

# Initial Environmental Examination (Draft)

Project Number: 53077-001  
June 2022

People's Republic of China: Gansu  
Environmentally Sustainable Rural Vitalization and  
Development Project: Yongchang County  
Subproject

## CURRENCY EQUIVALENTS

(as of 1 June 2022)

Currency unit	–	yuan (CNY)		
CNY1.00	=	€ 0.1425	or	\$0.1500
\$1.00	=	CNY 6.6651	or	€0.9341
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## ABBREVIATIONS

ADB	–	Asian Development Bank
AQG	–	Air Quality Guideline
BOD <sub>5</sub>	–	5-Day Biochemical Oxygen Demand
C&D	–	Construction and Demolition
CEMP	–	Construction Site-specific Environmental Management Plan
CNY	–	Chinese Yuan
CO	–	Carbon Monoxide
COD	–	Chemical Oxygen Demand
CPS	–	Country Partnership Strategy
CRA	–	Climate Risk Assessment
EA	–	Executing Agency
EEB	–	Ecology and Environment Bureau
EED	–	Ecology and Environment Department
EHS	–	Environment, Health and Safety
EIA	–	Environmental Impact Assessment
EIR	–	Environmental Impact Report
EIRF	–	Environmental Impact Registration Form
EIT	–	Environmental Impact Table
EM	–	Ethnic Minority
EMDP	–	Ethnic Minority Development Plan
EMoP	–	Environmental Monitoring Plan
EMP	–	Environmental Management Plan
EMS	–	Environmental Monitoring Station
EMU	–	Environmental Management Unit
EPL	–	Environmental Protection Law
FSR	–	Feasibility Study Report
GDP	–	Gross Domestic Product
GHG	–	Greenhouse Gas
GRM	–	Grievance Redress Mechanism
IA	–	Implementing Agency
IEE	–	Initial Environmental Examination
ILO	–	International Labor Organization
I <sub>Mn</sub>	–	Permanganate Index
IPCC	–	International Panel on Climate Change
LIEC	–	Loan Implementation Environment Consultant
MEE	–	Ministry of Ecology and Environment
NH <sub>3</sub> -N	–	Ammonia Nitrogen
NO <sub>2</sub>	–	Nitrogen Dioxide
NO <sub>x</sub>	–	Nitrogen Oxides
PAM	–	Project Administration Manual
PM	–	Particulate Matter
PM <sub>10</sub>	–	Particulate Matter with diameter ≤ 10 micrometers
PM <sub>2.5</sub>	–	Particulate Matter with diameter ≤ 2.5 micrometers
PPMO	–	Project Management Office
PPE	–	Personal Protective Equipment
PRC	–	People's Republic of China

PSC	–	Project Steering Committee
RP	–	Resettlement Plan
SO <sub>2</sub>	–	Sulfur Dioxide
SPS	–	Safeguard Policy Statement
SS	–	Suspended Solids
TN	–	Total Nitrogen
TP	–	Total Phosphorus
TRTA	–	Transaction Technical Assistance
TSP	–	Total Suspended Particulates
WHO	–	World Health Organization
WWTS	–	Wastewater Treatment Station

## **WEIGHTS AND MEASURES**

°C	–	degree centigrade
μ	–	micron
cm	–	centimeter
h	–	hour
ha	–	hectare
km	–	kilometer
km/h	–	kilometer per hour
km <sup>2</sup>	–	square kilometer
m	–	meter
m <sup>2</sup>	–	square meter
m <sup>3</sup>	–	cubic meter
m/s	–	meter per second
m <sup>3</sup> /d	–	cubic meter per day
m <sup>3</sup> /s	–	cubic meter per second
mg/l	–	milligram per liter
mg/m <sup>3</sup>	–	milligram per cubic meter
mm	–	millimeter
s	–	second
t	–	metric ton
y	–	year

## **NOTE**

In this report, “\$” refers to US dollars and € refers to the euro, the official currency of 19 of the 27 member states of the European Union.

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## EXECUTIVE SUMMARY

### I. Introduction

1. This is the Initial Environmental Examination (IEE) report for the Yongchang County Subproject, which will be implemented as part of the proposed Gansu Environmentally Sustainable Rural Vitalization and Development (the Project) in the People's Republic of China (PRC). The project aims to demonstrate innovative, low-carbon, and environmentally sustainable rural development models in Gansu Province by supporting the use of renewable energy, sustainable agriculture practices, and high-level technology. The project will explore a carbon credit scheme and new practices to sustain and propagate the low-carbon interventions, strengthen governments' institutional capacity for green governance and private sector engagement, and diversify employment opportunities beyond agriculture.

2. The project aims to demonstrate innovative, low-carbon, and environmentally sustainable rural development models in Gansu Province by supporting the use of renewable energy, sustainable agriculture practices, and high-level technology. The project will explore a carbon credit scheme and new practices to sustain and propagate the low-carbon interventions, strengthen governments' institutional capacity for green governance and private sector engagement, and diversify employment opportunities beyond agriculture.

3. The project includes five subprojects in five cities/counties and a total of five standalone subproject IEEs have been developed for the five subprojects. This report is focusing on the Yongchang County Subproject in Jinchang City. It does not include the project activities in Ganzhou District Subproject (Zhangye City), Pingchuan District Subproject (Baiyin City), Lintao County Subproject (Dingxi City) and Qinzhou District Subproject (Tianshui City), which are covered under four separate IEE reports.

4. ADB's environmental safeguard requirements are specified in the Safeguard Policy Statement (SPS, 2009). The subproject has been screened and classified by ADB as Environment Category B, requiring the preparation of an IEE (this report) including an environmental management plan (EMP). The EMP is presented in Appendix I.

5. This report has been prepared based on a domestic Feasibility Study Report (FSR); domestic EIA reports<sup>1</sup>; additional baseline data collection and analyses undertaken by the domestic EIA institute under the direction of an ADB TrTA team<sup>2</sup>; site visits and analyses conducted by the TrTA team; ADB review mission discussions and agreements with relevant government agencies; and, consultations with affected persons and stakeholders.

### II. Description

6. Gansu Province is located in the northwest People's Republic of China (PRC). The project area is part of the Yellow River Ecological Corridor (YREC), which comprises the PRC's second largest river basin, covering 752,400 square kilometers(km<sup>2</sup>) across nine provinces and serving as home to 120 million people. With only 2% of the country's water resources, the basin suffers from severe water scarcity, growing climate change impacts including floods and droughts, and unsustainable development. Gansu is one of the poorest provinces in the PRC, and about 70% of the population of 27 million lives in underdeveloped rural areas with rural incomes around one-third of those for urban households. Challenges in the province include

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1 This IEE has been developed based on one domestic Environmental Impact Tabular (EIT) and one Environmental Impact Registration Forms (EIRF) report (for the sheep farm) of the Yongchang subproject. For the project, a total of five EITs and three EIRFs were developed.

2 TA-9820 PRC: Preparing Sustainable Development Projects - Gansu Environmentally Sustainable Rural Vitalization and Development (53074-001).

(i) the semi-arid climate and mountainous terrain; (ii) an outdated, low value, and carbon-intensive agriculture sector; (iii) climate change, which is expected to lead to an even drier climate and more frequent natural hazards; (iv) underdeveloped rural infrastructure; (v) low level of experience engaging with the private sector; and (vi) insufficient control of pollution, which is leading to environmental degradation. The lack of modern and sustainable economic activities is leading to continued environmental degradation, constrained future economic growth, and out-migration of young people.

7. The project is aligned with the following impacts: low-carbon transition in rural development, and carbon sequestration in rural areas promoted;<sup>3</sup> sustainable rural development promoted; and rural ecosystems protected and restored.<sup>4</sup> The project will use innovative and replicable green development solutions to achieve the following outcome: climate-resilient and sustainable rural economic diversification and mitigation of climate change demonstrated in Gansu Province. The following outputs, each including various components) are proposed to achieve the outcome.

**Output 1: Institutional capacity for green governance and private sector engagement enhanced.** This output will strengthen institutional capacity of the executing and implementing agencies for (i) improving green governance with respect to reducing pollution from traditional agricultural production and promoting climate change mitigation and adaptation measures, strengthening local environmental pollution regulations, and strengthening local government capacity to support sustainable agriculture production; (ii) promoting private sector engagement in sustainable agricultural development through farmers' professional cooperative associations and village communities; (iii) developing carbon credit pilot institutions by establishing systems at the provincial level and promoting linkages from the local level to the provincial level; (iv) promotion of sustainable and green rural tourism; and (v) promoting inter-agency cooperation mechanisms for project performance, project asset management, and project implementation management. Lessons learned from institutional strengthening will be synthesized into knowledge products and disseminated through knowledge platforms, including the Regional Knowledge Sharing Initiative, launched by ADB and the government, and the Natural Capital Lab, currently under development.<sup>5</sup> The output will also provide important support for implementation of activities under outputs 2, 3, and 4.

**Output 2: Sustainable and climate-resilient agricultural development measures and practices enhanced.** Under this output, measures will be undertaken to improve the climate resilience of agriculture in the semi-arid Yellow River Basin including (i) energy and water saving practices such as drip irrigation; (ii) internet connected sensors and decision support systems for efficient use of water and fertilizers; (iii) circular agriculture practices such as producing fertilizer from agriculture waste; and (iv) use of farmland as a carbon sink with the resulting carbon credit contributing to rural incomes. The output will support (i) high standard farmland construction (2,000 mu) together with arched greenhouses and a vegetable storage and transportation center (2,000 m<sup>2</sup>), a fruit and livestock circularity demonstration park (1,090 mu), and an ecological beef cattle farm (400 head) in Ganzhou District; (ii) a smart agriculture demonstration area (72 mu of greenhouses) in Carrot Town, the Maobula Folk Culture Exhibition Zone and planting and breeding base (8,000 mu), and a sheep breeding base (220 mu) in Yongchang County; (iii) a planting base comprising solar greenhouses (300 mu), a cattle breeding base (400

3 Government of the People's Republic of China. 2021. Action Plan for Carbon Peaking by 2030. Beijing. [http://www.gov.cn/zhengce/content/2021-10/26/content\\_5644984.htm](http://www.gov.cn/zhengce/content/2021-10/26/content_5644984.htm);

4 Government of the People's Republic of China. 2021. 14th Five Year Plan for Promoting Agricultural and Rural Modernization. Beijing. [http://www.gov.cn/zhengce/content/2022-02/11/content\\_5673082.htm](http://www.gov.cn/zhengce/content/2022-02/11/content_5673082.htm)

5 ADB. ADB-PRC Regional Knowledge Sharing Initiative; and ADB. 2020. Building Partnerships Sharing Knowledge and Leveraging Finance for Natural Capital Lab in Asia Pacific Region –Ahmed Saeed. Speech. 6 November.

head), an integrated demonstration park for agricultural output processing (6,600 m<sup>2</sup> of facilities), and a Wenguan fruit economic forest (4,000 mu) in Pingchuan County; (iv) a peony demonstration garden (5.3 mu), green vegetable planting base (1,000 mu), and solar and plastic greenhouse planting bases (1,300 mu) in Lintao County; and (v) mountain ecological development including arched greenhouses (80 mu), Chinese herbal medicine planting base (258 mu), a Chinese herbal medicine processing workshop (500 m<sup>2</sup>), and an organic fruit and vegetable storage center (1,500 m<sup>2</sup>). Qinzhou District. This output will contribute to climate change mitigation through conservation of resources and reduction of water and soil pollution.

**Output 3: Sustainable low-carbon rural development measures and facilities installed.** Under this output, facilities and associated infrastructure will be developed to support sustainable, low-carbon economic activities in new areas such as (i) prioritized use of distributed renewable energy sources; (ii) compliance with building energy efficiency standards at least in accordance PRC standards; (iii) installation of electric vehicle chargers; and (iv) solar-powered street lighting. The output will support (i) a farming culture popularization base comprising 1,800 m<sup>2</sup> of exhibition and processing facilities, and 40 green shared farms, and a cultural service center (14,200 m<sup>2</sup>) in Ganzhou District; (building renovation and environment improvement in Carrot Town, and development of a traditional Chinese medicine cultural experience center with supporting facilities) in Yongchang County; (iii) a vegetable waste treatment workshop (100 m<sup>2</sup>) and rural ecological environment works including village road repairing, garbage collection, sewage pipelines, etc. in Pingchuan District; (iv) a community comprehensive service center (8 mu), demonstration of residential house renovation (20 households), homestay facilities (6 mu), a women's village camp (17 mu), and a wetland science base (172 mu) in Lintao County; and (v) a comprehensive elderly service center (3,000 m<sup>2</sup>), and an urban and rural mutual aid elderly caring demonstration base (30,000 m<sup>2</sup>) in Qinzhou District.

**Output 4: Environmental areas protected and restored.** Under this output, sites in the project area suffering from environmental degradation, including forests, rivers, and wetlands, will be restored; and nature-based solutions to prevent future degradation and to support environmentally sustainable growth will be introduced. The project will support (i) ecological restoration of 1,600 mu of forestation close to the Heiha River in Ganzhou; (ii) reservoir ecological management improvement of 8,000 mu on the west bank of the Jinchuanxia Reservoir in Yongchang County; (iii) slope protection on 6 km of riverbank in Pingchuan County; (iii) establishment of 5,350 mu of carbon sink forest (2,500 mu in Pingchuan District, 1,000 mu in Lintao County, and 1,850 mu in Qinzhou District); and (iv) ecological restoration of 3,000 mu of abandoned mining area in Pingchuan County.

8. The Yongchang County Subproject will be undertaken as part of project outputs 1-4. The subproject will support Jinchang City to (i) promote green development in rural areas; (ii) develop smart agriculture and ecological agriculture in rural areas; (iii) promote sustainable tourism; and (iv) undertake ecological restoration.

### III. Benefits

9. The five subprojects, covering six rural towns and 18 villages in five counties/districts, will contribute to rural development, and promote social and economic inclusion and sustainable livelihoods of the poor and vulnerable groups by providing diversified income generation channels and improved living environment. The main beneficiaries of the project will be rural residents in the project towns and villages, and members of cooperatives and small and medium-sized agriculture enterprises in the five project counties/districts (Lintao County of Dingxi City, Ganzhou District of Zhangye City, Yongchang County of Jinchang City, Pingchuan District of Baiyin City, and Qinzhou District of Tianshui City). In the six project towns and 18 villages there are 266,104 residents, including 33,035 persons in the 18 project villages,

who are identified as the primary beneficiaries. In addition, the total 2.03 m population in the five project counties/districts will indirectly benefit from the project as secondary beneficiaries, including approximately 1.01 million women (49.48% of the beneficiaries), 31,738 ethnic minorities (EM) (1.56%), and 119,913 low-income people (5.67%).

10. The primary beneficiaries of the Yongchang County Subproject will be 65,368 residents in Chengguan Town and Hongshanyao Town, including 7,178 persons in four subproject villages. In addition, the 0.18 million population in Yongchang County will indirectly benefit from the subproject as secondary beneficiaries, including approximately 86,262 women (48.56% of the beneficiaries), 1,524 EM people (0.86%), and 8,960 low-income people (5.04%).

11. The subproject will directly benefit vulnerable groups including 34,425 women and 3,294 low-income people (or 5.04%) through improved agricultural production facilities and service systems, upgraded public infrastructure, and better living environment and employment opportunities. Expected benefits for local residents, including women and vulnerable groups, include: (i) diverse job and income-generation opportunities in circular agriculture and agritourism sectors; (ii) improved/upgraded public infrastructure and services; (iii) improved living environment; (iv) improved institutional capacity of local agricultural organizations (farmers' cooperatives, leading enterprises, large family farms, etc.); (v) enhanced awareness and knowledge of public health, safety and environment protection; and (vi) increased consultation and participation opportunities in project design, implementation, and monitoring and evaluation.

12. A due diligence review reveals that the subproject is not expected to impact distinct and vulnerable communities of indigenous peoples or ethnic minorities. There are Hui and other EM populations accounting for 1.96% of the total population in the subproject area, and no significant differences exist between them and Han residents in terms of language and socioeconomic conditions. The EM population will benefit from improved services and employment opportunities under the subproject. Meanwhile, adverse impacts on ethnic minorities, mainly related to land use and construction disturbance of civil works, have been addressed by the resettlement plan (RP) and the EMP.

#### **IV. Impacts and Mitigation Measures**

13. The subproject zone of influence is defined as:

- i) A 200 m zone around the boundary of all subproject sites with respect to noise during construction and operation;
- ii) A 200 m zone around the boundary of all subproject sites with respect to air pollution during construction and operation; and
- iii) A 100 m zone around the boundary of the subproject with respect to local terrestrial and aquatic ecology.

14. **Siting and Land Acquisition.** The subproject will permanently occupy 100 mu (106,667 m<sup>2</sup>) of land. There will be no physical house relocation. In addition, temporary land occupation will occur during construction period and the subproject will use 11,787 mu of land through land use rights transfer (LURT) for agricultural development on a voluntary negotiation basis. One resettlement plan was prepared in line with ADB's SPS and PRC's laws and regulations, supported by a due diligence review by ADB social safeguard specialists. Each subproject management office (Sub-PMO) will designate resettlement staff and the project implementation consultants will provide training and support. An external agency will be engaged to monitor and evaluate the implementation of the RPs and corrective actions and submit reports to ADB.

15. **Construction Phase.** Potential negative construction phase environmental impacts

are short-term and localized, and are associated with fugitive dust, construction noise, wastewater, solid waste, vegetation clearance, and risks to worker and community health and safety. These will be effectively mitigated through good construction and health and safety practices, including construction soil and spoil management; dust controls including site watering and the use of ready-mix concrete; noise controls including limiting times and season when noisy activities can occur, selecting low noise equipment and scheduling materials delivery to avoid densely populated or sensitive areas; water quality protection measures including managing site runoff and provision of worker sanitary facilities; good solid and hazardous waste management practices; and worker and community good health, safety and emergency response procedures. Construction will not affect any parks, protected areas (except Jinchuanxia Reservoir), or rare or threatened flora or fauna species. The mitigation measures on Jinchuanxia Reservoir protection during construction phase have been developed and included in the EMP.

16. **Operation Phase.** Potential negative operation phase impacts include water usage, wastewater discharge, solid waste management, odor emissions and manure from the sheep farm, potential pollution of the Jinchuanxia Reservoir, noise, and potential safety risks. These impacts will be effectively mitigated through good design, including, for example, solid waste and wastewater management, odor control measures, noise control measures, good waste and health and safety management practices and safety plans.

17. **Project environmental benefits.** The subproject will have significant environmental benefits, as follows: (i) conservation of water resources, through the avoided future use of about 2.66 million m<sup>3</sup> water per year compared with existing water use by the farmers in existing operations (for similar crops and conditions at nearby sites), due to utilization of water saving technology; (ii) reduced pollution of water and soil resources, through the avoided future use of chemical fertilizer by about 4,308.8 tons per year, and reduced use of pesticides by about 10.77 tons and insecticides by 3.23 tons per year, compared to baseline conditions (reductions in the rate of application of agricultural chemicals per unit area, especially fertilizers, will decrease the non-point source pollution load entering waterways and contribute to improved water quality); (iii) reduction of greenhouse gas (GHG) emission and pollution emission through intensive sheep raising compared to individual sheep raising by local farmers, and solar photovoltaic (PV) compared to coal based power generation; (iv) environmental improvement from ecological restoration; and (v) through these benefits, contribution to national and provincial policies for water conservation and protection.

18. **Coronavirus disease outbreak (COVID-19).** The outbreak and global spread of COVID-19 since December 2019 pose new risks and management implications for most countries. The extent of COVID-19 in Gansu Province and the project area was reviewed, and requirements for a COVID-19 health and safety plan are included in the EMP. Measures include the screening of all project personnel prior to admission to project sites, onsite measures for sanitation, emergency response, and the provision of personal protective equipment (PPE).

19. **Climate Change.** A Climate Risk Assessment (CRA) was undertaken for the subproject (section G, chapter V). The subproject will contribute to GHG emission reduction by: (i) utilization of solar PV, lighting and heating to reduce electricity consumption; (ii) using green buildings to reduce building energy consumption; (iii) manure treatment and recycling; (iv) utilization of organic fertilizer to reduce fertilizer consumption; and (v) carbon sequestration by ecological restoration and afforestation and re-vegetation activities. The total CO<sub>2</sub>e emissions generated by the subproject during the operation will be about 1,467.8 tons/yr, while the total CO<sub>2</sub>e sequestration from the subproject will be 17,446.8 tons of CO<sub>2</sub>e/yr. Hence, the net GHG emission reduction from the subproject will be 15,979.0 tons/yr.

## **V. Environmental Management Plan**

20. A comprehensive subproject EMP was developed to ensure: (i) implementation of identified mitigation and management measures to avoid, reduce, mitigate, and compensate for anticipated adverse environment impacts; (ii) implementation of monitoring and reporting; and (iii) subproject compliance with the PRC's relevant environmental laws, standards and regulations and ADB's SPS. Organizational responsibilities and budgets are clearly identified for execution, monitoring and reporting. The subproject EMP is presented in Appendix I.

21. The EMP includes a project-level grievance redress mechanism (GRM), established to receive and facilitate resolution of complaints about the project during the preconstruction, construction and operation phases. The GRM includes procedures for receiving grievances, documenting key information, and evaluating and responding to the complainants in a reasonable time period. Any concerns raised through the GRM will be addressed quickly and transparently, and without retribution to the affected persons.

## **VI. Information Disclosure, Consultation and Participation**

22. Domestic EIAs (in Chinese) covering the subproject components in Yongchang County are available on request at the PPMO, and will be disclosed on the Yongchang County Environment and Ecology Bureau (EEB) website later. The first public information notice was posted on a famous website for information disclosure in May 2022 after the draft EIA was prepared. The information disclosure was undertaken by Sub-PMO and the domestic EIA Institute with the assistance from the TrTA environmental team.

23. Two rounds of public consultations were conducted in March to April 2022 in the subproject sites by the IA and Sub-PMO with the assistance from the TrTA environmental team. The first public consultation was conducted after the project scope and activities were confirmed. The second public consultation was conducted after the first information disclosure. Questionnaire survey was conducted after the public consultation. A total of 226 questionnaires were distributed and received. The results show that 100% of participants anticipate that the project will have a positive effect on the local economy, and 100% indicated that they support the subproject.

24. Meaningful consultation will continue throughout detailed design, construction and operation phases, including information disclosure by the subproject proponent, posting of project information on community notice boards, and public consultations.

25. The project-wide GRM has been designed to facilitate the resolution of complaints during project construction and operation. The GRM includes time-based steps for receiving, documenting, and resolving grievances. Any concerns raised through the GRM will be addressed quickly and transparently, and without retribution to the affected persons.

## **VII. Key EMP Implementation Responsibilities**

26. The Gansu Provincial Government will be the executing agency (EA) for the project and has established a provincial project management office (PPMO) under Gansu Culture Tourism Industry Co. Ltd. (GCT) to manage project preparation and implementation. The implementing agency (IA) of Yongchang County Subproject will be Yongchang County Government for project components in Yongchang County and the IAs for other subprojects will be Ganzhou District Government for project components in Ganzhou District, Pingchuan District Government for project components in Pingchuan District, Lintao County Government for project components in Lintao County, and Tianshui City Economic Development Investment and Financing (Group) Co., Ltd. for project components in Qinzhou District. A Project Steering Committee (PSC) was established to provide high level guidance, supervision



and coordination for the project. The PSC is led by the EA.

27. Each IA will establish a Sub-PMO to manage implementation of the relevant subprojects. The Sub-PMOs will designate staff to its Sub-PMO to ensure appropriate and efficient project implementation. The IAs will establish environmental management units (EMUs) within each Sub-PMO which will take overall responsibility for supervising the implementation of the EMP, including mitigation measures, coordinating the project level GRM, and preparing monitoring reports for submission by the PPMO to the ADB. The EMUs will consist of one qualified environment officer and an appropriate number of designated environmental staff from the components (one staff for one component).

28. The PPMO will recruit a Project Management and Capacity Development Consultants (PMC) to assist with project management, technical support, safeguards monitoring and implementation of the social development action plan, and the communication strategy. The PMC will also cater to the reporting needs of ADB. The PPMO will also engage a loan implementation environment consultant (LIEC) prior to the engagement of construction contractors, who will support the PPMO and Sub-PMOs in mitigation implementation, environmental monitoring, reporting, and addressing any environment-related issues that arise including grievances. The LIEC will also support contractors in developing construction site-specific environmental management plans (CEMPs) prior to construction and operation.

## **VIII. Risks and Assurances**

29. Most of IAs and Sub-PMOs have no previous experience in ADB projects (although the Ganzhou District Subproject IA and Sub-PMO have had previous experience in ADB projects) and have low institutional capacity for environmental management. This may result in limited implementation of the subproject EMPs and inadequate operation of the project facilities. These risks will be minimized by (i) the appointment of qualified environmental officers within the PPMO, Sub-PMO and IAs to lead EMP delivery; (ii) the appointment of additional qualified environmental officers as needed; (iii) inclusion of consultant environment specialists in the start-up and loan implementation consulting services; (iv) recruitment of an environmental monitoring agency to lead the external monitoring specified in the EMP; (iv) clear roles and responsibilities of all relevant agencies for EMP implementation, including contractors and construction supervision companies; and (v) capacity building for EMP implementation. Environmental assurances have been agreed upon and will be included in the loan and project agreements.

## **IX. Conclusion**

30. The Yongchang County subproject IEE has: (i) identified potential negative environment impacts and established mitigation measures; (ii) assessed public support from the project beneficiaries and affected people; (iii) presented the project GRM; and (iv) prepared a subproject EMP, including environmental management and supervision structure, environmental mitigation and monitoring plans, and capacity building and training.

31. It is concluded that the subproject will not result in adverse environmental impacts that are irreversible, diverse, or unprecedented. Any minimal adverse environmental impacts associated with the subproject will be prevented, reduced, or minimized through the implementation of the subproject EMP.



## I. INTRODUCTION

1. This is the Initial Environmental Examination (IEE) report for the Yongchang County Subproject (the subproject), which will be implemented as part of the proposed Gansu Environmentally Sustainable Rural Vitalization and Development (the Project) in the People's Republic of China (PRC). The project aims to demonstrate innovative, low-carbon, and environmentally sustainable rural development models in Gansu Province by supporting the use of renewable energy, sustainable agriculture practices, and high-level technology. The project will explore a carbon credit scheme and new practices to sustain and propagate the low-carbon interventions, strengthen governments' institutional capacity for green governance and private sector engagement, and diversify employment opportunities beyond agriculture.
2. The project includes five subprojects in five cities/counties and a total of five standalone subproject IEEs have been developed for the five subprojects. This report is focusing on the Yongchang County Subproject in Jinchang City (the subproject). It does not include the project activities in Ganzhou District Subproject (Zhangye City), Pingchuan District Subproject (Baiyin City), Lintao County Subproject (Dingxi City) and Qinzhou District Subproject (Tianshui City), which are covered under four separate IEE reports.
3. ADB's environmental safeguard requirements are specified in the Safeguard Policy Statement (SPS, 2009). The subproject has been screened and classified by ADB as Environment Category B, requiring the preparation of an IEE (this report) including an environmental management plan (EMP). The EMP is presented in Appendix I.
4. This report has been prepared based on domestic Feasibility Study Report (FSR); domestic EIA report; additional baseline data collection and analyses undertaken by the domestic EIA institute under the direction of an ADB TrTA team<sup>6</sup>; site visits and analyses conducted by the TrTA team; ADB review mission discussions and agreements with relevant government agencies; and, consultations with affected persons and stakeholders.
5. The project is aligned with the following impacts: low-carbon transition in rural development, and carbon sequestration in rural areas promoted<sup>7</sup>; and sustainable rural development promoted, and rural ecosystems protected and restored<sup>8</sup>. The project will use innovative and replicable green development solutions to achieve the following outcome: climate-resilient and sustainable rural economic diversification and mitigation of climate change demonstrated in Gansu Province. The following outputs are proposed to achieve the outcome.

**Output 1: Institutional capacity for green governance and private sector engagement enhanced.** This output will strengthen institutional capacity of the executing and implementing agencies for (i) improving green governance with respect to reducing pollution from traditional agricultural production and promoting climate change mitigation and adaptation measures, strengthening local environmental pollution regulations, and strengthening local government capacity to support sustainable agriculture production; (ii) promoting private sector engagement in sustainable agricultural development through farmers' professional cooperative associations and village communities; (iii) developing carbon credit pilot institutions by establishing systems at the provincial level and promoting linkages from the local level to the provincial level; (iv) promotion of sustainable and green rural tourism; and (v) promoting inter-agency cooperation mechanisms for

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6 TA-9820 PRC: Preparing Sustainable Development Projects - Gansu Environmentally Sustainable Rural Vitalization and Development (53074-001).

7 Government of the People's Republic of China. 2021. Action Plan for Carbon Peaking by 2030. Beijing. [http://www.gov.cn/zhengce/content/2021-10/26/content\\_5644984.htm](http://www.gov.cn/zhengce/content/2021-10/26/content_5644984.htm);

8 Government of the People's Republic of China. 2021. 14th Five Year Plan for Promoting Agricultural and Rural Modernization. Beijing. [http://www.gov.cn/zhengce/content/2022-02/11/content\\_5673082.htm](http://www.gov.cn/zhengce/content/2022-02/11/content_5673082.htm)

project performance, project asset management, and project implementation management. Lessons learned from institutional strengthening will be synthesized into knowledge products and disseminated through knowledge platforms, including the Regional Knowledge Sharing Initiative, launched by ADB and the government, and the Natural Capital Lab, currently under development.<sup>9</sup> The output will also provide important support for implementation of activities under outputs 2, 3, and 4.

**Output 2: Sustainable and climate-resilient agricultural development measures and practices enhanced.** Under this output, measures will be undertaken to improve the climate resilience of agriculture in the semi-arid Yellow River Basin including (i) energy and water saving practices such as drip irrigation; (ii) internet connected sensors and decision support systems for efficient use of water and fertilizers; (iii) circular agriculture practices such as producing fertilizer from agriculture waste; and (iv) use of farmland as a carbon sink with the resulting carbon credit contributing to rural incomes. The output will support (i) high standard farmland construction (2,000 mu) together with arched greenhouses and a vegetable storage and transportation center (2,000 m<sup>2</sup>), a fruit and livestock circularity demonstration park (1,090 mu), and an ecological beef cattle farm (400 head) in Ganzhou District; (ii) a smart agriculture demonstration area (72 mu of greenhouses) in Carrot Town, the Maobula Folk Culture Exhibition Zone and planting and breeding base (8,000 mu), and a sheep breeding base (220 mu) in Yongchang County; (iii) a planting base comprising solar greenhouses (300 mu), a cattle breeding base (400 head), an integrated demonstration park for agricultural output processing (6,600 m<sup>2</sup> of facilities), and a Wenguan fruit economic forest (4,000 mu) in Pingchuan County; (iv) a peony demonstration garden (5.3 mu), green vegetable planting base (1,000 mu), and solar and plastic greenhouse planting bases (1,300 mu) in Lintao County; and (v) mountain ecological development including arched greenhouses (80 mu), Chinese herbal medicine planting base (258 mu), a Chinese herbal medicine processing workshop (500 m<sup>2</sup>), and an organic fruit and vegetable storage center (1,500 m<sup>2</sup>). Qinzhou District. This output will contribute to climate change mitigation through conservation of resources and reduction of water and soil pollution.

**Output 3: Sustainable low-carbon rural development measures and facilities installed.** Under this output, facilities and associated infrastructure will be developed to support sustainable, low-carbon economic activities in new areas such as (i) prioritized use of distributed renewable energy sources; (ii) compliance with building energy efficiency standards at least in accordance PRC standards; (iii) installation of electric vehicle chargers; and (iv) solar-powered street lighting. The output will support (i) a farming culture popularization base comprising 1,800 m<sup>2</sup> of exhibition and processing facilities, and 40 green shared farms, and a cultural service center (14,200 m<sup>2</sup>) in Ganzhou District; (building renovation and environment improvement in Carrot Town, and development of a traditional Chinese medicine cultural experience center with supporting facilities) in Yongchang County; (iii) a vegetable waste treatment workshop (100 m<sup>2</sup>) and rural ecological environment works including village road repairing, garbage collection, sewage pipelines, etc. in Pingchuan District; (iv) a community comprehensive service center (8 mu), demonstration of residential house renovation (20 households), homestay facilities (6 mu), a women's village camp (17 mu), and a wetland science base (172 mu) in Lintao County; and (v) a comprehensive elderly service center (3,000 m<sup>2</sup>), and an urban and rural mutual aid elderly caring demonstration base (30,000 m<sup>2</sup>) in Qinzhou District.

**Output 4: Environmental areas protected and restored.** Under this output, sites in the project area suffering from environmental degradation, including forests, rivers, and

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9 ADB. ADB-PRC Regional Knowledge Sharing Initiative; and ADB. 2020. Building Partnerships Sharing Knowledge and Leveraging Finance for Natural Capital Lab in Asia Pacific Region –Ahmed Saeed. Speech. 6 November.

wetlands, will be restored; and nature-based solutions to prevent future degradation and to support environmentally sustainable growth will be introduced. The project will support (i) ecological restoration of 1,600 mu of forestation close to the Heiha River in Ganzhou; (ii) reservoir ecological management improvement of 8,000 mu on the west bank of the Jinchuanxia Reservoir in Yongchang County; (iii) slope protection on 6 km of riverbank in Pingchuan County; (iii) establishment of 5,350 mu of carbon sink forest (2,500 mu in Pingchuan District, 1,000 mu in Lintao County, and 1,850 mu in Qinzhou District); and (iv) ecological restoration of 3,000 mu of abandoned mining area in Pingchuan County.

6. The project will apply best practices for climate-resilient agricultural development, sustainable rural infrastructure development, and protection and restoration of critical environmental areas. This will be accomplished by adopting high-level technologies, strengthening climate resilience, and demonstrating climate adaptation and mitigation measures in the five counties of the project area. The project will also finance institutional strengthening at the provincial and county level. The practical models, experience and lessons of each demonstration activity will be collected and shared, and knowledge dissemination activities will be carried out with other applicable provinces. Capacity building and strengthening actions have been designed to ensure the sustainability of all interventions.

7. The Yongchang County Subproject will be undertaken as part of project outputs 1 to 4. The subproject will support Jinchang City to (i) promote green development in rural areas; (ii) develop smart agriculture and ecological agriculture in rural areas; (iii) promote sustainable tourism; and (iv) undertake ecological restoration. The subproject will demonstrate various innovative green rural development models and is expected to result in the avoidance of additional CO<sub>2</sub> emissions. The subproject activities are presented in detail in **Chapter III**.

8. The primary beneficiaries of the Yongchang County Subproject will be 65,368 residents in Chengguan Town and Hongshanyao Town, including 7,178 persons in four subproject villages. In addition, the 0.18 million population in Yongchang County will indirectly benefit from the subproject as secondary beneficiaries, including approximately 86,262 women (48.56% of the beneficiaries), 1,524 EM people (0.86%), and 8,960 low-income people (5.04%).

9. The subproject will directly benefit 65,368 residents, particularly vulnerable groups, in the project areas, including 34,425 women, 3,294 low-income people (or 5.04%) through improved agricultural production facilities and service system, upgraded public infrastructure, better living environment and employment opportunities under the subproject. Expected project benefits for local residents, including women and vulnerable groups, include: (i) diverse job and income-generation opportunities in circular agriculture and agritourism sectors; (ii) improved/upgraded public infrastructure and services; (iii) improved living environment; (iv) improved institutional capacity of local agricultural organizations (farmers' cooperatives, leading enterprises, large family farms, etc.); (v) enhanced awareness and knowledge of public health, safety and environment protection; and (vi) increased consultation and participation opportunities in project design, implementation, and monitoring and evaluation.

10. A due diligence review reveals that the project is not expected to impact distinct and vulnerable communities of indigenous peoples or ethnic minorities. There are mainly Hui ethnic minority populations that account for 0.48% of the total population in the project area, and no significant differences exist between them and Han residents in terms of language and socioeconomic conditions. The ethnic minority population will benefit from improved services and employment opportunities under the project. Meanwhile, adverse impacts on ethnic minorities, mainly related to of land use and construction disturbance of civil works, have been addressed by resettlement plan (RP) and EMP.

11. ADB's environmental safeguard requirements are specified in the SPS 2009. The Subproject has been screened and classified by ADB as Environment Category B, requiring

the preparation of an IEE including an environmental management plan (EMP). The subproject EMP is presented in **Appendix I**.

## II. POLICY, LEGAL, AND ADMINISTRATIVE FRAMEWORK

### A. Applicable ADB Policies, Regulations and Requirements

12. The major applicable ADB policies, regulations, requirements and procedures for environmental management and environmental impact assessment (EIA) are the *Safeguard Policy Statement* (SPS, 2009) and the *Environmental Safeguards – A Good Practice Sourcebook* (2012), which jointly provide the basis for this EIA. The SPS promotes good international practice as reflected in internationally recognized standards such as the World Bank Group's *EHS Guidelines*. The policy is underpinned by the ADB Operations Manual for the SPS (OM Section F1, 2010).

13. The SPS establishes an environmental review process to ensure that projects undertaken as part of programs funded through ADB loans are environmentally sound, are designed to operate in compliance with applicable regulatory requirements, and are not likely to cause significant environment, health, social, or safety hazards.

14. At an early stage in the project cycle, typically the project identification stage, ADB screens and categorizes proposed projects based on the significance of potential project impacts and risks. Project screening and categorization are undertaken to:

- i) reflect the significance of the project's potential environmental impacts;
- ii) identify the type and level of environmental assessment and institutional resources required for the safeguard measures proportionate to the nature, scale, magnitude and sensitivity of the proposed project's potential impacts; and,
- iii) determine consultation and disclosure requirements.

15. A project's environment category is determined by the category of its most environmentally sensitive component, including direct, indirect, induced, and cumulative impacts. ADB assigns a proposed project to one of the following categories:

- i) **Category A.** Proposed project is likely to have significant adverse environmental impacts that are irreversible, diverse, or unprecedented; impacts may affect an area larger than the sites or facilities subject to physical works. A full-scale EIA including an EMP, is required.
- ii) **Category B.** Proposed project's potential environmental impacts are less adverse and fewer in number than those of category A projects; impacts are site-specific, few if any of them are irreversible, and impacts can be readily addressed through mitigation measures. An IEE, including an EMP, is required.
- iii) **Category C.** Proposed project is likely to have minimal or no adverse environmental impacts. No EIA or IEE is required although environmental implications need to be reviewed.
- iv) **Category FI.** Proposed project involves the investment of ADB funds to, or through, a financial intermediary.

16. The Yongchang County Subproject has been classified by ADB as environment category B. The other four subprojects have also been classified as environment category B. An IEE (this report) has been prepared for the Yongchang County Subproject (this report). Four separate Category B IEEs have been prepared for the Ganzhou District Subproject (Zhangye City), Pingchuan District Subproject (Baiyin City), Lintao County Subproject (Dingxi City) and Qinzhou District Subproject (Tianshui City) separately.

17. The SPS 2009 requires a number of additional considerations, including: (i) project risk and respective mitigation measures and project assurances; (ii) project-level grievance redress mechanism; (iii) definition of the project area of influence; (iv) physical cultural resources

damage prevention analysis; (v) climate change mitigation and adaptation; (vi) occupational and community health and safety requirements (including emergency preparedness and response); (vii) economic displacement that is not part of land acquisition; (viii) biodiversity conservation and natural resources management requirements; (ix) provision of sufficient justification if local standards are used; (x) assurance of adequate consultation and participation; and (xi) assurance that the EMP includes an implementation schedule and measurable performance indicators. These requirements, which may not be covered in a domestic environmental assessment, have been considered, and all applicable environmental requirements in the SPS 2009 are covered in this IEE.

18. During the design, construction, and operation of a project, the SPS also requires the borrower to follow environmental standards consistent with good international practice, as reflected in internationally recognized standards such as the World Bank Group's *Environment, Health and Safety Guidelines* (hereafter referred to as the EHS Guidelines).<sup>10</sup> The *EHS Guidelines* includes both general guidelines and industry sector guidelines. The general *EHS Guidelines* contains (i) environmental guidelines on discharge effluent, air emissions, and other numerical guidelines; (ii) occupational health and safety guidance; (iii) community health and safety guidance; and (iv) construction and decommissioning guidelines.

19. The *EHS Guidelines* also include performance indicators and prevention and control approaches that are normally acceptable to ADB and are generally considered to be achievable at reasonable costs by existing technology. When host country regulations differ from these levels and measures, the borrower/client is to achieve whichever is more stringent. If less stringent levels or measures are appropriate in view of specific project circumstances, the borrower/client is required to provide justification for any proposed alternatives.

## **B. ADB Assistance to PRC**

20. The Project, including the Ganzhou District Subproject, Yongchang County Subproject, Pingchuan District Subproject, Lintao County Subproject and Qinzhou District Subproject are aligned with the key thrusts of ADB's assistance to the PRC under the PRC Country Partnership Strategy (CPS)<sup>11</sup> in the areas of: (i) environmentally sustainable development; and (ii) climate change adaptation and mitigation; and (iii) aging society and health security.

## **C. PRC Environmental Legal Framework**

21. The environmental protection and management system in the PRC consists of a well-defined hierarchy of regulatory, administrative and technical institutions. At the top level the People's Congress of the PRC has the authority to pass and revise national environmental laws; the Ministry of Ecology and Environment (MEE) under the State Council promulgates national environmental regulations; and the MEE either separately or jointly with the Administration of Quality Supervision, Inspection and Quarantine issues national environmental standards and guidelines. Provincial and local governments can also issue provincial and local environmental regulations and guidelines in accordance with the national ones. In addition, national and local five-year environmental protection plans form an important part of the legal framework.

22. Key PRC environmental laws are listed in **Table II-1**, including associated regulations and decrees that support their implementation. Guidelines for EIA implementation are listed in **Table II-2**.

23. The most far-reaching legislation on pollution prevention and control is the

10 World Bank Group, *Environmental, Health, and Safety Guidelines*, April 30, 2007, Washington, USA. <http://www.ifc.org/ifcext/enviro.nsf/Content/EnvironmentalGuidelines>

11 Asian Development Bank. ADB's Country Partnership Strategy for the People's Republic of China 2021-2025.



*Environmental Protection Law* (EPL) (1989, amended 2014, effective 2015 and item 2 in **Table II-1**), which sets out key principles for the nation's pollution control system, including the "Three Simultaneities policy,"<sup>12</sup> the application of pollution levy's, and EIA requirements. The implementation of the "Three Simultaneities" was further strengthened by implementation decrees (items 26 and 28 **Table II-1**) and the *Construction Project Environmental Protection Management Regulation* (item 17 **Table II-1**).

**Table II-1: Applicable PRC environmental laws, regulations and decrees.**

No.	Laws	Issued/ Updated
1	Environmental Impact Assessment Law	2016
2	Environmental Protection Law	2015
3	Atmospheric Pollution Prevention and Control Law	2018
4	Occupational Disease Prevention and Control Law	2018
5	Water and Soil Conservation Law	2011
6	Water Pollution Prevention and Control Law	2018
7	Urban and Rural Planning Law	2008
8	Solid Waste Pollution Prevention and Control Law	2016
9	Water Law	2002
10	Cultural Relics Protection Law	2016
11	Noise Pollution Prevention and Control Law	2017
12	Labor Law	2018
<b>Regulations</b>		
13	Atmospheric Pollution Prevention and Control Action Plan (State Council Announcement No. 37)	2013
14	Policy on Integrated Techniques for Air Pollution Prevention and Control of Small Particulates (MEE Announcement No. 59)	2013
15	Planning Environmental Impact Assessment Regulation	2009
16	Implementation Regulation of Cultural Relics Protection Law	2003
17	Construction Project Environmental Protection Management Regulation	1998
18	Wild Plant Protection Regulation	1996
<b>Decrees and Announcements</b>		
19	Directory for the Management of Construction Project EIA Categorization (MEE Decree 2015-33)	2015
20	Measures for Public Participation in Environmental Protection (MEE Decree 2015-35)	2015
21	Management Measures for Environmental Impact Post Assessment of Construction Projects (on trial) (MEE Decree 2015-37)	2015
22	Government Information Disclosure of Construction Project EIA (on trial) (MEE Announcement No. 103)	2013
23	Measures for Environmental Supervision (MEE Decree 2012-21)	2012
24	Requirements for Preparation of EIA Report Summary (MEE Announcement 2012-51)	2012
25	Strengthening of EIA Management for Prevention of Environmental Risk (MEE Announcement 2012-77)	2012
26	Opinion from the State Council on Important Tasks for Strengthening Environmental Protection (State Council Announcement 2011-35)	2011
27	Management Measures for Operation of the Environmental Complaint Hotline (MEE Decree 2010-15)	2010
28	Management Procedures for the Supervision, Inspection and Environmental Acceptance of Construction Projects under the "Three Simultaneities" (on trial) (MEE Announcement 2009-150)	2009
29	Specifications on the Management of Urban Construction and Demolition Waste (Ministry of Construction Decree 2005-139)	2005
30	Management Measures for Inspection and Acceptance of Environmental Protection at Construction Project Completion (MEE Decree 2001-13)	2001

12 The "Three Simultaneities Policy" requires the design, construction, and operation of pollution control and treatment facilities to occur simultaneously with the project design, construction, and operation.

31	Interim Measures for the Environmental Protection Acceptance of Completed Construction Projects (EIA department of MEP, 2007-04)	2017
32	Gansu Environmental Protection Regulation	2020
33	Gansu Atmospheric Pollution Prevention and Control Regulation	2018
34	Gansu Water Pollution Prevention and Control Regulation	2021
35	Gansu Natural Reserve Regulation	2020
36	Gansu Provincial Ecological Protection Red Line Demarcation Plan	2021
37	Gansu Provincial Soil and Water Conservation Plan	2012
38	Gansu Soil Pollution Prevention and Control Regulation	2021
39	Gansu Solid Waste Pollution Prevention and Control Regulation	2021

Source: TrTA consultant.

24. The amended EPL further defines enforcement and supervision responsibilities for all levels of environmental protection authorities, imposes stricter obligations and more severe penalties on enterprises and construction units regarding pollution prevention and control, and allows for environmental public interest litigation including through nongovernment organizations. The procedures and requirements for the technical review of EIA reports by authorities have been specified (**Table II-2**, item 4), and environmental inspection and enforcement on design, installation, and operation of project-specific environmental protection and control measures are regulated under the “Three Simultaneities” (**Table II-1**, items 5, 15, 25, 26, and 28).

**Table II-2: PRC EIA Guidelines.**

	<b>Guidelines</b>	<b>Date</b>
1	Technical Guideline on EIA: Construction Projects	HJ/T 2.1-2016
2	Technical Guideline on EIA: Atmospheric Environment	HJ 2.2-2018
3	Technical Guideline on EIA: Surface Water Environment	HJ/T 2.3-2018
4	Technical Guideline on EIA: Acoustic Environment	HJ 2.4-2009
5	Technical Guideline on EIA: Ecological Assessment	HJ 19-2011
6	Technical Guideline on EIA: Ground Water Environment	HJ610-2016
7	Standards for the Assessment of Regional Biodiversity	HJ623-2011
8	HJ 964—2018 Technical guidelines for environmental impact assessment —soil environment	2018
9	Technical Guideline for Assessment on Environmental Risk of Alien Species	HJ624-2011
10	Technical Guideline on Environmental Risk Assessment for Construction Project	HJ/T169-2018
11	Technical Specifications for the Collection, Storage and Transportation of Hazardous Waste	HJ2025-2012
12	National List of Hazardous Wastes (MEE, Order No. 39)	2021
13	General Provisions-Technical Guidelines for Self-Monitoring of Pollution Emission Entities	HJ819-2017
14	Guidelines for Environmental Impact Assessment of Hazardous Wastes in Construction Projects” (MEE, No. 43)	2017
15	Technical Specifications for Application and Issuance of Pollution Discharge Permits	HJ942-2018
16	HJ/T 81—2001 Technical standard of preventing pollution for livestock and poultry breeding	2001
17	GB/T 36195-2018 Technical specification for sanitation treatment of livestock and poultry manure	2018
18	HJ 568 —2010 Farmland environmental quality evaluation standards for livestock and poultry production	2010

Source: TrTA consultant.

25. Public participation and environmental information disclosure provisions are among the most significant changes introduced in the amended EPL, further supported by the decrees on the preparation of EIA summaries for the purpose of public disclosure (**Table II-1**, item 24), information disclosure on construction project EIAs by government (**Table II-1**, item 22), method for public participation in environmental protection (**Table II-1**, item 20), and technical

guidelines for public participation in EIAs.

26. For grievance redress, a hotline number (12369) was established in March 2011 at each level of environmental protection authority throughout the nation for receiving and resolving environmental complaints, in accordance with the *Management Measures for Operation of the Environmental Complaint Hotline* (MEE Decree [2010] No. 15) (**Table II-1**, item 27).

27. The PRC also provides protection for community health and occupational health and safety through the *Labor Law* (2008) (**Table II-1**, item 12), the *Occupational Disease Prevention and Control Law* (2001) (**Table II-1**, item 4), and environmental and hygiene standards for construction sites.

28. The *Labor Law* is also the main legislation regulating labor relations of individuals employed with labor contract by enterprises, institutions, organizations of all type of ownership forms, including contracted by individuals. These legislations are considering interests of employees and employers provide efficient function of labor market, just and secure labor conditions, protection of labor rights and employees health, promote to growth of labor productivity, increase of work quality, raising on this matter welfare and social livelihood level of the population.

29. China and the International Labor Organization (ILO) are actively cooperating on the elimination of the forced labor. Currently, 26 conventions of the ILO have been ratified, including 4 fundamental ones, which are focused on the preventing of forced labor. This project will be implemented based on the national legislation of prohibition of the forced labor in China.

#### **D. PRC Environmental Impact Assessment Framework and Procedures**

30. **EIA Administrative Framework.** The PRC administrative framework consists of national, provincial, and local (city and county) environmental protection authorities. The national authority is the MEE, which promulgates laws, regulations, administrative decrees, technical guidelines, and environmental quality and emission standards on EIA and pollution prevention and control. At the provincial level there are Ecology and Environment Departments (EEDs), which act as gatekeepers for EIA and pollution prevention and control in the provinces. They are often delegated authority by the MEE to approve EIA reports for development planning and construction projects, except for those projects with national interest or which cross provincial boundaries. Local (city or county level) Environmental Protection Bureaus (EEB) enforce environmental laws and conduct environmental monitoring within city or county limits. EEBs can also be delegated the authority to approve EIA reports by the provincial EEDs. EEDs and EEBs are supported by Environmental Monitoring Stations (EMS), which are subsidiaries of EEDs or EEBs and are qualified entities to carry out environmental monitoring.<sup>13</sup>

31. The MEE's "Guideline on Jurisdictional Division of Review and Approval of EIAs for Construction Projects" (2019 revised) defines which construction project EIAs require MEE review and approval, and which EIAs are delegated to the provincial EEDs and local EEBs.

32. The PRC has an EIA qualification and registration system, and only qualified and registered institutes and individuals are allowed to prepare EIAs. Under MEE Decree 2015-36, as of 1 November 2015 qualified institutes for conducting EIAs for construction projects in the PRC can no longer be a subsidiary of an environmental authority responsible for approving EIAs.

33. **EIA Legal Framework.** EIA in the PRC is governed by the *Environmental Impact*

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13 In this report, "environmental monitoring" refers to the activity of collecting environmental data either through *in-situ* measurements or through sampling followed by laboratory testing of samples.

*Assessment Law* (2002) (**Table II-1**, item 1), covering EIAs for (i) plans (such as new development areas and new industrial parks) and strategic environmental assessments (SEA); and (ii) construction projects. This was followed by the promulgation of two regulations: the *Construction Project Environmental Protection Management Ordinance* (1998) (**Table II-1**, item 17) and the *Planning Environmental Impact Assessment Regulation* (2009) (**Table II-1**, item 15), both of which require early screening and environmental categorization.

34. **EIA Procedures.** EIA procedures have been established in the PRC for over 20 years. In 2008, MEE issued “Management Guideline on EIA Categories of Construction Projects” (revised 2021). Under MEE decree *Directory for the Management of Construction Project Environmental Impact Assessment Categorization* (MEE Decree 2015-33) (**Table II-1**, item 19), classifies EIAs for construction projects into three categories with different reporting requirements, based on the significance of potential environmental impacts and the environmental sensitivity<sup>14</sup> of the project site:

- i) Projects with significant adverse environmental impacts, for which a full environmental impact report (EIR) is required;
- ii) Projects with adverse environmental impacts which are of a lesser degree and/or significance than those of Category A, for which a tabular environmental impact report (EIT) is required; and
- iii) Projects unlikely to have adverse environmental impacts, for which an environmental impact registration form (EIRF) is required.

35. EIR and EITs report are generally equivalent to ADB’s Category A EIA and Category B IEE reports, respectively. The EIRF is similar to an ADB Category C.

36. **EIA Follow-Up Actions.** In 2015, MEE issued decree *Management Measures for Post-Environmental Impact Assessment of Construction Projects* (MEE Decree 2015-37, item 21 of **Table II-1**). Under this decree a trial program was implemented on 1 January 2016 requiring follow-up actions 3 to 5 years after commencement of project operation for large infrastructure and industrial projects or projects located in environmentally sensitive areas. These actions include environmental monitoring and impact assessment to verify the effectiveness of environmental protection measures and to undertake any corrective actions that might be needed. The decree also specifies that the institute that did the original impact assessment for the project cannot undertake post-environmental impact assessment for the same project.

37. **Environmental Protection Acceptance.** In 2017, MEE issued *Interim Measures for the Environmental Protection Acceptance of Completed Construction Projects* (MEP Decree 2017-4, item 31 of **Table II-1**). Under this measure, environmental protection acceptance can be implemented by the project owner and the procedures and standards for the acceptance were also stipulated.

38. **EIA Guidelines.** The MEE has issued a series of technical guidelines for preparing EIAs (**Table II-2**). These include impact assessment guidelines on general EIA implementation and principles, atmospheric environment and ambient air quality, noise, surface water, groundwater, ecology and regional biodiversity, biodiversity monitoring, quality management on environmental monitoring, and public participation.

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14 Environmentally sensitive areas are defined in the Decree, and include: (i) nature reserves and protected areas, scenic areas, world cultural and natural heritage sites, drinking water source protection zones; (ii) basic farmland and grassland, forest parks, geological parks, important wetland, natural woodland, critical habitats for endangered plant and animal species, important aquatic spawning/nursery/ wintering/migration grounds, regions suffering from water resource shortage, serious soil erosion areas, desertification protection areas, eutrophic water bodies; and (iii) inhabited areas with major residential, health care, scientific research, and administration functions, cultural heritage protection sites, and protection areas with historical, cultural, scientific, and ethnic values.

## E. Project Domestic Environmental Assessment

39. Under MEE decree *Directory for the Management of Construction Project Environmental Impact Assessment Categorization* (MEE Decree 2015-33), the Yongchang County Subproject (sheep farm component excluded) was classified as category B, requiring the preparation of one EIT report covering the various activities and the sheep farm component was classified as category C, requiring the preparation of the one EIRF report. The domestic EIA reports were prepared by the Gansu Hengxin Chuangxin science and technology development Co. Ltd. The company is certified by the MEE to undertake EIAs until 2025, including common construction projects.

40. The domestic EIT report will be reviewed by Jinchang EEB. Draft EIT reports were prepared and disclosed in May 2022. The final EIT reports will be submitted to Jinchang EEB for formal review, revision (if required) and approval <sup>15</sup>.

## F. Environmental Standards

41. This section discusses the applicable environmental standards that will be adopted for the Subproject.

42. **PRC Environmental Standards.** Standards issued by the MEE generally consist of environmental quality (ambient) standards applicable to the receiving environment, and emission standards applicable to the pollution source. The former includes standards for ambient air quality, noise and vibration, surface water, groundwater, soil, etc. The latter includes standards for integrated wastewater discharge, construction and community noise, odor and air pollutants, etc. (**Table II-3**).

43. As noted above, ADB's SPS requires borrowers to follow environmental standards consistent with good international practice, as reflected in internationally recognized standards such as the World Bank Group's *EHS Guidelines*. When host country regulations differ from these levels and measures, the borrower is to achieve whichever is more stringent. If less stringent levels or measures are appropriate in view of specific project circumstances, the borrower is required to provide justification for any proposed alternatives.

**Table II-3:** Applicable PRC environmental standards.

No.	Standards
1	GB3095-2012 Ambient Air Quality Standards
2	GB16297-1996 Air Pollutant Integrated Emission Standards
3	GB3096-2008 Environmental Quality Standards for Noise
4	GB3838-2002 Environmental Quality Standards for Surface Water
5	GB8978-1996 Integrated Wastewater Discharge Standards
6	GB22337-2008 Emission Standards for Community Noise
7	GB10070-88 Standards of Environmental Vibration in Urban Area
8	GB12523-2011 Emission Standards of Environmental Noise for Boundary of Construction Site
9	GB/T 15190-2014 Technical Specifications for Regionalizing Environmental Noise Function
10	GB12348-2008 Noise Standards for Industrial Enterprises at Site Boundary
11	GB50118-2010 Design Specifications for Noise Insulation of Buildings for Civil Use
12	GB14554-93 Emission Standards for Odor Pollutants
13	GB/T 14848-2017 Quality Standards for Groundwater
14	GB15618-1995 Environmental Quality Standard for Soils
15	Storage and Disposal Site for General Industrial Solid Wastes (GB18599-2001)
16	GB11340-2005 Limits and Measurement Methods for Crankcase Pollutants from Heavy-duty Vehicles Equipped with Pressure Ignition Engines
17	GB17691-2005 Emission Limits and Measurement Methods for Exhaust Pollutants from

<sup>15</sup> The EIA shall be approved before commencement of construction and domestic EIA approval is not a pre-condition for domestic project approval.

No.	Standards
	Vehicle Compression-Ignition and Gas Fueled Ignition Engines
18	GB18285-2005 Limits and Measurement Methods for Exhaust Pollutants from Vehicles Equipped with Ignition Engines
19	GB18352-2005 Limits and Measurement Methods for Emissions from Light Duty Vehicles
20	Technical Specifications for the Collection, Storage and Transportation of Hazardous Waste (HJ 2025-2012)
21	Standard for Pollution Control on Hazardous Waste Storage (GB 18597-2001, revised in 2013)

Source: ADB TrTA Consultants and domestic EIA report (2022).

### Air Quality

44. Ambient air quality limits are intended to indicate safe exposure levels for the majority of the population, including the very young and the elderly, throughout an individual's lifetime. Limits are given for one or more specific averaging periods, typically one-hour average, 24-hour average, and/or annual average. The longer averaging period such as one year is more applicable to assessing impacts from multiple or regional sources, while shorter averaging periods such as 24 hours and 1 hour are more applicable to assessing short-term impacts from project-related activities such as from peak hour traffic or daily or peak construction activities. The PRC's updated *Ambient Air Quality Standards* (GB3095-2012) has two classes of limit values; Class 1 standards apply to special areas such as nature reserves and environmentally sensitive areas, and Class 2 standards apply to all other areas, including urban and industrial sites. The PRC standards for Class 2 areas are applicable for the Project.<sup>16</sup>

45. The World Health Organization (WHO) Air Quality Guidelines (AQGs, 2021) are international standards and are adopted in the EHS Guidelines. In addition to guideline values, interim targets (IT) are given for each pollutant as incremental targets in a progressive reduction of air pollution.

46. The WHO AQGs and corresponding PRC standards are presented in **Table II-4**. From a review of the table, it can be observed that:

- (i) For TSP, there are PRC standards but no corresponding WHO AQGs.
- (ii) For PM<sub>10</sub> PRC Class 2 annual average and 24-hour average standards meet WHO IT-1 target (there are no 1-hour average standards or guidelines for PRC or WHO) but not the WHO AQG.
- (iii) For PM<sub>2.5</sub> PRC Class 2 annual and 24-hour standards meet WHO IT-1 target (there are no 1-hour standards or guidelines for either PRC or WHO) but not the WHO AQG.
- (iv) For SO<sub>2</sub> WHO only has a 24-hour guidelines. The PRC Class 2 24 hour standard (150 µg/m<sup>3</sup>) almost meets the WHO IT-1 target (125 µg/m<sup>3</sup>).
- (v) For NO<sub>2</sub> the PRC annual average standard is equivalent to the WHO IT-1 target, and the PRC 1-hour standard meets the WHO AQG; and the 24-hour average PRC standard (80 µg/m<sup>3</sup>) is more stringent than the WHO IT-1 target (120 µg/m<sup>3</sup>).
- (vi) For O<sub>3</sub>, the PRC 8-hour average standard is equivalent to the WHO IT-1 target. There is no WHO 1-hour average guideline. There is no PRC standard for peak season concentration.

47. Overall the PRC standards show a high degree of equivalency to the WHO AQG or IT-1 values. The PRC Class 2 standards are adopted for use in this report for general ambient air quality assessment, but WHO AQGs will be used for effects monitoring at sensitive receptors.

<sup>16</sup> On 29 February 2012, the China State Council approved the roadmap for ambient air quality standards to improve the environment and human health. The Ambient Air Quality Standards (GB3095-2012) prescribes the first-ever limits for PM<sub>2.5</sub>. It also modified the previous area classifications by combining Class III (special industrial areas) with Class II (residential, mixed use areas).

**Table II-4:** Comparison of PRC ambient *Air Quality Standards* (GB3095-2012) and WHO ambient air quality guidelines (2021).

Air Quality Parameter	Averaging Period	PRC GB3095-2012 ( $\mu\text{g}/\text{m}^3$ )		WHO/EHS Guidelines ( $\mu\text{g}/\text{m}^3$ )	
		Class I (special regions such as national parks)	Class II (all other areas, including urban and industrial areas)	Interim Targets	AQG
TSP	1-year	80	200	n/a	n/a
	24-hour	120	300	n/a	n/a
PM <sub>10</sub>	1-year	40	70	20 - 70	15
	24-hour	50	150	50 - 150	45
PM <sub>2.5</sub>	1-year	15	35	10 - 35	5
	24-hr	35	75	25 - 75	15
SO <sub>2</sub>	1-year	20	60	n/a	n/a
	24-hour	50	150	50 - 125	40
	1-hour	150	500	n/a	n/a
NO <sub>2</sub>	1-year	40	40	20-40	10
	24-hour	80	80	50-120	25
	1-hour	200	200	n/a	200
O <sub>3</sub>	8-hour	100	160	120-160	100
	1-hour	160	200	n/a	n/a
	Peak season	n/a	n/a	70-100	60
CO	24-hour	4,000	4,000	7000	4000
	8-hour	n/a	n/a	n/a	10,000
	1-hour	10,000	10,000	n/a	35,000

Note: n/a = not applicable.

Source: WHO Air Quality Guidelines (2021), and PRC GB3095-2012.

### Fugitive Particulate Matter

48. Fugitive emission of particulate matter such as dust from construction sites is regulated under PRC's *Air Pollutant Integrated Emission Standard* (GB16297-1996), which sets 120 mg/m<sup>3</sup> as the maximum allowable emission concentration and  $\leq 1.0$  mg/m<sup>3</sup> as the concentration limit at the boundary of construction sites (with no specification on particle diameter). There is no equivalent standard recommended in the *EHS Guidelines*, and the PRC standard is adopted for use in this report.

### Noise and Vibration

49. **Table II-5** presents the relevant PRC *Environmental Quality Noise Standards* (GB3096-2008) compared with relevant international guidelines from the WHO (as presented in the *EHS Guidelines*). The classes within the standards are not directly comparable as the PRC noise standards are set in different zones and WHO standards concern noise at specific receptors. Noise and noise at sensitive receptors need different standards to be applied: the PRC standard will be used for noise while the *EHS Guidelines* will be applied for noise based on types of receptors.

**Table II-5:** PRC *Environmental Quality Standards for Noise* (GB3096-2008).

Class	PRC Standards Leq dB(A)		International Standards One Hour Leq dB(A)		Comparison
	Day 06-22h	Night 22-06h	Day 07-22h	Night 22-07h	
0: Areas needing extreme quiet, such as special	50	40	WHO Class I: Residential,	WHO Class I: Residential,	Classes are not directly

health zones			institutional, educational:	institutional, educational:	comparable, but PRC Class II standards exceed WHO Class II standards. PRC standards will be used for traffic noise while the EHS Guidelines will be applied for noise based on types of receptors.
I: Mainly residential; and cultural and educational institutions	55	45	55	45	
II: Mixed residential, commercial and industrial areas	60	50	WHO Class II: industrial, commercial:	WHO Class II: Industrial, Commercial:	
III: Industrial areas	65	55	70	70	
IVa: Area within 35 m on both sides of urban trunk roads (Class II and above)	70	55			
IVb: Both sides of railway lines	70	60			

Source: WHO Noise Quality Guidelines (1999) in IFC EHS Guidelines (2007), and PRC GB3096-2008.

50. **Table II-6** presents relevant PRC and international standards (US EPA, IFC EHS Guideline: Occupational Health and Safety Standards) for on-site construction noise. The PRC's *Emission Standard of Environmental Noise for Boundary of Construction Site* (GB12523-2011) regulates construction noise, limiting construction noise levels at the construction site boundary to 70 dB(A) in the day time (0600–2200 hours) and 55 dB(A) at night (22:00–06:00 hours).

**Table II-6:** PRC Noise Emission Standard for Construction Site Boundary (GB12523-2011) and relevant international guidelines.

Day Leq dB(A)	Night Leq dB(A)	International Standards Leq dB(A)	
70	55	US EPA: 85 (day, 8 hour exposure)	IFC EHS Guideline, Occupational Health and Safety: 85 (Equivalent level LAeq, 8h); 110 (Maximum LAmax, fast)

Source: US EPA, IFC Occupational Health and Safety Standard, and PRC GB12523-2011.

51. Construction activities may cause vibration impact and must comply with PRC *Standard of Vibration in Urban Area Environment* (GB10070-88). The *EHS Guidelines* have no vibration standards.

**Table II-7:** Vertical (Z) Vibration Standard for Various Urban Areas (GB10070-88, Unit: dB)

Scope of Applicable Area	Day	Night
Special residential area	65	65
Residential, cultural and educational area	70	67
Mixed area and commercial center	75	72
Industrial centralized area	75	72
Both sides of arterial roads with more than 100 vehicles per hour	75	72
Within 30 m of railways with more than 20 trains per day	80	80

Source: GB10070-88.

### Surface Water

52. PRC's *Surface Water Ambient Quality Standard* (GB3838-2002) defines five water quality classes for different environmental functions (**Table II-8**). Class I is the highest quality, suitable for head waters and national nature reserves. Class II is suitable for drinking water sources in Class I protection areas, habitats for rare aquatic organisms, breeding grounds for fish and crustaceans, and feeding grounds for fish fry. Class III is suitable for drinking water



sources in Class II protection areas, wintering grounds for fish and crustaceans, migration routes, water bodies for aquaculture and capture fishery, and swimming activities. Class IV is suitable for general industrial use and non-contact recreational activities. Class V is the worst quality, suitable only for agricultural and scenic water uses. The *EHS Guidelines* do not have ambient water quality standards and recognize the use of national and local ambient water quality criteria, and the PRC standards are adopted for use in this report. For Jiachuanxia Reservoir near the project area the Class III standard is applicable.

**Table II-8: PRC Surface Water Ambient Quality Standard (GB3838-2002).**

Parameter	Water Quality Category				
	I	II	III	IV	V
pH	6-9	6-9	6-9	6-9	6-9
Dissolved oxygen (DO) [mg/L]	90% saturation or $\geq 7.5$	$\geq 6$	$\geq 5$	$\geq 3$	$\geq 2$
Permanganate index ( $I_{Mn}$ ) [mg/L]	$\leq 2$	$\leq 4$	$\leq 6$	$\leq 10$	$\leq 15$
Chemical oxygen demand (COD) [mg/L]	$\leq 15$	$\leq 15$	$\leq 20$	$\leq 30$	$\leq 40$
5-day Biochemical oxygen demand (BOD <sub>5</sub> ) [mg/L]	$\leq 3$	$\leq 3$	$\leq 4$	$\leq 6$	$\leq 10$
Ammonia nitrogen (NH <sub>3</sub> -N) [mg/L]	$\leq 0.15$	$\leq 0.5$	$\leq 1.0$	$\leq 1.5$	$\leq 2.0$
Total phosphorus (as P) [mg/L]	$\leq 0.02$	$\leq 0.1$	$\leq 0.2$	$\leq 0.3$	$\leq 0.4$
Lakes & reservoirs	$\leq 0.01$	$\leq 0.025$	$\leq 0.05$	$\leq 0.1$	$\leq 0.2$
Total nitrogen (lakes, reservoirs, as N) [mg/L]	$\leq 0.2$	$\leq 0.5$	$\leq 1.0$	$\leq 1.5$	$\leq 2.0$
Copper (Cu) [mg/L]	$\leq 0.01$	$\leq 1.0$	$\leq 1.0$	$\leq 1.0$	$\leq 1.0$
Zinc (Zn) [mg/L]	$\leq 0.05$	$\leq 1.0$	$\leq 1.0$	$\leq 2.0$	$\leq 2.0$
Fluoride (as F <sup>-</sup> ) [mg/L]	$\leq 1.0$	$\leq 1.0$	$\leq 1.0$	$\leq 1.5$	$\leq 1.5$
Selenium (Se) [mg/L]	$\leq 0.01$	$\leq 0.01$	$\leq 0.01$	$\leq 0.02$	$\leq 0.02$
Arsenic (As) [mg/L]	$\leq 0.05$	$\leq 0.05$	$\leq 0.05$	$\leq 0.1$	$\leq 0.1$
Mercury (Hg) [mg/L]	$\leq 0.0005$	$\leq 0.0005$	$\leq 0.0001$	$\leq 0.001$	$\leq 0.001$
Cadmium (Cd) [mg/L]	$\leq 0.001$	$\leq 0.005$	$\leq 0.005$	$\leq 0.005$	$\leq 0.01$
Chromium (Cr, hexavalent) [mg/L]	$\leq 0.01$	$\leq 0.05$	$\leq 0.05$	$\leq 0.05$	$\leq 0.1$
Lead (Pb) [mg/L]	$\leq 0.01$	$\leq 0.01$	$\leq 0.05$	$\leq 0.05$	$\leq 0.1$
Cyanide (CN) [mg/L]	$\leq 0.005$	$\leq 0.05$	$\leq 0.2$	$\leq 0.2$	$\leq 0.2$
Volatile phenol [mg/L]	$\leq 0.002$	$\leq 0.002$	$\leq 0.005$	$\leq 0.01$	$\leq 0.1$
Total petroleum hydrocarbon (TPH) [mg/L]	$\leq 0.05$	$\leq 0.05$	$\leq 0.05$	$\leq 0.5$	$\leq 1.0$
Anionic surfactant (=LAS) [mg/L]	$\leq 0.2$	$\leq 0.2$	$\leq 0.2$	$\leq 0.3$	$\leq 0.3$
Sulfide [mg/L]	$\leq 0.05$	$\leq 0.1$	$\leq 0.2$	$\leq 0.5$	$\leq 1.0$
Fecal coliform bacteria [number/L]	$\leq 200$	$\leq 2000$	$\leq 10000$	$\leq 20000$	$\leq 40000$

Source: PRC GB3838-2002.

## Groundwater

53. The PRC's Groundwater Water Ambient Quality Standards (GB/T14848-2017) is presented in **Table II-9**. WHO guidelines for drinking-water quality<sup>17</sup> are also given in **Table II-9**, and concentrations above these guidelines are the cause of health concern. The national Grade III standards are more stringent than WHO standards, and hence the groundwater quality in the project area must comply with the Grade III standards. The Class III standard is applicable to the Subproject. There is no equivalent standard recommended in the EHS Guidelines, and the PRC standard is adopted for use in this report.

17 Guidelines for drinking-water quality, 4th edition, incorporating the 1st addendum, 2017. [https://www.who.int/water\\_sanitation\\_health/publications/drinking-water-quality-guidelines-4-including-1st-addendum/en/](https://www.who.int/water_sanitation_health/publications/drinking-water-quality-guidelines-4-including-1st-addendum/en/)

**Table II-9:** Groundwater standard (Class III, *GB/T14848-2017 Quality Standard for Ground Water*).

No.	Parameter	Class I	Class II	Class III	Class IV	Class V	WHO Guidelines for drinking water quality (2017)
1	pH	6.5-8.5			5.5-6.5 8.5-9	<5.5->9	6.5-8.5
2	Ammonia nitrogen (mg/L)	≤0.02	≤0.10	≤0.50	≤1.5	>1.5	NA
3	Chloride (mg/L)	≤50	≤150	≤250	≤350	>350	≤250
4	Sulfate (mg/L)	≤50	≤150	≤250	≤350	>350	NA
5	Nitrate (in N) (mg/L)	≤2	≤5	≤20	≤30	>30	≤50
6	Nitrite (in N) (mg/L)	≤0.01	≤0.10	≤1.00	≤4.80	>4.80	≤3
7	Fluoride (mg/L)	≤1	≤1	≤1	≤2	>2	≤1.5
8	Zinc (mg/L)	≤0.05	≤0.5	≤1	≤5	>5	≤3
9	Copper (mg/L)	≤0.01	≤0.05	≤1	≤1.5	>1.5	≤2
10	Manganese (mg/L)	≤0.05	≤0.05	≤0.1	≤1.5	>1.5	NA
11	Iron (mg/L)	≤0.1	≤0.2	≤0.3	≤2.0	>2.0	NA
12	Total dissolved solids (mg/L)	≤300	≤500	≤1000	≤2000	>2000	≤1000
13	Total hardness (mg/L)	≤150	≤300	≤450	≤650	>650	NA
14	Permanganate index (mg/L)	≤1	≤2	≤3	≤10	>10	NA
15	Mercury (mg/L)	≤0.0001	≤0.0001	≤0.001	≤0.002	>0.002	≤0.006
16	Hexavalent chromium (mg/L)	≤0.005	≤0.01	≤0.05	≤0.1	>0.1	≤0.05
17	Arsenic (mg/L)	≤0.001	≤0.001	≤0.01	≤0.05	>0.05	≤0.01
18	Lead (mg/L)	≤0.005	≤0.005	≤0.01	≤0.1	>0.1	≤0.01
19	Cadmium (mg/L)	≤0.0001	≤0.001	≤0.005	≤0.01	>0.01	≤0.003
20	Cyanide (mg/L)	≤0.001	≤0.01	≤0.05	≤0.1	>0.1	≤0.07
21	Volatile phenol (mg/L)	≤0.001	≤0.001	≤0.002	≤0.01	>0.01	≤0.002
22	Benzene (μg/L)	≤0.5	≤1	≤10	≤120	>120	≤10
23	Toluene (μg/L)	≤0.5	≤140	≤700	≤1400	>1400	≤700
24	Xylene (μg/L)	≤0.5	≤100	≤500	≤1000	>1000	≤500
25	Nickel (mg/L)	≤0.002	≤0.002	≤0.02	≤0.1	>0.1	≤0.02

Source: ADB TrTA Consultants and GB/T14848-2017.

**Wastewater**

54. Discharge of wastewater from construction sites is regulated under the PRC's *Integrated Wastewater Discharge Standard* (GB8978–1996) (**Table II-10**). The Class 1 standard applies to discharge into Class III water bodies under GB3838–2002; the Class 2 standard applies to discharge into class IV and V water bodies; and the Class 3 standard applies to discharge into municipal sewers going to municipal wastewater treatment plants (WWTPs) with secondary treatment. No new discharge of wastewater into Class I and II water bodies is allowed. The EHS Guidelines do not have standards for wastewater discharges from construction sites, and hence PRC standards are applicable to the subproject.

**Table II-10:** PRC Standards for discharging wastewater from construction sites (GB8978–1996).

Parameter		Class 1	Class 2	Class 3
		(Discharge into Class III water bodies)	(Discharge into Class IV and V water bodies)	(Discharge into municipal sewers)
pH	no unit	6-9	6-9	6-9
SS	mg/L	70	150	400
BOD <sub>5</sub>	mg/L	20	30	300
COD	mg/L	100	150	500
TPH	mg/L	5	10	20
Volatile phenol	mg/L	0.5	0.5	2.0
Ammonia Nitrogen NH <sub>3</sub> -N	mg/L	15	25	---
PO <sub>4</sub> <sup>2-</sup> (as P)	mg/L	0.5	1.0	---
Anionic Surfactants	mg/L	5.0	10	20

Source: PRC GB8978-1996.

55. The Chengguan Town wastewater treatment station (WWTS) will treat domestic wastewater and wastewater from vegetable washing during operation. The PRC has more stringent standards than World Bank Group EHS standards (see **Table II-12** for comparison) for treated wastewater discharges, and hence PRC standards are applicable to the project. The wastewater generated during operation will be required to meet Class B maximum acceptable concentrations in Wastewater Quality Standards for Discharge to Municipal Sewers (GB/T 31962-2015), and the effluent of Yongchang County WWTS is regulated under PRC's Discharge Standard of Pollutants for Municipal Wastewater Treatment Plant (GB 18918-2002). Class IA standards apply to Yongchang County WWTS of the project. The PRC standard includes 12 basic parameters and the other parameters are for industrial sewage. The Yongchang County WWTS will not involve treatment of industrial wastewater.

56. During operation, wastewater will also be generated from the solar PV equipment wash. The wash wastewater will be recycled as irrigation water after sedimentation.

**Table II-11:** PRC Wastewater Quality Standards for Discharge to Municipal Sewers

No.	Pollutant	Maximum acceptable concentration (mg / L, except pH and chromacity)
		Class B
1	pH	6.5-9.5
2	SS	400
3	COD	500
4	Ammonia nitrogen	45
5	TDS	2000
6	Chromacity	70
7	BOD	350
8	Total phosphorus	8

Source: PRC GB/T 31962-2015.

**Table II-12:** Discharge Standards of Pollutants for Municipal Wastewater Treatment Plant and relevant international guidelines (Units: mg/L, except pH, chromaticity and fecal coliform).

No.	Parameter	Class IA	World Bank Group EHS Guidelines
1	COD <sub>Cr</sub>	≤50	125
2	BOD <sub>5</sub>	≤10	30
3	SS	≤10	50
4	Oils	≤1	NA
5	Petroleum	≤1	10
6	LAS	≤0.5	NA
7	Total nitrogen	≤15	10
8	Ammonia nitrogen	≤5	NA
9	Total phosphorus	≤0.5	NA
10	Chromaticity	≤30	NA
11	pH	6-9	6-9
12	Fecal coliform	≤1,000	400

Source: PRC GB18918-2002.

### Odor Pollutant Emission

57. The odor generated from the sheep farm mainly consists of ammonia (NH<sub>3</sub>) and hydrogen sulfide (H<sub>2</sub>S). The concentration of NH<sub>3</sub> and H<sub>2</sub>S at the boundary of the project site shall comply with the Emission Standard for Odor Pollutant (GB14554-93) - Grade II, which details are summarized in **Table II-13**.

**Table II-13:** Emission Standard for Odor Pollutant Unit: mg/m<sup>3</sup>

Parameter	Standard Value	Code of Standard
NH <sub>3</sub>	1.5	GB 14554-93
H <sub>2</sub> S	0.06	

Source: PRC GB14554-93.

### Soil

32. In 2018, the Ministry of Ecology and Environment (MEE) released one standard for agricultural soil contamination risk management. Soil Environmental Quality Soil Contamination Risk Control Standard for Agricultural Land (GB 15618-2018) replaced the previous GB15618-1995 that set thresholds for agricultural production. The World Bank Guidelines do not have EHS standards for soil quality. The Contaminated Sites Management Series - Assessment Levels for Soil, Sediment and Water<sup>18</sup> of Western Australia are referred to as a recognized international standard. These guidelines list generic assessment levels adopted by the Western Australia Department of Environment and Conservation and provide guidance on the application of assessment levels to determine whether a site is potentially contaminated and whether further investigation is required. The guidelines contain health investigation levels and ecological investigation levels (EIL) as screening assessment levels. If the screening assessment levels are exceeded, further risk assessment is required to determine whether the levels present are likely to pose an actual risk in the site-specific setting. For the project, both the PRC standard GB 15618-2018 and Western Australian EIL guidelines are applied, as the maximum allowable concentrations are higher for some parameters in one standard than the other and vice versa (**Table II-14**).

18 Department of Environment and Conservation. 2010. [https://www.der.wa.gov.au/images/documents/your-environment/contaminated-sites/guidelines/2009641\\_-\\_assessment\\_levels\\_for\\_soil\\_sediment\\_and\\_water\\_-\\_web.pdf](https://www.der.wa.gov.au/images/documents/your-environment/contaminated-sites/guidelines/2009641_-_assessment_levels_for_soil_sediment_and_water_-_web.pdf)

**Table II-14:** List of Soil Standard Limits

Parameter	Maximum Allowable Concentration (mg/kg dry weight)					Western Australia (EIL)
	GB 15618-2018 (trail)					
	Soil pH	<5.5	5.5~6.5	6.5-7.5	>7.5	
Cadmium (Cd)	Paddy	0.3	0.4	0.6	0.8	3
	Others	0.3	0.3	0.3	0.6	
Mercury (Hg)	Paddy	0.5	0.5	0.6	1.0	1
	Others	1.3	1.8	2.4	3.4	
Arsenic (As)	Paddy	30	30	25	20	20
	Others	40	40	30	25	
Copper (Cu)	Orchard	150	150	200	200	100
	Others	50	50	100	100	
Lead (Pb)	Paddy	80	100	140	240	600
	Others	70	90	120	170	
Chromium (Cr VI)	Paddy	250	250	300	350	400
	Others	150	150	200	250	
Zinc (Zn)		200	200	250	300	200
Nickel (Ni)		60	70	100	190	60
DDT				0.1		0.5
666 (Lindane)				0.1		0.5
Benzo(a)pyrene				0.55		1

Source: PRC GB15618-2018, and Western Australia Department of Environment and Conservation, 2010.

### Solid Waste

58. For general solid waste, the *Standards for Pollution Control on the Storage and Disposal Site for General Industrial Solid Wastes* (GB18599-2001) and its revision in 2013 apply.

59. For hazardous waste, Technical Specifications for the Collection, Storage and Transportation of Hazardous Waste (HJ 2025-2012) and Standard for Pollution Control on Hazardous Waste Storage (GB 18597-2001, revised in 2013) apply.

### Summary of Environmental Standards applicable to the Project

60. **Table II-15** presents the environmental standards and guidelines applicable to the Project, which reflects the requirements set forth by the Jinchang EEB as presented in the domestic EIA report, and the ADB SPS (2009) on the use of domestic and international standards.

**Table II-15:** Environmental standards and guidelines applicable to the project, including Yongchang County Subproject.

Parameter / Area of Concern	Applicable Standards and Guidelines	Remarks
Ambient air quality	Ambient Air Quality Standard (GB3095-2012), Class II	Yearly average: PM <sub>10</sub> : 0.070 mg/m <sup>3</sup> PM <sub>2.5</sub> : 0.035 mg/m <sup>3</sup> SO <sub>2</sub> : 0.06 mg/m <sup>3</sup> NO <sub>2</sub> : 0.04 mg/m <sup>3</sup> CO: 4.0 mg/m <sup>3</sup>
		Daily average: TSP: 0.30 mg/m <sup>3</sup> PM <sub>10</sub> : 0.15 mg/m <sup>3</sup> PM <sub>2.5</sub> : 0.075 mg/m <sup>3</sup> SO <sub>2</sub> : 0.15 mg/m <sup>3</sup>

Parameter / Area of Concern	Applicable Standards and Guidelines	Remarks
		NO <sub>2</sub> : 0.08 mg/m <sup>3</sup> CO: 4.0 mg/m <sup>3</sup> <u>Hourly average:</u> SO <sub>2</sub> : 0.50 mg/m <sup>3</sup> NO <sub>2</sub> : 0.20 mg/m <sup>3</sup> CO: 10.0 mg/m <sup>3</sup>
Construction air pollutant emission	<i>Air Pollutant Integrated Emission Standard</i> (GB16297-1996)	<u>Maximum allowable emission concentration:</u> Particulate matter (PM): 120 mg/m <sup>3</sup> Fumes from asphalt plant: 40 mg/m <sup>3</sup> during production and 75 mg/m <sup>3</sup> during mixing <u>Limits for fugitive emission:</u> PM: ≤1.0 mg/m <sup>3</sup> at construction site boundary Fumes from asphalt plant: no obvious emission at asphalt production plant
Environmental noise	<i>Environmental Quality Standard for Noise</i> (GB3096-2008): <ul style="list-style-type: none"> <li>Class III for areas within the sites</li> </ul> <i>WHO Noise Quality Guidelines</i> <ul style="list-style-type: none"> <li>Class I for sensitive receptors near the sites</li> </ul>	<u>Class III areas:</u> Day time: 65 dB(A) Night time: 55 dB(A) <u>Class I areas:</u> Day time: 55 dB(A) Night time: 45 dB(A)
Construction noise	<i>Emission Standard of Environmental Noise for Boundary of Construction Site</i> (GB12523-2011)	<u>Noise level at construction site boundary:</u> Day time: 70 dB(A) Night time: 55 dB(A) <u>Noise level within construction site:</u> Day time: 60 dB(A) Night time: 50 dB(A)
Surface water quality	<i>Environmental Quality Standards for Surface Water</i> (GB3838-2002), see <b>Table II-8</b> .	Class III for rivers near the project area.
Ground water quality	<i>Quality Standard for Ground Water</i> (GB/T 14848-2017), see <b>Table II 9</b> .	Class III for groundwater near the project area.
Wastewater discharge	<i>Integrated Wastewater Discharge Standard</i> (GB8978-1996)	<u>Discharge into Municipal Sewers:</u> COD: ≤500 mg/l BOD <sub>5</sub> : ≤350 mg/l SS: ≤400 mg/l NH <sub>3</sub> -N: ≤45 mg/l <u>Effluence of the wastewater treatment facility:</u> COD: ≤50 mg/l BOD <sub>5</sub> : ≤10 mg/l SS: ≤10 mg/l
Odor	<i>Emission Standard for Odor Pollutant</i> (GB14554-93)	<u>Odor at site boundary:</u> NH <sub>3</sub> -N: ≤1.5 mg/ m <sup>3</sup> H <sub>2</sub> S: ≤0.06 mg/m <sup>3</sup>
Solid waste	<i>Standards for Pollution Control on the Storage and Disposal Site for General Industrial Solid Wastes</i> (GB18599-2001) and its revision in 2013 apply.	Approaches and measures appropriate to mitigate adverse impacts from the project activities
Soil	<i>PRC standard GB 15618-2018 and Western Australian</i>	Both the PRC standard GB 15618-2018 and Western Australian guidelines are applied, as

Parameter / Area of Concern	Applicable Standards and Guidelines	Remarks
	<i>guidelines, see Table II 14.</i>	the maximum allowable concentrations are higher for some parameters in one standard than the other and vice versa
Hazardous waste	<i>Technical Specifications for the Collection, Storage and Transportation of Hazardous Waste (HJ 2025-2012) and Standard for Pollution Control on Hazardous Waste Storage (GB 18597-2001, revised in 2013)</i>	Approaches and measures appropriate to mitigate adverse impacts from the project activities
Environmental adverse impacts	<i>WB EHS Guidelines: Environment</i>	Approaches and measures appropriate to mitigate adverse impacts from the project activities
Occupational health and safety	<i>WB EHS Occupational Health and Safety Guidelines</i>	Approaches and measures appropriate to mitigate adverse impacts from the project activities
Community health and safety	<i>WB EHS Community Health and Safety Guidelines</i>	Approaches and measures appropriate to mitigate adverse impacts from the project activities
Construction and Decommissioning	<i>WB EHS Construction and Decommission Guidelines</i>	Approaches and measures appropriate to mitigate adverse impacts from the project activities

Source: Domestic EIA report (2022) and TrTA consultant.

## G. International Agreements

61. The PRC is a signatory to a number of international agreements relevant to environment protection. Those relevant to the project, along with the dates of signing by the PRC, are listed in **Table II-16**.

**Table II-16:** Applicable international agreements with the PRC as a signatory.

No.	Name of Agreement	PRC Signing Date	Agreement Objective
1	Ramsar Convention on Wetlands of International Importance	1975	Prevent encroachment on and loss of wetlands for now and the future (project includes the reservoir)
2	Convention on Biological Diversity	1993	Conservation and sustainable use of biological diversity (project includes afforestation)
3	United Nations Framework Convention on Climate Change	1994	Achieve stabilization of atmospheric greenhouse gas (GHG) concentrations (project involves GHG emission reduction)
4	Kyoto Protocol to UN Framework Convention on Climate Change	2005	Further reduction of greenhouse gas emissions (as above)
5	Montreal Protocol on Substances That Deplete the Ozone Layer	1989	Protection of the ozone layer (same as above)
6	UN Convention to Combat Desertification	1996	Combat desertification and mitigate effects of drought (project involves soil erosion control)

Source: TrTA consultant.

### III. DESCRIPTION OF THE SUBPROJECT

#### A. Introduction

62. The Gansu Environmentally Sustainable Rural Vitalization and Development Project is aligned with the following impact: green and inclusive rural growth promoted in Gansu province. The project will use innovative and replicable green development solutions to achieve the following outcome: climate-resilient and sustainable rural economic diversification and mitigation of climate change demonstrated in Gansu Province.

63. The Yongchang County Subproject will be implemented as part of the Gansu Environmentally Sustainable Rural Vitalization and Development Project.

#### B. Gansu Environmentally Sustainable Rural Vitalization and Development Project Rational

64. **Underdeveloped and vulnerable rural areas.** Gansu Province is located in the northwest People's Republic of China (PRC). The project area is part of the Yellow River Ecological Corridor (YREC), which comprises the PRC's second largest river basin, covering 752,400 square kilometers across nine provinces and serving as home to 120 million people. With only 2% of the country's water resources, the basin suffers from severe water scarcity, growing climate change impacts including floods and droughts, and unsustainable development. Gansu is one of the poorest provinces in the PRC, and about 70% of the population of 27 million lives in underdeveloped rural areas with rural incomes around one-third of those for urban households. Challenges in the province include (i) the semi-arid climate and mountainous terrain; (ii) an outdated, low value, and carbon-intensive agriculture sector; (iii) climate change, which is expected to lead to an even drier climate and more frequent natural hazards; (iv) underdeveloped rural infrastructure; (v) low level of experience engaging with the private sector; and (vi) insufficient control of pollution, which is leading to environmental degradation. The lack of modern and sustainable economic activities is leading to continued environmental degradation, constrained future economic growth, and out-migration of young people.

65. **Sustainable Infrastructure.** From the rural revitalization strategic plan and the Central No. 1 document, the construction of rural public infrastructure is necessary. In particular, the document "Opinions of the Central Committee of the Communist Party of China and the State Council on Comprehensively Promoting Rural Revitalization and Accelerating Agricultural and Rural Modernization" has specific requirements for the construction of rural public infrastructure.

66. Strengthen the construction of rural public infrastructure. Continue to focus on the construction of public infrastructure in rural areas and strive to promote coverage in villages and extension to households. Implement the rural road smooth project. Orderly implementation of large population-scale natural villages (groups) through hardened roads. Strengthen the construction of rural resource roads, industrial roads, tourist roads and main roads in the village. Promoting rural road construction projects is more inclined to go to villages and households. Continue to support the development of rural roads in accordance with regulations through channels such as central vehicle purchase tax subsidies to local funds, refined oil tax and fee reform transfer payments, and local government bonds. Continue to carry out the demonstration and creation of "Four Good Rural Roads". Fully implement the road length system. Carry out demonstration and creation of integrated urban and rural transportation. Strengthen the investigation of potential safety hazards of rural roads and bridges and implement the main responsibility for maintenance. Strengthen rural road traffic safety supervision. Implement rural water supply security projects. Strengthen the construction of small and medium-sized reservoirs and other stable water source projects and water source protection, implement large-scale water supply project construction and small-scale project standardized transformation, and promote the integration of urban and rural water supply in



areas where conditions permit. By 2025, the penetration rate of tap water in rural areas will reach 88%. Improve the formation mechanism of rural water price and water fee and the long-term operation mechanism of the project. Implement rural clean energy construction projects. Strengthen the construction of rural power grids, and comprehensively consolidate and improve the level of rural power security. Promote the use of gas to the countryside and support the construction of safe and reliable rural gas storage tank stations and micro-pipeline network gas supply systems. Develop rural biomass energy. Strengthen the clean utilization of coal. Implement digital village construction and development projects. Promote the simultaneous planning and construction of rural gigabit optical networks, fifth-generation mobile communications (5G), and mobile Internet of Things and cities. Improve the compensation mechanism for universal telecommunications services and support the construction of information and communication infrastructure in rural and remote areas. Accelerate the construction of space-based facilities such as agricultural and rural remote sensing satellites. Develop smart agriculture, establish a big data system for agriculture and rural areas, and promote the deep integration of new generation information technology and agricultural production and operation. Improve the agrometeorological comprehensive monitoring network and enhance the ability to prevent agrometeorological disasters. Strengthen the digital and intelligent construction of rural public services and social governance. Implement the village-level comprehensive service facility improvement project. Strengthen the construction of service facilities such as village-level passenger stations, culture and sports, and public lighting.

67. In 2018, the National Development and Reform Commission, the Ministry of Finance and the Asian Development Bank signed the "Memorandum of Understanding between the National Development and Reform Commission of the People's Republic of China, the Ministry of Finance and the Asian Development Bank on Supporting the Rural Revitalization of the People's Republic of China". The three parties agreed that ADB and other development partners will raise a package of support totaling \$6 billion from 2018 to 2022 to support my country's rural revitalization strategy.

68. PRC will make full use of the financial and intellectual support of the Asian Development Bank, through the implementation of a number of high-quality Asian Development Bank loan projects and national and regional knowledge cooperation technical assistance projects, and the Asian Development Bank will jointly promote the improvement of China's rural human settlements, agricultural The development of key areas of rural revitalization such as modernization of production, construction of demonstration parks for the integrated development of rural industries, improvement of rural public services, and integrated development of urban and rural areas.

69. Through the series of "Guidelines for Low-Carbon Action in Northwest Villages", "Waste Sorted Supermarkets and Carbon Inclusive Mechanism", "Guidebook for the Construction of Low-Carbon Villages in Northwest China", low-carbon life publicity, and low-carbon construction concepts supported by ADB, etc., Explore the low-carbon rural construction model and path in Gansu Province, provide experience for low-carbon rural construction in the province and even in the northwest region, and guide the rural infrastructure concept to a new starting point.

70. **Yellow River Ecological Corridor.** To address the complex development and environmental challenges facing the Yellow River basin (para. 2), which accounts for 8% of national gross domestic product and is critical for food security, the government has prepared the Yellow River Master Plan, 2021–2035 and the Yellow River Basin Law, both of which prioritize ecological protection and promote high-quality green development. To help achieve these goals, the YREC program, which has been shaped by ADB's experience with the Yangtze River Economic Belt program and PRC rural vitalization programs, uses a programmatic approach targeting (i) institutional strengthening through governance and policy reforms; (ii) demonstration of innovative approaches and technology through integrated solutions; and (iii) knowledge development, management, and sharing and strategic

partnerships. The proposed project is part of the YREC program and supports the approach through (i) institutional strengthening to enhance green governance, (ii) demonstration of innovative approaches and technologies to achieve low carbon rural vitalization in semi-arid environments, and (iii) development and sharing of knowledge on such rural vitalization approaches through new and existing initiatives.

**71. Government's Strategy.** The Government of the PRC (the government) designated rural vitalization as a national priority in the National Strategic Plan for Rural Revitalization (2018–2022). Following the national plan, the Gansu Provincial Government (GPG) developed the Implementation of Strategy for Rural Vitalization and the Implementation Plan of Strategy for Rural Vitalization in Gansu Province (2018–2022), which encourage agriculture value chain expansion. Asian Development Bank's (ADB) support for rural vitalization was declared in the Memorandum of Understanding agreed with the government in 2018. The government has committed to carbon dioxide (CO<sub>2</sub>) emissions peaking before 2030 under the Paris Agreement, and recently announced targeting carbon neutrality by 2060. The expected key government priorities under the 14th Five-Year Plan include reducing carbon intensity and formulating an action plan for carbon emissions to peak before 2030. The project will contribute to achieving these two key government priorities of rural vitalization and carbon peaking/neutrality.

**72. Tourism Development.** At the provincial level, Gansu remains a poorest region in China with lowest GDP capita in 2020, which results in an inadequate investment on tourism and transportation infrastructure. Slow economic growth also led to issues such as unsatisfactory commercial environment and loss of manpower. Today tourists demand more on the overall living and leisure condition of the destination. Tourism has been proved worldwide to be an effective tool for poverty reduction and rural revitalization. Despite the world class natural and cultural tourism resources, Gansu tourism is still unknown in the global market due to insufficient exposure on international media and promotion. The situation has been worsened by the COVID -19 pandemic. As a consequence, Gansu inbound tourism market is very small as compared to the surrounding provinces.

73. To address the above issues, Gansu will invest more on its tourism infrastructure and commercial facilities, aiming to increase the connectivity to the international source market and strengthen the overall tourist experience. Social medias, particularly Tik Tok and WeChat, are currently the most powerful platform to raise the destination image of Gansu. Local tourism authorities should give greater priority to promoting the destination either through social media and hosting marketing events. In line with China's ambition to revitalize its countryside, rural tourism can be a key sector for the revival of Gansu tourism.

74. At the provincial level, rural tourism has been underlined as a development priority in a series of provincial legislation, guidelines, and master plan. As set out in the Gansu Cultural and Tourism Master Development Plan for the 14th Five-year Plan 2021-2025 released in November 2021, culture and tourism will be utilized as a major tool to advance rural revitalization. To focus on rural tourism development, Gansu Provincial Department of Culture and Tourism issue the Gansu Rural Tourism Development Plan for the 14th Five-year Plan in December 2021, setting the goals that by 2025 Gansu will establish 50 national tourism demonstration villages, 1,000 rural home stay inns, 300 rural tourism co-operatives and 50 leading rural tourism enterprises.

**75. Low Carbon Design/ Green Development.** China has issued the Measures for the Administration of Carbon Emissions Trading, which clarifies the main ideas and management system for establishing a national carbon market. At present, the relevant departments are actively considering legislation and formulating regulations on the management of carbon emissions trading. Gansu Province has great potential in low-carbon agricultural carbon sinks and renewable energy utilization. It can contribute to the national carbon emission reduction work. On the other hand, it can provide financial support for farmers through carbon trading

and improve agricultural production methods, increasing the income of farmers. Therefore, establishing an agricultural carbon exchange in Gansu Province to find buyers for low-carbon agriculture emission reduction projects has more practical and far-reaching significance than simple emission reduction activities.

76. The government encourages the development of afforestation carbon sinks, renewable energy utilization, methane gas utilization and other projects into CCER projects for carbon trading. The National Energy Administration encourages the submission of the entire county (city, district) rooftop distributed photovoltaic development pilot. Except for Qinzhou District of Tianshui City, this project has been included in the development pilot areas of Gansu Province.

77. The first carbon sink transaction of the 351,000-mu afforestation carbon sink project of Zhangye Forestry and Grass Bureau was successfully completed recently, achieving economic benefits of more than CNY4 million. Zhangye City has thus become the first city in Gansu Province that has completed the registration, issuance and the first successful transaction about forestry carbon sink of the International Verified Carbon Standard (VCS). In the future, Zhangye will continue to trade carbon sinks with this model. Therefore, the carbon sink components of the project will promote the carbon sink trading in Gansu Province and the cost of the project will be reduced which will be a highlight of the project.

78. **Strategic Alignment.** The project will support key operational priorities of Strategy 2030, particularly: (i) OP1: addressing remaining poverty and reducing inequalities by raising the income level of rural farmers; (ii) OP2: accelerating progress in gender equality by expanding employment opportunities for women; (iii) OP3: tackling climate change, building climate and disaster resilience, and enhancing environmental sustainability by reducing greenhouse gas (GHG) emissions and increasing resilience, (iv) OP5: promoting rural development by supporting agriculture value chain expansion; and (v) OP6: strengthening governance and institutional capacity by focusing on green governance and engagement with the private sector. The project will also contribute to achieving the Sustainable Development Goals, particularly, (i) SDG 13 on taking urgent action to combat climate change and its impacts, (ii) SDG 5 on gender equality, and (iii) SDG 10 on reducing inequality within and among countries. The project is aligned with ADB's country partnership strategy for the PRC, 2021–2025, through (i) reducing pollution to support environmentally sustainable development; and (ii) promoting low-carbon development and strengthening climate resilience to support climate change adaptation and mitigation.<sup>19</sup>

79. **Public Sector Involvement.** The project's institutional strengthening will be particularly important for the development of economic activities in new markets such as sustainable agribusiness. Village collectives, which typically are the owners of farmland, and cooperatives will be substantially involved in project implementation, resulting in strengthened institutional capacity. The need for public sector involvement is due to the lack of sufficient knowledge of and experience with the private sector among institutions and residents of the project area.

### C. Detailed Yongchang County Subproject Description by Component

80. The subproject will be located at Yongchang County. The Subproject includes nine components (not including capacity building in which there are no physical works), in which components 1-3 will be located at Jinchuan East Village, Jinchuan West Village and Beihaizi Village of Chengguan Town. Components 5, 7 and 8 will be located at Maobula Village of Hongshanyao Town. Components 4, 6 and 9 will be located at the two towns. The subproject's scope by component is presented in **Table III-1** and the locations of the components are presented in **Figure III-1**.

<sup>19</sup> ADB. 2021. *Country Partnership Strategy: People's Republic of China, 2021–2025 — Toward High-Quality, Green Development*. Manila.

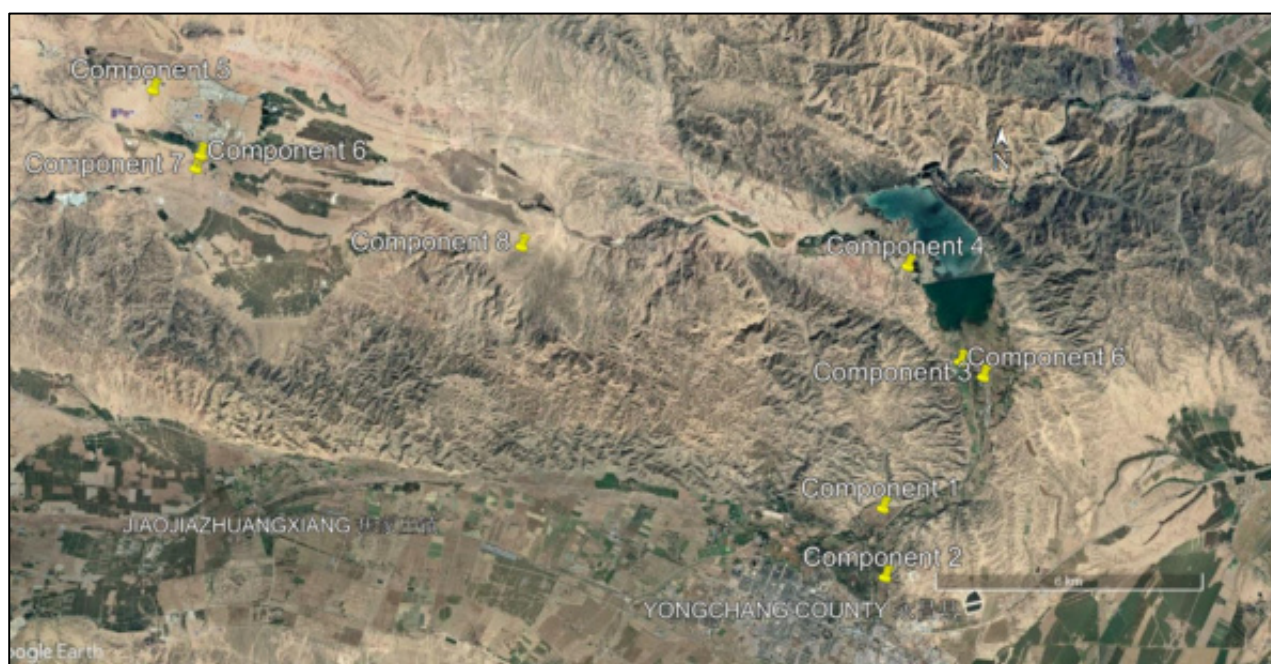
**Table III-1: Yongchang County Subproject activities.**

Output	Scope	Scale	Location
Output 2	1. Carrot Characteristic Town (component 1, 2 and 3) a. Smart Agriculture Demonstration Area, including: a1. 46 sets of ecological agriculture greenhouses, 3 vehicle bridges (500 m <sup>2</sup> in total), 8,625 m <sup>2</sup> (570 m) ecological landscaping roads, 8,760 m <sup>2</sup> (660 m) rural sightseeing routes (component 1);	various	Chengguan Town: Beihaizi Village Beihaizi Village Jinchuan East Village
	Output 3 b. 9,000 m <sup>2</sup> irrigation channel greening and protection belt, 1 entrance gate, green and energy saving renovation for 25 households (including 750 m <sup>2</sup> rooftop PV panels), 10,000 m <sup>2</sup> environment improvement, 7,680 m <sup>2</sup> (3,840 m) sidewalks and wooden footpath, 390 m flood control culvert improvement, 1,200 m <sup>2</sup> ecological parking lots (including charging piles) and 110 solar streetlights (component 1);		
Output 3	c. Flower Farm and Wellness Area, including 850 m <sup>2</sup> traditional Chinese medicine cultural experience center and supporting facilities, 1,685 m <sup>2</sup> farming culture experience center construction, 1,300 m <sup>2</sup> pastoral wellness community development, 4,600 m <sup>2</sup> pavement in flower farm and wellness area, 5,250 m <sup>2</sup> greening in flower farm and wellness area, 5,740 m <sup>2</sup> (4,200 m) road widening in wellness area, 900 m <sup>2</sup> rest and sightseeing platform, 5,550 m <sup>2</sup> (1,850 m) county road (X188) upgrading and 14,700 m <sup>2</sup> village road renovation, 1,795 m <sup>2</sup> ecological parking spaces (including charging piles), 2 ecological toilets (320 m <sup>2</sup> in total), 8,700 m trapezoidal irrigation channel (60*150*60cm) and 4,700 m U-shaped irrigation channel (D70), 20,880 m <sup>2</sup> wooden footpath, 100 solar streetlights, and 1,030 m <sup>2</sup> rooftop PV panel (component 2).		
Output 2	d. Carrot Characteristic Town Area, including 1000 mu farmland improvement and affiliated facilities installation, 15,500 m U-shaped irrigation channel and 5,560 m reinforced concrete rectangular channel construction, 15,120 m <sup>2</sup> sightseeing plank footpath, 2,000 m <sup>2</sup> rest and sightseeing platforms, 50 resting benches, 9 leisure galleries, 2,600 m <sup>2</sup> ecological pavement, 25,200 m <sup>2</sup> agriculture production roads, 25,000 m <sup>2</sup> cleaning up and ecological environment improvement, 1 beautiful village entrance gate, 2,385 m <sup>2</sup> pavement and 2,400 m <sup>2</sup> greening in carrot characteristic town area, as well as 90 solar streetlights (component 3).		
Output 4	2. Reservoir Ecological Management and Improvement Area (component 4) a. Ecological environment improvement on the west bank of Jinchuanxia Reservoir, including irrigation facilities to prevent soil erosion and protect the environment of the reservoir. The main activities would be ecological restoration of the bare land close to the reservoir through 18,400 trees and 500,000 m <sup>2</sup> grass planting and 84,420 m <sup>3</sup> soil improvement/replacement (component 4).	500,000 m <sup>2</sup>	Chengguan Town, Jinchuan West Village. Hongshanyao Town, Maobula Village.
Output 2	3. Maobula Folk Culture Exhibition Zone and Planting & Breeding Base (component 5, 6, 7 and 8) a. Efficient Agricultural Planting Base, including 8,000 mu Chelugou land improvement and supporting facilities, 3 agricultural irrigation storage tanks (95,000 m <sup>2</sup> each), 4,050 m irrigation water intake channel, 500 mu Zhongquan downstream land improvement and supporting facilities, 1 agricultural irrigation storage tank of 50,000 m <sup>3</sup> , 4,000 m irrigation water intake channel, 6,000 m Zhongquan water saving irrigation tributary pipes, 1,200 mu Maobula characteristic economic forest, and 11,050 m <sup>2</sup> ecological parking lot (component 5);	8,000 mu  various	
Output 3	b. Village Infrastructure, including 10,500 m <sup>2</sup> (2,100 m) village roads improvement, 8,000 m <sup>2</sup> (40 places) passing bays along X188 road, 50 solar streetlights, 2 ecological toilets		

Output	Scope	Scale	Location
	(320 m <sup>2</sup> in total), and 35 m <sup>2</sup> rooftop PV panels (component various 6);		
	c. Folk Customs and Intangible Cultural Heritage Exhibition Area, including 440 m <sup>2</sup> industry development comprehensive service center and affiliated facilities, 1,005 m <sup>2</sup> folk custom exhibition hall and intangible cultural heritage inheriting workshops; 2,582 m <sup>2</sup> sheep culture exhibition and experience center; 1 entrance gate, 1 ecological toilet of 160 m <sup>2</sup> , green and energy saving renovation for 15 households, permeable bricks and grass pavement and greening in the exhibition area and farms, 165 solar streetlights, and 3,465 m <sup>2</sup> rooftop PV panels (component 7);		
Output 2	d. Featured Breeding Base, including 1 meat sheep breeding farm of 138,000 m <sup>2</sup> , 1 sheep manure comprehensive treatment plant of 10,170 m <sup>2</sup> (component 8).	7,000 heads	Maobula Village, Hongshanyao Town
Output 3	4. Village Facilities (component 9)		All subproject villages
	a. Sanitation Facilities (vehicles), 3 garbage trucks and sprinkling trucks, 220 waste collection bins;		
	b. 12 signs and 50 signals;	1 set	
	c. 15 electric Sightseeing Vehicles;	15 vehicles	
	d. 361 Solar Streetlights;	361 units	
	e. 106 Solar Water Heaters.	106 units	

Source: Domestic EIA, 2022.

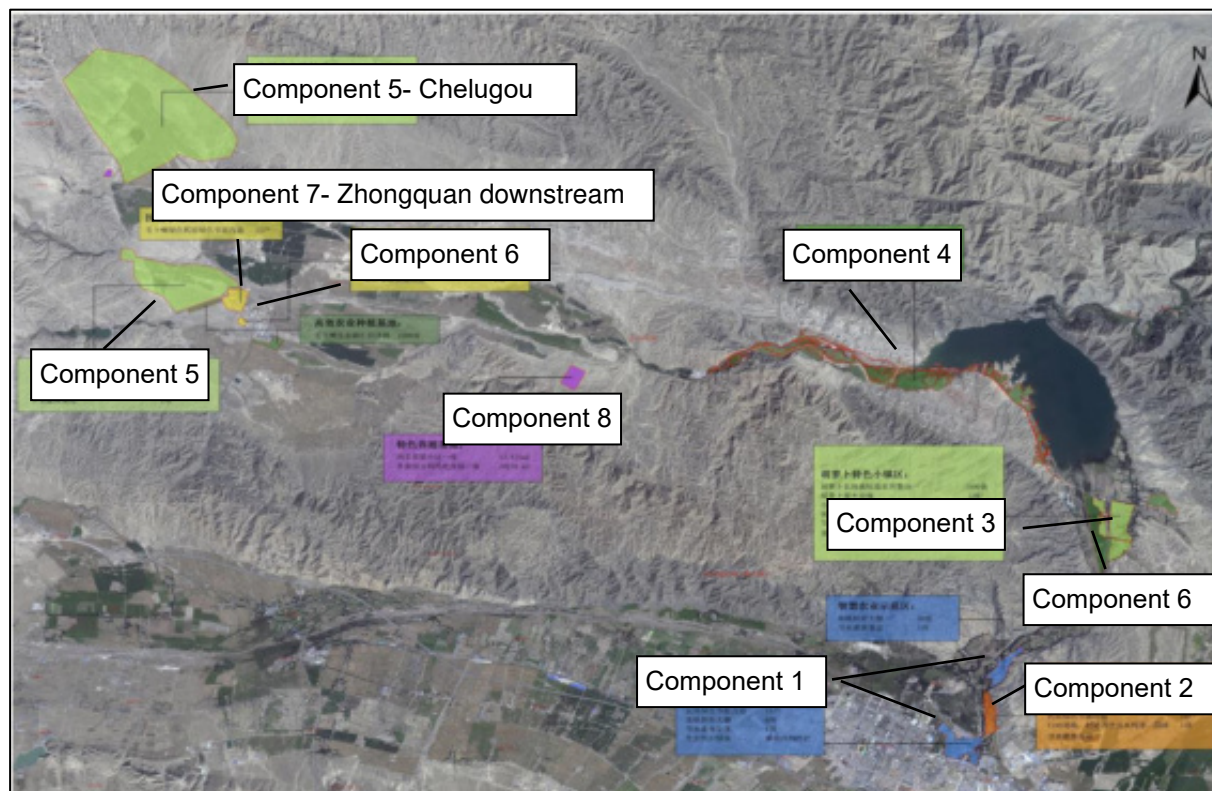
**Figure III-1: Location of the subproject.**



Source: Google earth (2022)

81. The layout of the subproject is presented in **Figure III-2**.

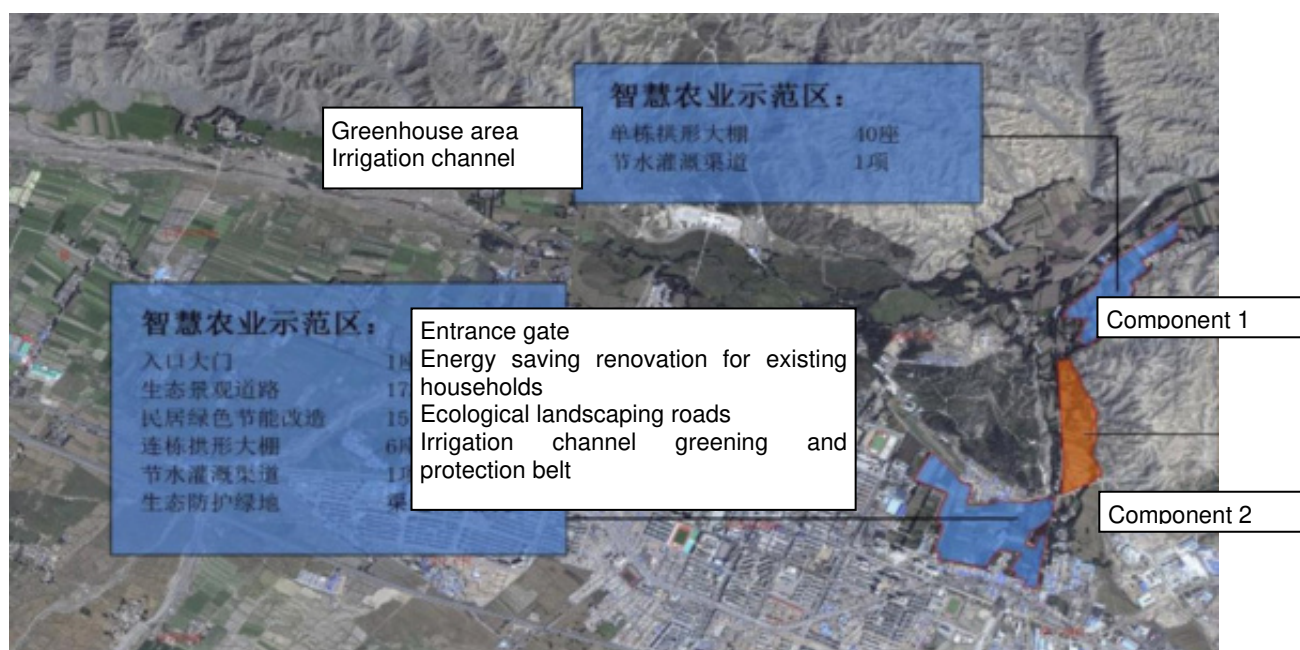


**Figure III-2: Layout of the subproject.**

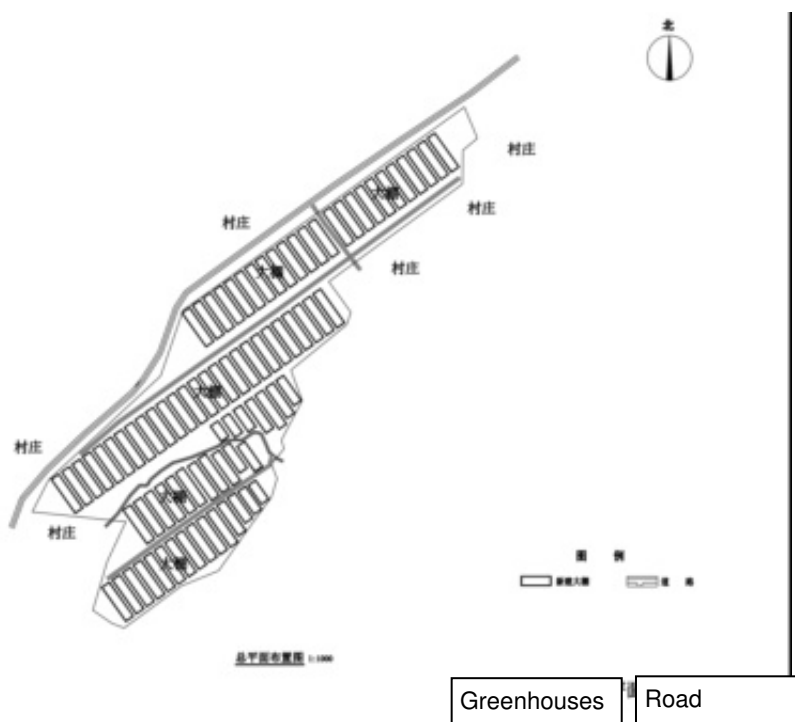
Source: FSR, 2022.

#### a) Smart Agriculture Demonstration Area

82. The component will be located at Beihaizi Village of Chengguan Town. The component will involve: (i) Smart Agriculture Demonstration Area, including 46 sets of ecological agriculture greenhouses, 3 vehicle bridges (500 m<sup>2</sup> in total), 8,625 m<sup>2</sup> (570 m) ecological landscaping roads, 8,760 m<sup>2</sup> (660 m) rural sightseeing routes; (ii) 9,000 m<sup>2</sup> irrigation channel greening and protection belt, 1 entrance gate, green and energy saving renovation for 25 households (including 750 m<sup>2</sup> rooftop PV panels.), 10,000 m<sup>2</sup> environment improvement, 7,680 m<sup>2</sup> (3,840 m) sidewalks and wooden footpath, 390 m flood control culvert improvement, 1,200 m<sup>2</sup> ecological parking lots (including charging piles) and 110 solar streetlights.

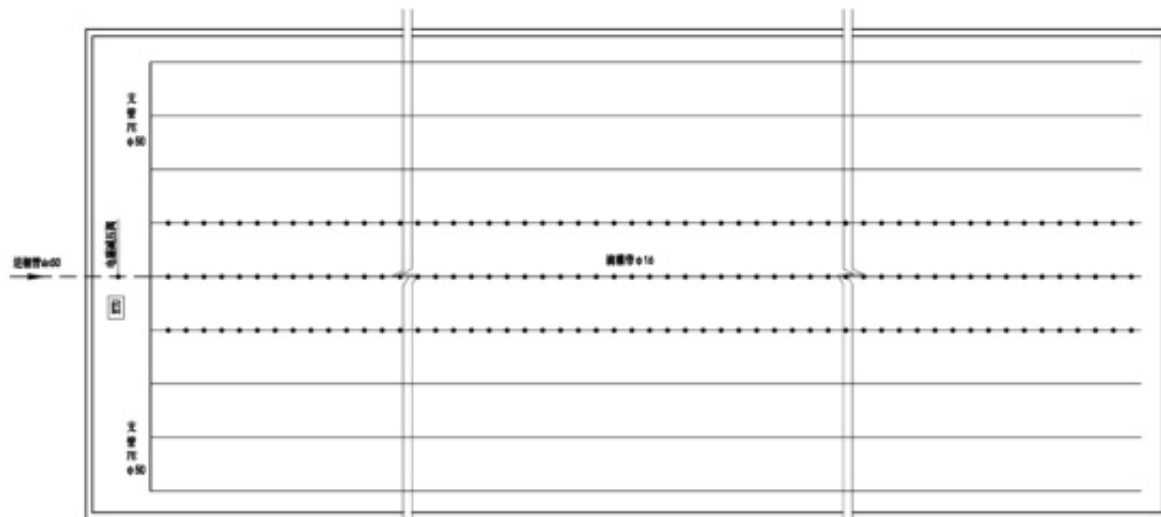
**Figure III-3:** Locations of component 1 and component 2.

Source: FSR, 2022.

**Figure III-4:** Layout of the greenhouses area.

Source: FSR, 2022.

83. The arch greenhouses will be assembled and welded by hot-dip galvanized steel pipe or rectangular pipe and manual film rolls and insect-proof nets will be installed on both sides of the greenhouses. During operation, drip irrigation and integrated water and fertilizer technology will be utilized. Organic fertilizer and biological and physical pest control measures will be implemented to reduce the consumption of fertilizer, pesticides and insecticides. The irrigation water will be sourced from the existing irrigation system. The drip irrigation system of the greenhouses is presented in **Figure III-5**.

**Figure III-5:** Layout of the drip irrigation system.

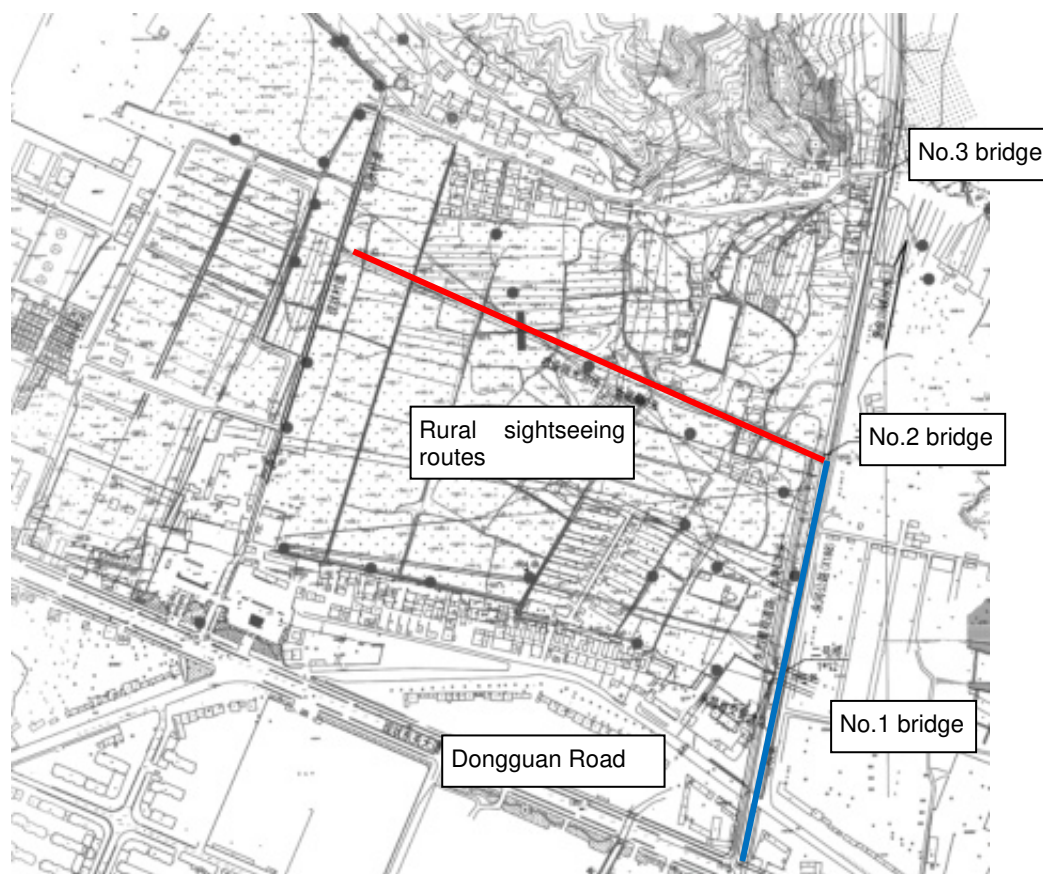
Source: FSR, 2022.

84. Three vehicle bridges (500 m<sup>2</sup> in total) will be built for connection of Smart Agriculture Demonstration Area and the existing town area. The width of No.1 and No. 2 bridges will be 24m and the No.3 bridge will be 12m width. The cross section of No.1 and No. 2 bridges will be 2.5m (sidewalk and railings) + 14m (motorway and non-motorway) + 2.5m (sidewalk and railings). The cross section of No.3 bridge will be 2.0m (sidewalk and railings) + 8.0m (motorway and non-motorway) + 2.0m (sidewalk and railings). All the three bridges will be fabricated hollow slab bridges.

85. A 570 m (8,625 m<sup>2</sup>) ecological landscaping road and a 660 m (8,760 m<sup>2</sup>) rural sightseeing routes will be built. The roads will be connected to the existing Dongguan Road and agricultural sightseeing road. East of the road is the existing irrigation canal. The layout of the roads is presented in **Figure III-6**.



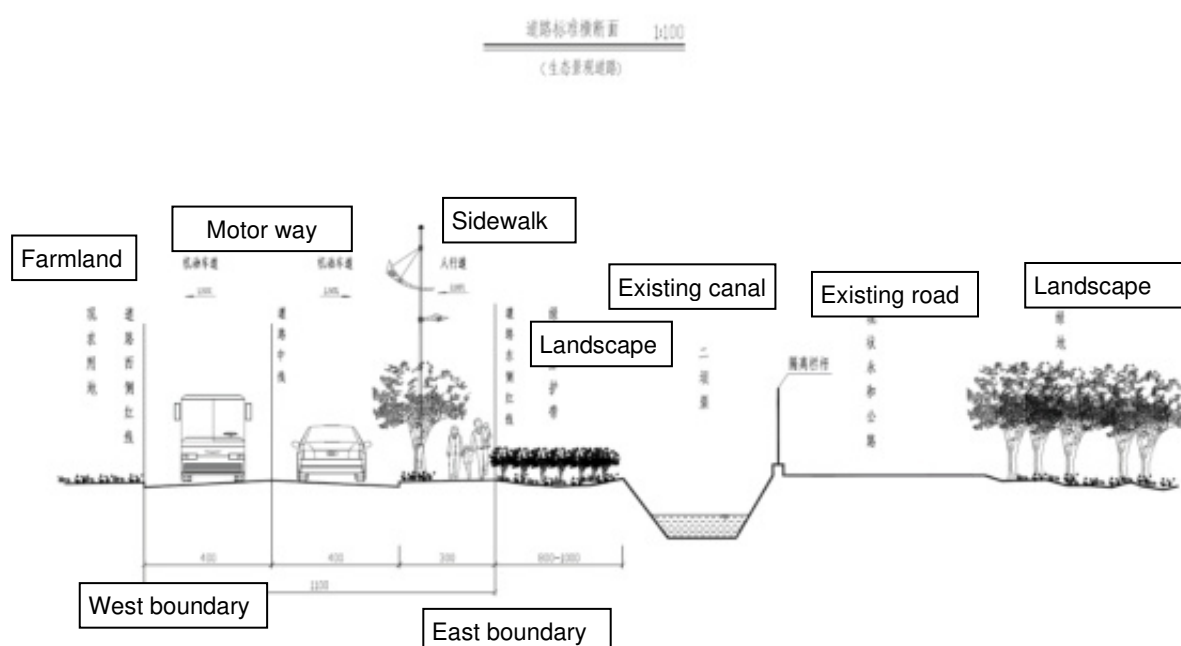
**Figure III-6:** Layout of the ecological landscaping roads.



Source: FSR, 2022.

86. The ecological landscaping road will be 11m width and the rural sightseeing routes will be 12m width. Cross sections of the roads are presented in **Figure III-7** and **Figure III-8**.

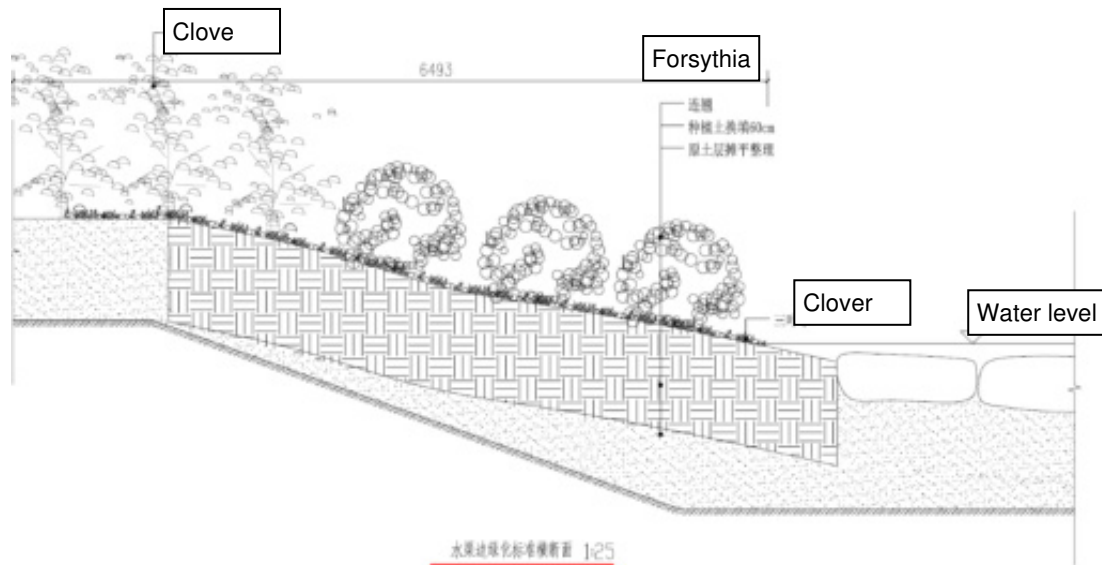
**Figure III-7:** Cross section of ecological landscaping road.



Source: FSR, 2022.



**Figure III-9:** Cross section of greening and protection belt.



Source: FSR, 2022.

90. Sponge city measures including rain garden low elevation greenbelts and will be utilized. Low elevation greenbelts will be distributed at the both sides of the irrigation channel. The rainwater will seep into the low elevation greenbelt and soil to accumulate and conserve water. Low elevation greenbelt can also effectively delay surface runoff, realize peak shifting, reduce waterlogging, purifying initial rainwater and reducing non-point source pollution of rainwater to water bodies. Local trees and plants will be planted.

91. A rain garden is a bowl-shaped depression designed as a garden to capture, hold, and absorb rainwater. Rain gardens slow the flow of rainwater from roofs, sidewalks, streets, parking lots, and other impervious surfaces, allowing the water to penetrate the soil.

92. The soil cleans the water of pollutants before it enters the storm drain and empties into the rivers. This process allows us to keep more of the rain and the stormwater that finally enters the storm drain is cleaner.

93. Rain gardens use native plants as well as nonnative plants that are adapted to our climate. When designed properly, water in the rain garden should stand for no more than 24 to 48 hours, too short a period for mosquitoes to hatch.

94. The structure of low elevation greenbelt is as follows: the water storage layer is 0.2 m high, the planting soil is 0.8 m, and the graded broken stone is 0.5 m (the porosity of broken stone is not less than 25%).

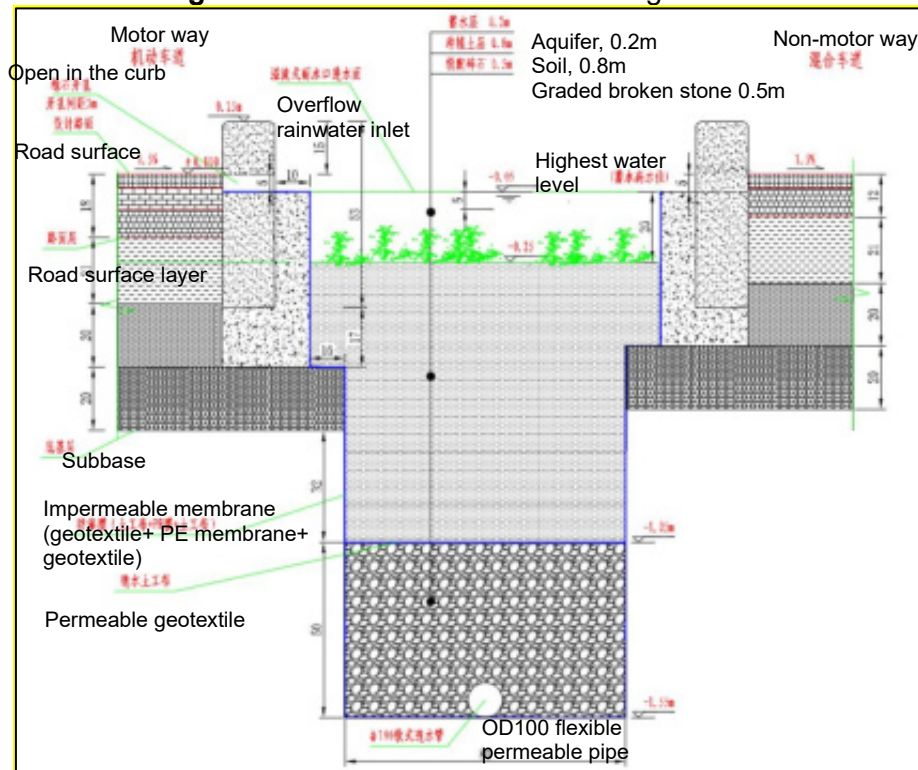
95. OD100 flexible permeable pipes will be set at the bottom of the low elevation greenbelts to collect the waterlogging and discharge it into the overflow gutter inlet which is connected to the main rainwater pipe.

96. The following principles will be utilized in the selection of plants in the sponge city measures:

- i) The plants should be waterlogging tolerant and be able to collect, purify and infiltrate rainwater. The plants should be able to grow normally in grass lawns, low elevation greenbelts and rain gardens where rainwater is collected during rain and floods.
- ii) Plants should be drought resistance to reduce the irrigation water needs in the dry season.

- iii) Plants should have a developed root system and strong purification ability for removal of nitrogen and phosphorus in the rainwater, so that rainwater can infiltrate into groundwater without pollution.
- iv) Native plants will be given priority.

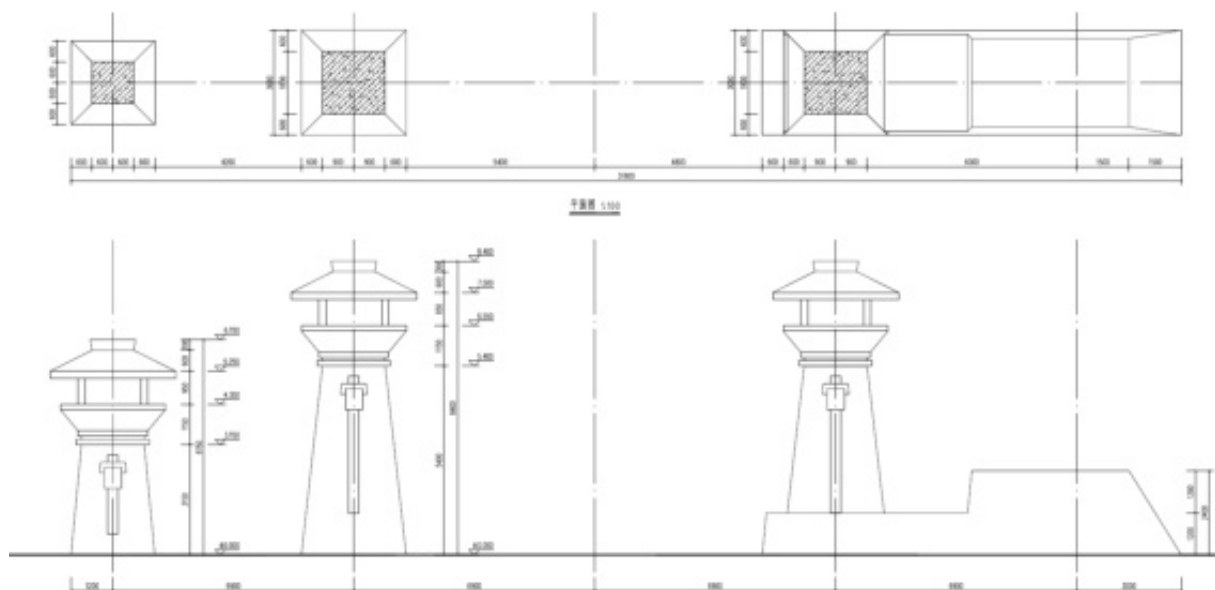
**Figure III-10: Profile of low elevation greenbelt.**



Source: FSR, 2022.

97. A gate will be installed at the entrance of the component. The gate will include three Han Dynasty style watchtowers. Two watchtowers will be 8.4 m height and 3m width and one watchtower will be 6.15 m height and 3m width. The distances between two watchtowers will be 6.9m. The total length of the gate will be 31.8m and width will be 3m. Sectional view of the gate is presented below.

**Figure III-11: Sectional view of entrance gate.**



Source: FSR, 2022.

98. The component will also implement green and energy saving renovation for 25 existing households. The measures will include: (i) 80mm EPS thermal insulation board (thermal conductivity is  $0.04\text{w}/(\text{m.k})$ ) will be installed at the existing brick external wall; (ii) the original flat roof will be transformed into a resin tile sloping roof. The sloping roof structure (from top to bottom) will be: synthetic resin tile (solar PV and solar water heating system will be installed on the south roof), 4mm thick SBS modified asphalt membrane waterproofing layer, 25mm thick wooden roof boarding, 120mm thick EPS thermal insulation board (thermal conductivity  $0.04\text{w}/(\text{m.k})$ ), supporting net, 60x40x3.0 square steel pipe purlin. After the renovation, the heat transfer coefficient of the roof will be  $0.38\text{w}/(\text{m}^2.\text{k})$ ; (iii) the existing external windows will be changed to broken bridge aluminum alloy low radiation insulating glass energy-saving windows (thermal conductivity  $1.8\text{w}/(\text{m}^2.\text{k})$ ); (iv) the external doors will be changed to stella insulation door (thermal conductivity  $2.0\text{w}/(\text{m}^2.\text{k})$ ); (v) interior walls will be painted with nano negative oxygen ion environmental protection coating; and (vi) the coal based heating will be changed to electricity heating and solar heating system will be installed.

99. Besides, landscape and permeable brick will be installed around the 25 households. The households renovation quantities is presented below.

**Table III-2: Households renovation quantities.**

Item	Unit	Quantity
External wall thermal insulation board installation	$\text{m}^2$	4000
External window replacement	$\text{m}^2$	600
External door replacement	$\text{m}^2$	375
Roof	$\text{m}^2$	750
Solar PV	$\text{m}^2$	1250
Solar heating system at the roof	Set	25
Landscape	$\text{m}^2$	875
Permeable brick installation	$\text{m}^2$	600
Solar lights	na	55

Source: FSR, 2022.

100. The component will involve  $10,000\text{ m}^2$  environment improvement of existing waste land. The main work includes trees planting and land leveling and soil replacement (0.4-0.5 m). The main work is presented below. During operation, drip irrigation will be utilized.

**Table III-3: Environment improvement work.**

Item	Unit	Quantity
Ansu apricot	$\text{m}^2$	556
Red leaf plum	$\text{m}^2$	556
Soil replacement	$\text{m}^2$	570

Source: FSR, 2022.

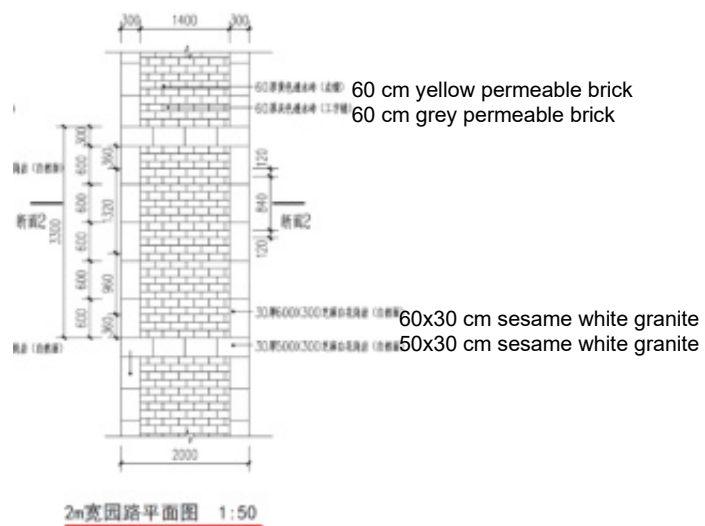
101. The component will build  $7,680\text{ m}^2$  (3,840 m) sidewalks and wooden footpath at the east of existing X188 road for tourist development. Wooden footpath will be installed within the existing forest and sidewalks will be installed close to the X188 road. The width of the sidewalks and footpath will be 2m and the length will be 3,840m.



**Figure III-12:** Environment improvement area.

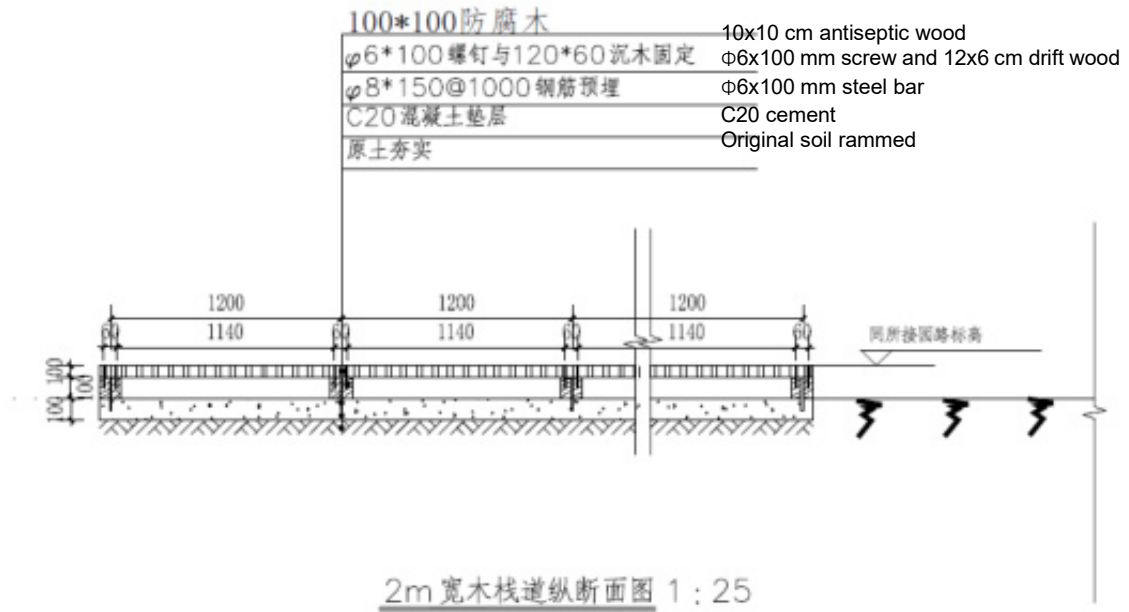
Source: FSR, 2022.

102. Sponge city measures will be implemented. Permeable brick will be installed at the sidewalks. The wooden footpath will be made from fast-growing woods.

**Figure III-13:** Plan of the sidewalks.

Source: FSR, 2022.

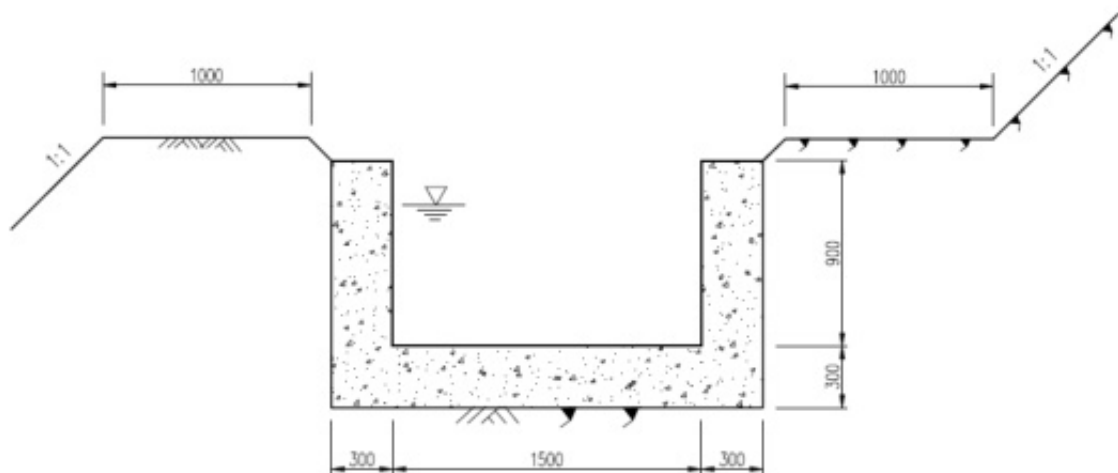
**Figure III-14:** Sectional view of wooden footpath.



Source: FSR, 2022.

103. The component will transfer the existing earth flood control channel (390 m) to closed concrete culvert for flood control.

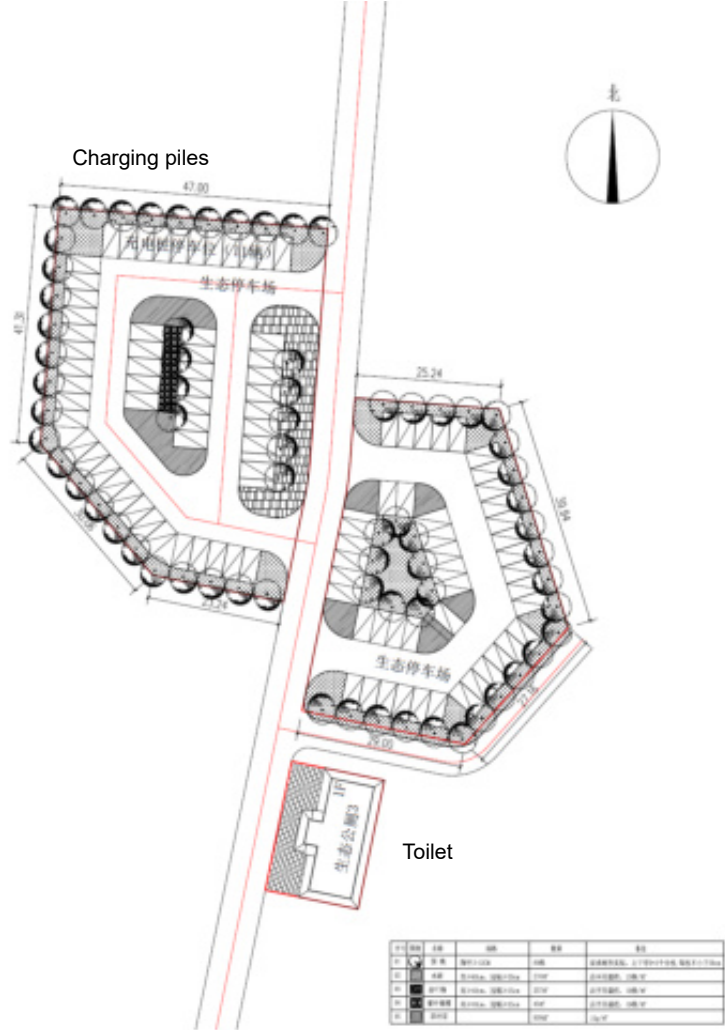
**Figure III-15:** Sectional view of closed concrete culvert.



Source: FSR, 2022.

104. The component will build one 1,200 m<sup>2</sup> ecological parking lots (including charging piles), and install 110 solar streetlights, and 750 m<sup>2</sup> rooftop PV panels.

Figure III-16: Layout of the parking lot.



Source: FSR, 2022.

105. The component area is relatively stable with a basic seismic intensity of Grade 6, a peak ground acceleration of 0.05 g, a 10% probability of exceedance in 50 years, and a return period of 475 years. The Grade 6 seismicity intensity will be applied for the design and construction project facilities as per the requirements of the Code for Seismic Design of Buildings (GB 5011-2010).

106. During operation, the main pollutants will be domestic waste, waste package materials (package for fertilizers and pesticides excluded), agricultural waste (plastic film and the packaging of fertilizers and pesticides), and domestic wastewater. Domestic wastewater will be treated by the existing Yongchang County WWTS. Domestic solid waste will be collected by local sanitary department and transported to the existing Yongchang County Municipal Landfill for treatment. Waste package materials will be sold out for recycling. The waste plastic film will be stockpiled and transported to “plastic film waste recycling centers” under the management of the Gansu Agricultural Department for the production of recycled fine-particle plastic materials. Waste packaging such as chemical fertilizer and pesticide will be collected and recycled by manufacturers. During operation, the main pollutants will be domestic waste, waste package materials (package for organic fertilizers etc.), agricultural waste (plastic film), and domestic wastewater. Domestic wastewater will be treated by the existing Yongchang County WWTS. Waste package materials will be collected and sold out for recycling. The waste plastic film will be stockpiled and transported to “plastic film waste recycling centers” under the management of the Gansu Agricultural Department for the production of recycled fine-particle plastic materials.

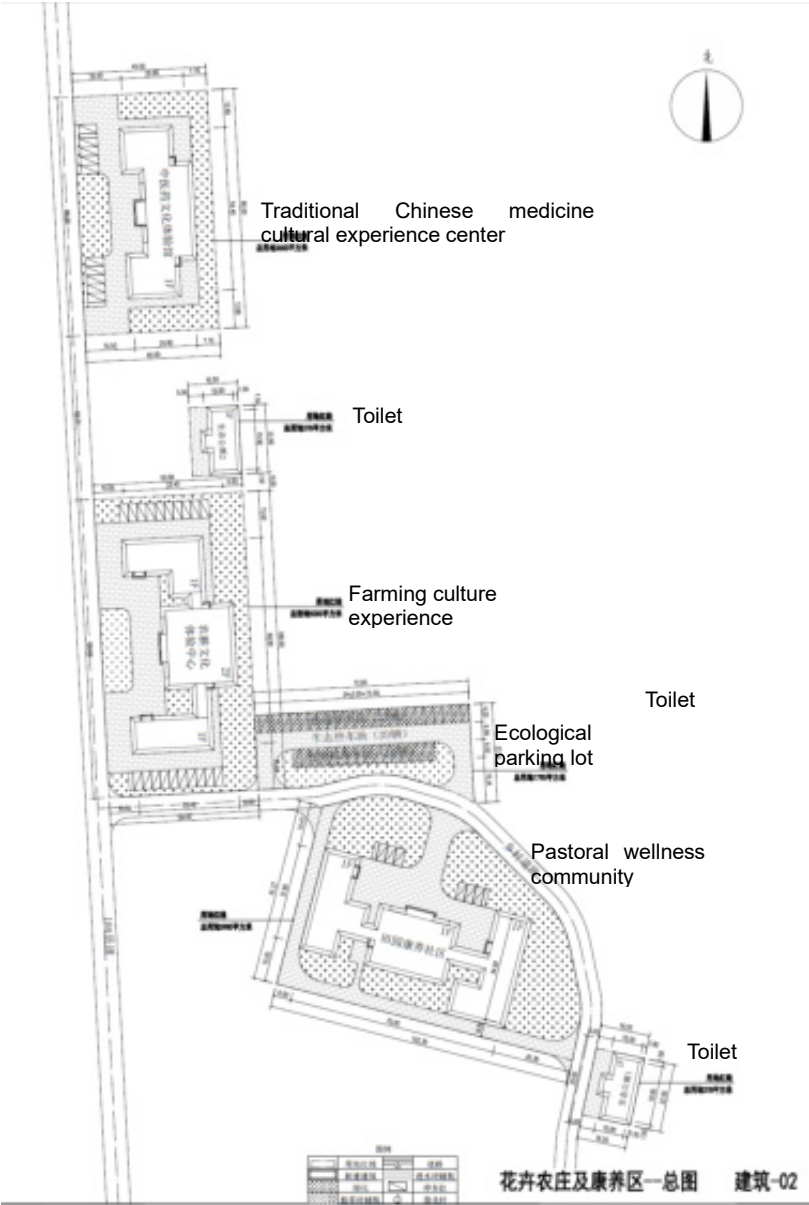


## b) Flower Farm and Wellness Area

107. The component will be located at Beihaizi Village of Chengguan Town. The component will build one Flower Farm and Wellness Area, including 850 m<sup>2</sup> traditional Chinese medicine cultural experience center and supporting facilities, 1,685 m<sup>2</sup> farming culture experience center construction, 1,300 m<sup>2</sup> pastoral wellness community development, 4,600 m<sup>2</sup> pavement in flower farm and wellness area, 5,250 m<sup>2</sup> greening in flower farm and wellness area, 5,740 m<sup>2</sup> (4,200 m) road widening in wellness area, 900 m<sup>2</sup> rest and sightseeing platform, 5,550 m<sup>2</sup> (1,850 m) county road (X188) upgrading and 14,700 m<sup>2</sup> village road renovation, 1,795 m<sup>2</sup> ecological parking spaces (including charging piles), 2 ecological toilets (320 m<sup>2</sup> in total), 8,700 m trapezoidal irrigation channel (60\*150\*60cm) and 4,700 m U-shaped irrigation channel (D70), 20,880 m<sup>2</sup> wooden footpath, 100 solar streetlights, and 1,030 m<sup>2</sup> rooftop PV panel. The location of the component 2 is presented in **Figure III-3**. The layout of the component is presented below.

108. These buildings will be constructed in accordance with the one-star standard of the national green building evaluation standard. Green building measures will include: (i) external wall will be cavity structure light steel core ribbed wall with 140 mm EPS thermal insulation board; (ii) the windows will be broken bridge aluminum alloy low radiation insulating glass energy-saving windows (thermal conductivity 1.8 w/(m<sup>2</sup>.k)); (iii) 70 mm foam concrete will be installed at the top of concrete cushion; (iv) the roof will be 120mm thick EPS thermal insulation board (thermal conductivity 0.04w/(m.k)) with solar PV system; and (v) nano negative oxygen ion coating will be used. With these measures, the energy saving effect of the buildings will be more than 72%.

Figure III-17: Layout of Flower Farm and Wellness Area.



Legend 图例

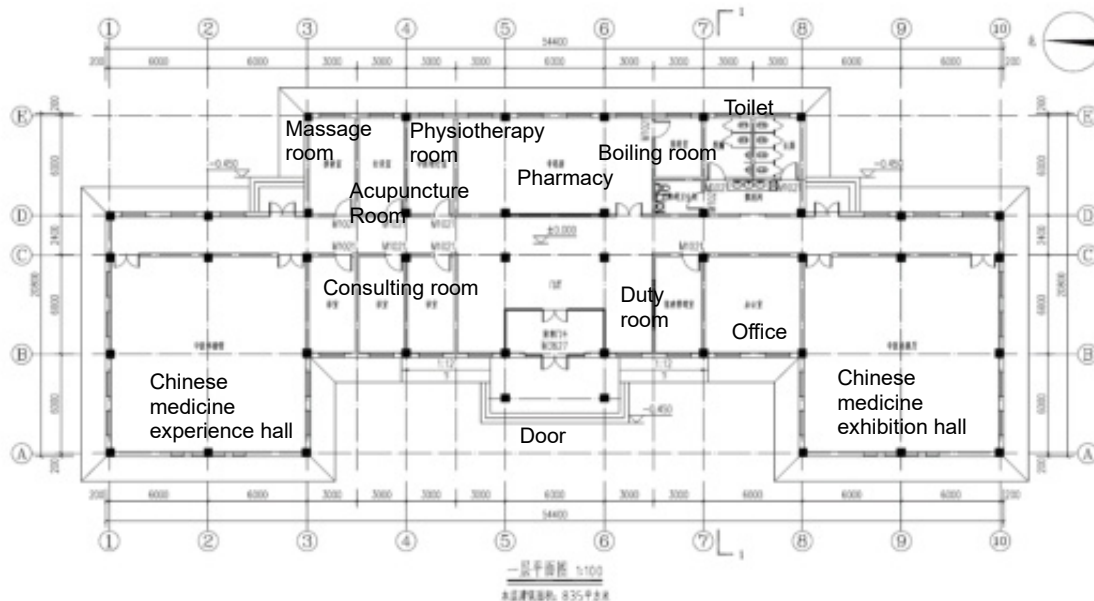
	Boundary		Road
	New building		Water permeable brick
	Landscape		Parking area
	Grass planting brick		Compass

Source: FSR, 2022.

110. The Traditional Chinese medicine cultural experience center is a one-floor steel structure prefabricated building with a building area of 835 m<sup>2</sup>. The heating system of the center

will be air source heat pump. 100 m DN150 PE pipelines will be installed for water supply and 100m DN225 HDPE pipelines will be installed for wastewater emission.

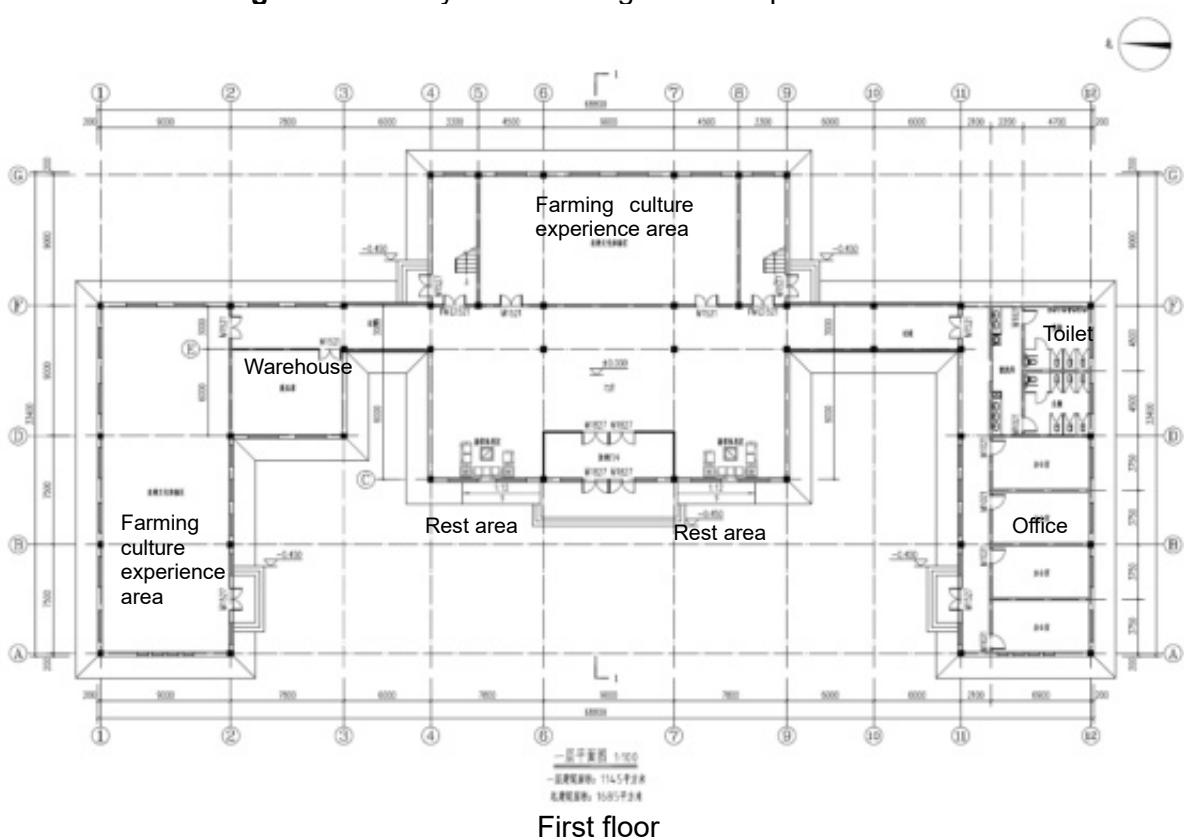
**Figure III-18:** Layout of Traditional Chinese medicine cultural experience center.

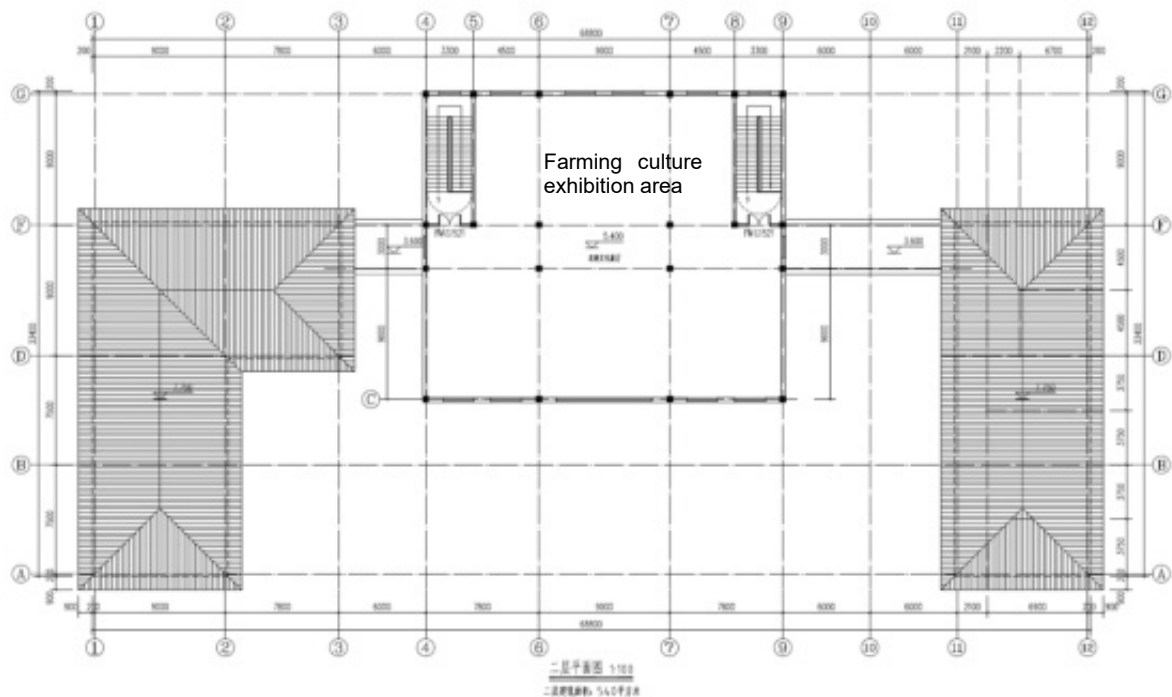


Source: FSR, 2022.

111. The farming culture experience center is a two-floors steel structure prefabricated building with a building area of 1,685 m<sup>2</sup>. The heating system of the center will be air source heat pump. 100 m DN150 PE pipelines will be installed for water supply and 100m DN225 HDPE pipelines will be installed for wastewater emission.

**Figure III-19:** Layout of farming culture experience center





Second floor

Source: FSR, 2022.

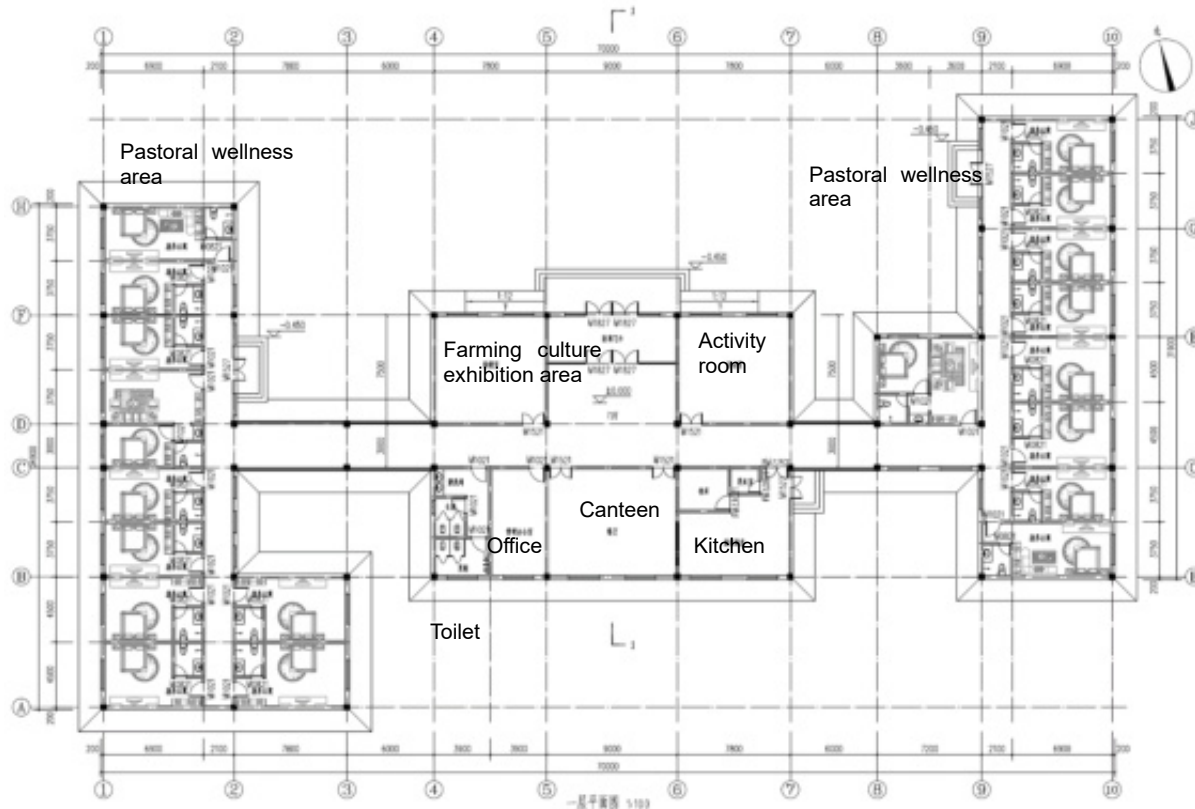
112. The pastoral wellness community is a one-floor steel structure prefabricated building with a building area of 1,315 m<sup>2</sup>. The heating system of the center will be air source heat pump. 100 m DN150 PE pipelines will be installed for water supply and 100m DN225 HDPE pipelines will be installed for wastewater emission.

113. Landscape (5,250 m<sup>2</sup> m<sup>2</sup>) and pavement (4,600 m<sup>2</sup>) including grass planting brick and water permeable brick will be installed in the Flower Farm and Wellness Area. The existing road (4,200 m) in the area will be widened. The layout of these components is presented in **Figure III-17**.

Table III-4: Landscape work.

Item	Unit	Quantity
Landscape area	m <sup>2</sup>	5,250
Chinese scholar tree	na	36
Border Privet	na	3614
Ulmus pumila L cv	na	4788
Prunus cistena	na	12540
Soil replacement	m <sup>2</sup>	757.8

Source: FSR, 2022.

**Figure III-20: Layout of pastoral wellness community**

Source: FSR, 2022.

114. A 1,795 m<sup>2</sup> ecological parking spaces (including charging piles) including 401 m<sup>2</sup> landscape area and 702 m<sup>2</sup> parking area will be built in the area. The parking area will be installed with grass planting brick and the road will be installed with water permeable brick.

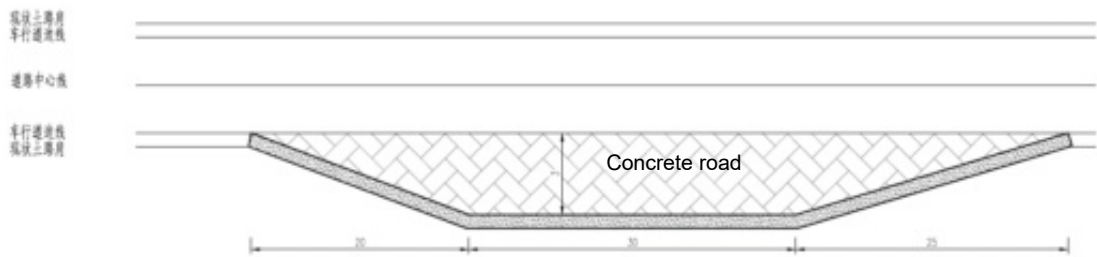
**Table III-5: Parking spaces work.**

Item	Unit	Quantity
Total area	m <sup>2</sup>	1,795
Grass planting brick pavement	m <sup>2</sup>	720
Water permeable brick pavement	m <sup>2</sup>	665
Landscape area	m <sup>2</sup>	410
Chinese scholar tree	na	12
Border Privet	na	1175
Ulmus pumila L cv	na	1538
Prunus cistena	na	4364
Parking area	m <sup>2</sup>	702 (39 parking lots)
Soil replacement	m <sup>2</sup>	252.6
Solar light	na	10

Source: FSR, 2022.

115. The component will also improve the existing X188 county road (1,850 m) and existing village road. The existing X188 county road will be widened at 30 places for two-way vehicle pass. The main work includes construction of new concrete road (6,750 m<sup>2</sup>) and earth road shoulder (1,200 m<sup>2</sup>). The new concrete road will involve 18cm concrete road surface, 15cm cement-stabilized macadam base (5% cement) and 25cm natural gravel cushion.

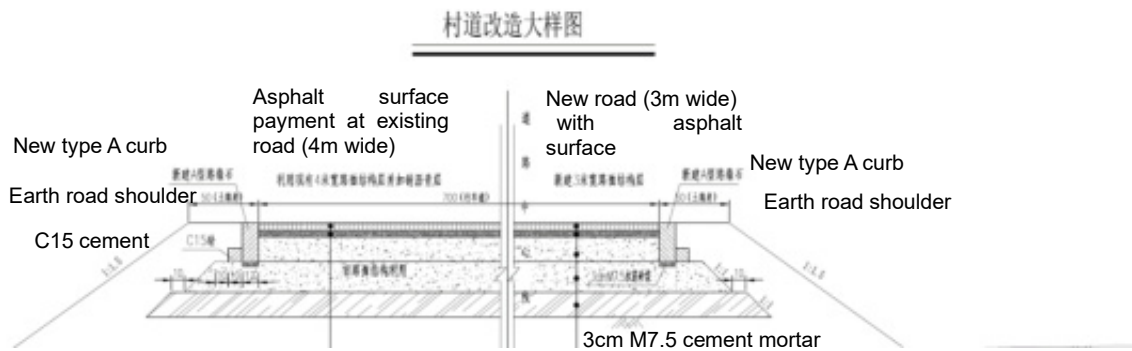
Figure III-21: Layout of improved X188 road



Source: FSR, 2022.

116. The existing village road (concrete) in the area is 4m wide. The component will expand the village road to 7m wide (asphalt surface).

Figure III-22: Layout of improved village road

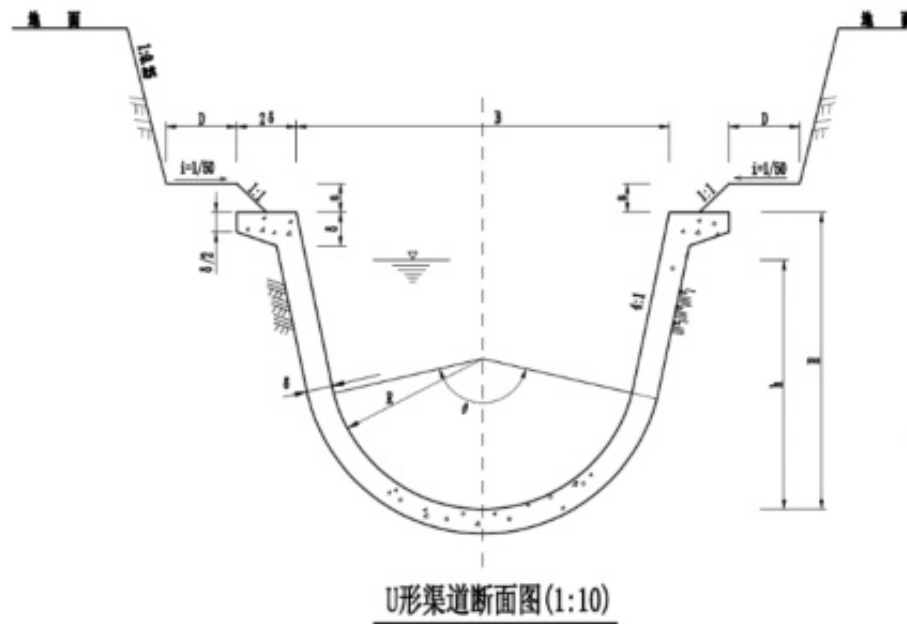


Source: FSR, 2022.

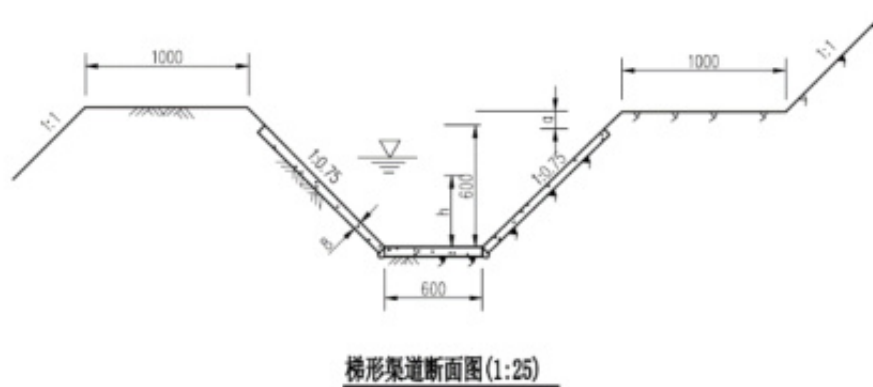
117. The component will build 6,960 m<sup>2</sup> (3,840 m) sidewalks and 6,960 m<sup>2</sup> (3,840 m) wooden footpath in the area for tourist development. Wooden footpath will be installed within the existing forest and sidewalks will be installed close to the existing roads. The width of the sidewalks and footpath will be 2m and the length will be 3, 840m. The sectional view of the sidewalks and footpath are presented in **Figure III-13** and **Figure III-14**.

118. Sponge city measures will be implemented. Permeable brick will be installed at the sidewalks. The wooden footpath will be made from fast-growing woods.

119. The component will update the existing earth irrigation channel to concrete irrigation channel including 8,700 m trapezoidal irrigation channel (60\*150\*60cm) and 4,700 m U-shaped irrigation channel (D70). The sectional views of the channels are presented below.

**Figure III-23: Sectional view of U-shaped irrigation channel**

Source: FSR, 2022.

**Figure III-24: Sectional view of trapezoidal irrigation channel**

Source: FSR, 2022.

120. The component area is relatively stable with a basic seismic intensity of Grade 6, a peak ground acceleration of 0.05 g, a 10% probability of exceedance in 50 years, and a return period of 475 years. The Grade 6 seismicity intensity will be applied for the design and construction project facilities as per the requirements of the Code for Seismic Design of Buildings (GB 5011-2010).

121. During operation, the main pollutants will be domestic waste and domestic wastewater. Domestic wastewater will be treated by the existing Yongchang County WWTS. Domestic solid waste will be collected by local sanitary department and transported to the existing Yongchang County Municipal Landfill for treatment.

### c) Carrot Characteristic Town Area

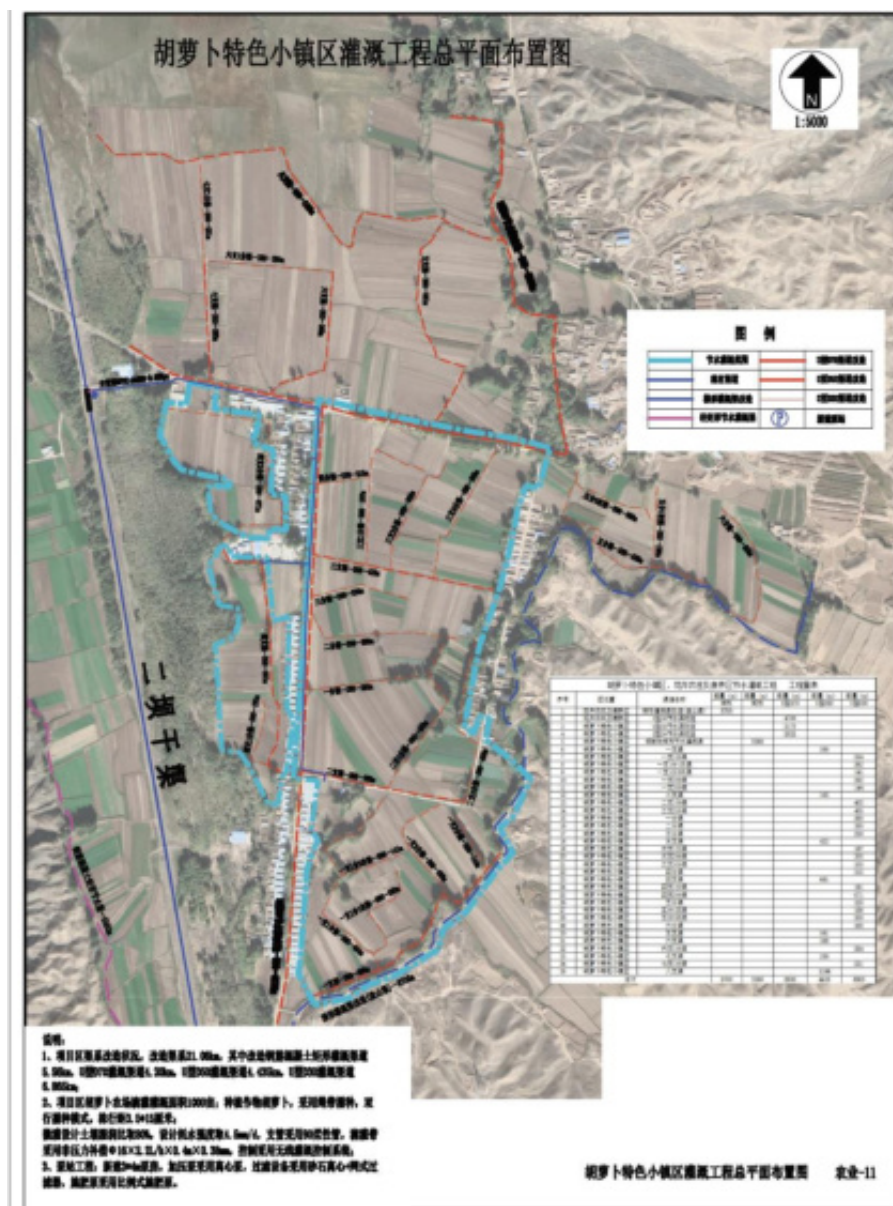
122. The component will be located at Jinchuan East Village of Chengguan Town. The component will involve including 1000 mu farmland improvement and affiliated facilities



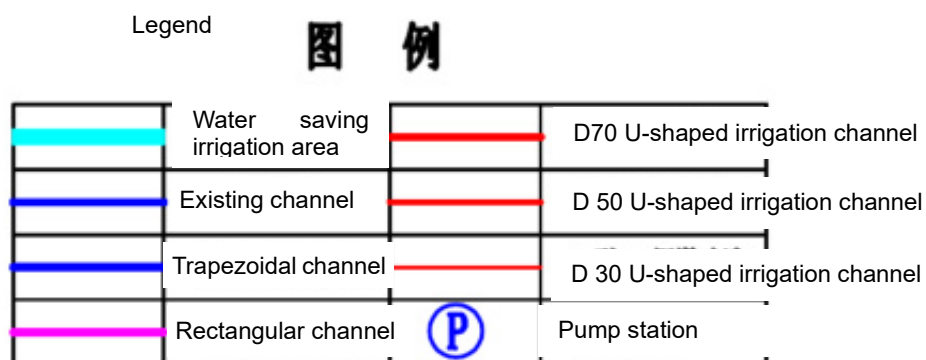
installation, 15,500 m U-shaped irrigation channel and 5,560 m reinforced concrete rectangular channel construction, 15,120 m<sup>2</sup> sightseeing plank footpath, 2,000 m<sup>2</sup> rest and sightseeing platforms, 50 resting benches, 9 leisure galleries, 2,600 m<sup>2</sup> ecological pavement, 25,200 m<sup>2</sup> agriculture production roads, 25,000 m<sup>2</sup> cleaning up and ecological environment improvement, 1 beautiful village entrance gate, 2,385 m<sup>2</sup> pavement and 2,400 m<sup>2</sup> greening in carrot characteristic town area, as well as 90 solar streetlights.

123. The component will improve existing 1,000 mu farmland, including land leveling and soil fertilization improvement and install water-saving irrigation system for the 1,000 mu farmland. Besides, 20,000 m<sup>2</sup> of new production roads and 6,000 m<sup>2</sup> of sightseeing trails will be built within the 1,000 mu farmland. The component will also transfer the existing earth channel into concrete channel including 15,500 m U-shaped irrigation channel and 5,560 m reinforced concrete rectangular channel. The layout of the improved farmland is presented below. The sectional view of channels is presented in **Figure III-15** and **Figure III-23**.

**Figure III-25:** Layout of the irrigation system of the improved farmland.



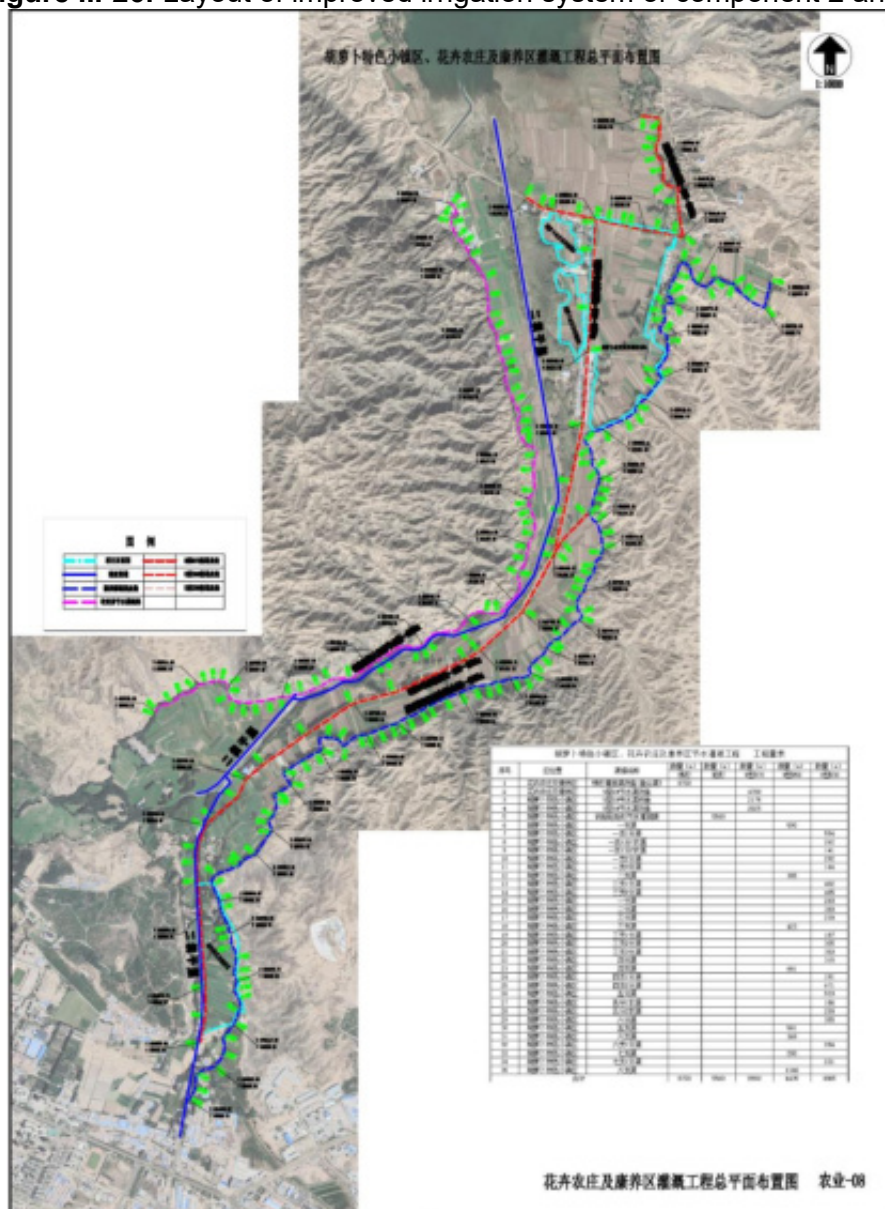


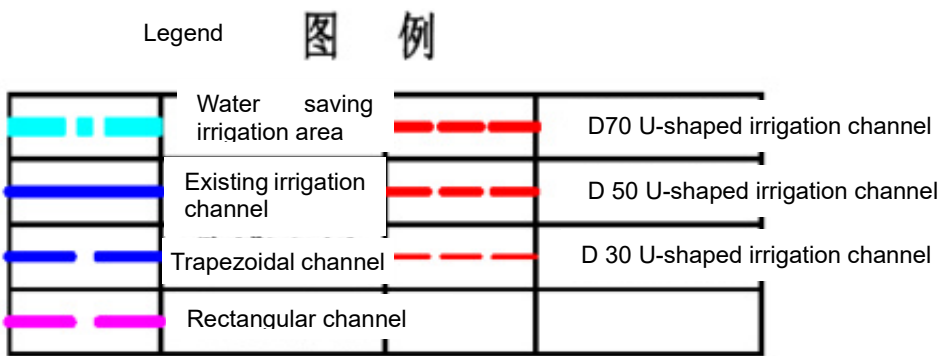


Source: FSR, 2022.

124. The improved channels of component 2 and 3 will be form one integrated irrigation system. The layout of the system is presented below. The irrigation water will be sourced from the Jinchuanxia Reservoir.

**Figure III-26:** Layout of improved irrigation system of component 2 and 3





Source: FSR, 2022.

125. Besides 2,000 m<sup>2</sup> rest and sightseeing platforms, 50 resting benches, 9 leisure galleries and 2,600 m<sup>2</sup> ecological pavement will be installed in Jinchuan East Village for tourist development.

**Figure III-27:** Samples of leisure galleries and ecological pavement



Source: FSR, 2022.

126. The component will improve the ecological environment in Jinchuan East Village including cleaning up of solid waste and waste residue at the site of 25,000 m<sup>2</sup>, then ecological environment improvement will be conducted at the site.

**Table III-6:** Environment improvement work.

Item	Unit	Quantity
Total area	m <sup>2</sup>	25,000
S. matsudana	na	400
White poplar	na	400
Clover	m <sup>2</sup>	20,000
Soil replacement	m <sup>2</sup>	8,410

Source: FSR, 2022.

127. The component will also implement 2,600 m<sup>2</sup> ecological pavement (grass planting brick and water permeable brick), 2,400 m<sup>2</sup> greening and 90 solar streetlights in carrot characteristic town area.

128. The component will build one gate at the entrance of the village. The gate will consist of 4 columns and the main structure will be steel structure assembly type. The external envelope will be dry-hanging granite and the top will be light steel decorative components

129. The component area is relatively stable with a basic seismic intensity of Grade 6, a peak ground acceleration of 0.05 g, a 10% probability of exceedance in 50 years, and a return period of 475 years. The Grade 6 seismicity intensity will be applied for the design and construction project facilities as per the requirements of the Code for Seismic Design of Buildings (GB 5011-2010).

130. During operation, the main pollutants will be domestic waste, waste package materials (package for fertilizers and pesticides excluded), agricultural waste (plastic film and the packaging of fertilizers and pesticides), and domestic wastewater. Domestic wastewater will be treated by the existing Yongchang County WWTS. Domestic solid waste will be collected by local sanitary department and transported to the existing Yongchang County Municipal Landfill for treatment. Waste package materials will be sold out for recycling. The waste plastic film will be stockpiled and transported to “plastic film waste recycling centers” under the management of the Gansu Agricultural Department for the production of recycled fine-particle plastic materials. Waste packaging such as chemical fertilizer and pesticide will be collected and recycled by manufacturers. During operation, the main pollutants will be domestic waste, waste package materials (package for organic fertilizers etc.), agricultural waste (plastic film), and domestic wastewater. Domestic wastewater will be treated by the existing Yongchang County WWTS. Waste package materials will be collected and sold out for recycling. The waste plastic film will be stockpiled and transported to “plastic film waste recycling centers” under the management of the Gansu Agricultural Department for the production of recycled fine-particle plastic materials.

#### d) Reservoir Ecological Management and Improvement Area

131. The component will be located at Jinchuan West Village of Chengguan Town and Maobula Village of Hongshanyao Town. The component will involve ecological environment improvement on the west bank of Jinchuanxia Reservoir, including irrigation facilities to prevent soil erosion and protect the environment of the reservoir. The main activities would be ecological restoration of the bare land close to the reservoir through 18,400 trees and 500,000 m<sup>2</sup> grass planting and 84,420 m<sup>3</sup> soil improvement/replacement.

**Figure III-28: Layout of the component**



Source: FSR, 2022.

**Table III-7: Ecological environment improvement work.**

Item	Unit	Quantity
Spruce	na	10,000
S. matsudana	na	8,400
Clover	m <sup>2</sup>	500,000
Soil replacement	m <sup>2</sup>	84,420

Source: FSR, 2022.

132. Drip irrigation system will be installed. The water will be sourced from the water supply tower of Jinchuan West Village. The water supply system will include 10,000 DN 100 PE pipelines and 20,000 DN 50 PE pipelines.

133. The component area is relatively stable with a basic seismic intensity of Grade 6, a peak ground acceleration of 0.05 g, a 10% probability of exceedance in 50 years, and a return period of 475 years. The Grade 6 seismicity intensity will be applied for the design and construction project facilities as per the requirements of the Code for Seismic Design of Buildings (GB 5011-2010).

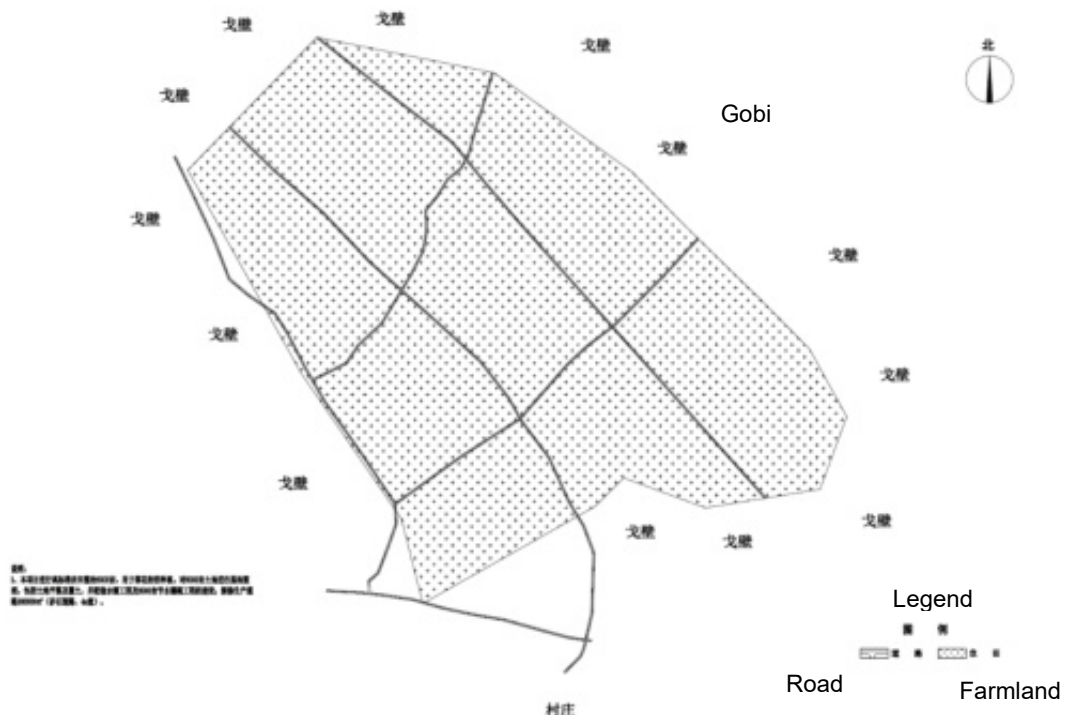
134. During operation, domestic solid waste will be generated. Littering of domestic waste in the area is prohibited and usage of fertilizer and pesticides is prohibited too for protection of the Jinchuanxia Reservoir.

#### e) Efficient Agricultural Planting Base

135. The component will be located at Mandula Village of Hongshanyao Town. The component will involve 8,000 mu Chelugou land improvement and supporting facilities, 3 agricultural irrigation storage tanks (95,000 m<sup>2</sup> in total), 4,050 m irrigation water intake channel, 500 mu Zhongquan downstream land improvement and supporting facilities, 1 agricultural irrigation storage tank of 50,000 m<sup>3</sup>, 4,000 m irrigation water intake channel, 6,000 m Zhongquan water saving irrigation tributary pipes, 1,200 mu Maobula characteristic economic forest, and 11,050 m<sup>2</sup> ecological parking lot.

136. The Chelugou land improvement component will involve land leveling and soil replacement (0.4-0.5 m) of 8,000 mu grass land, abandoned farmland and waste land. Then the land will be used for sunflower planting. Besides, 3 agricultural irrigation storage tanks (95,000 m<sup>2</sup> each) and 4,050 m irrigation water intake channel will be built for irrigation. During operation, drip irrigation and integrated water and fertilizer technology will be utilized.

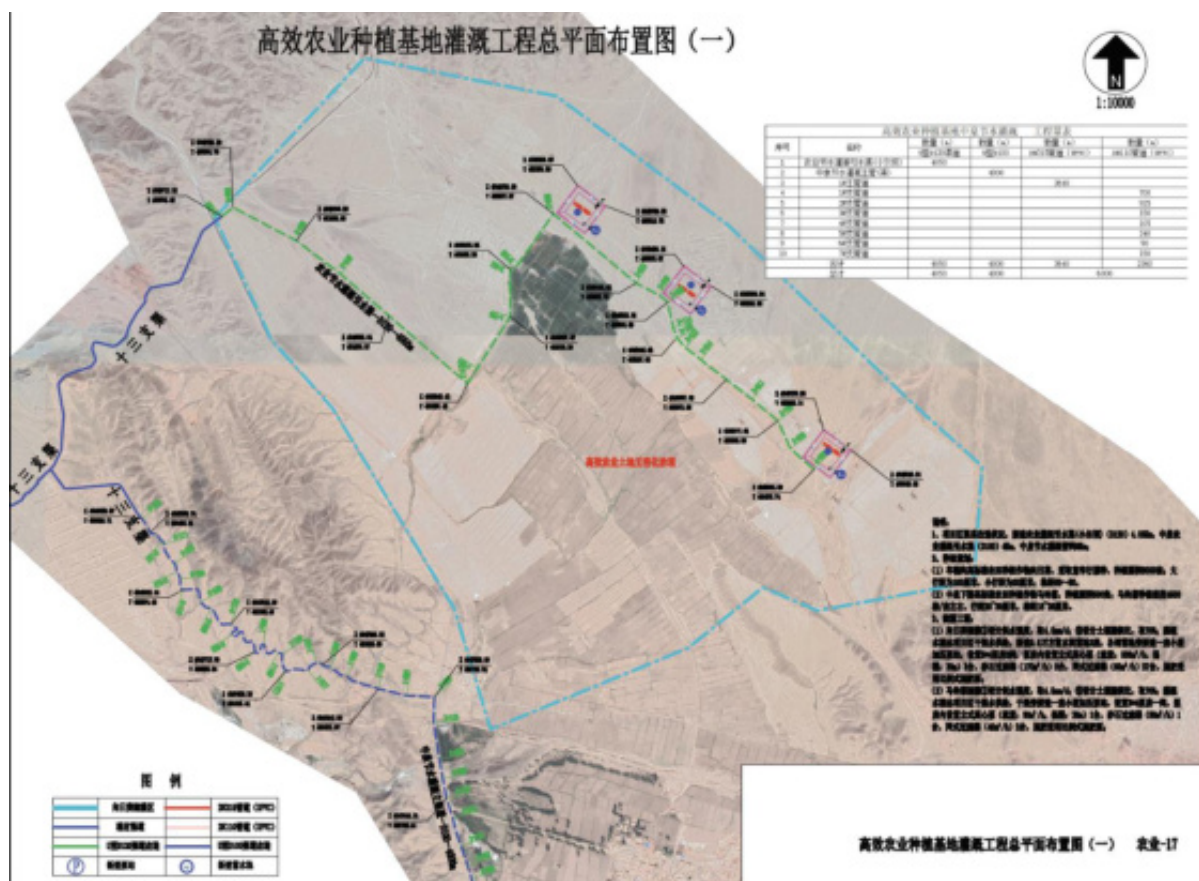
**Figure III-29: Layout of the Chelugou land improvement**



Source: FSR, 2022.



Figure III-30: Layout of the irrigation system



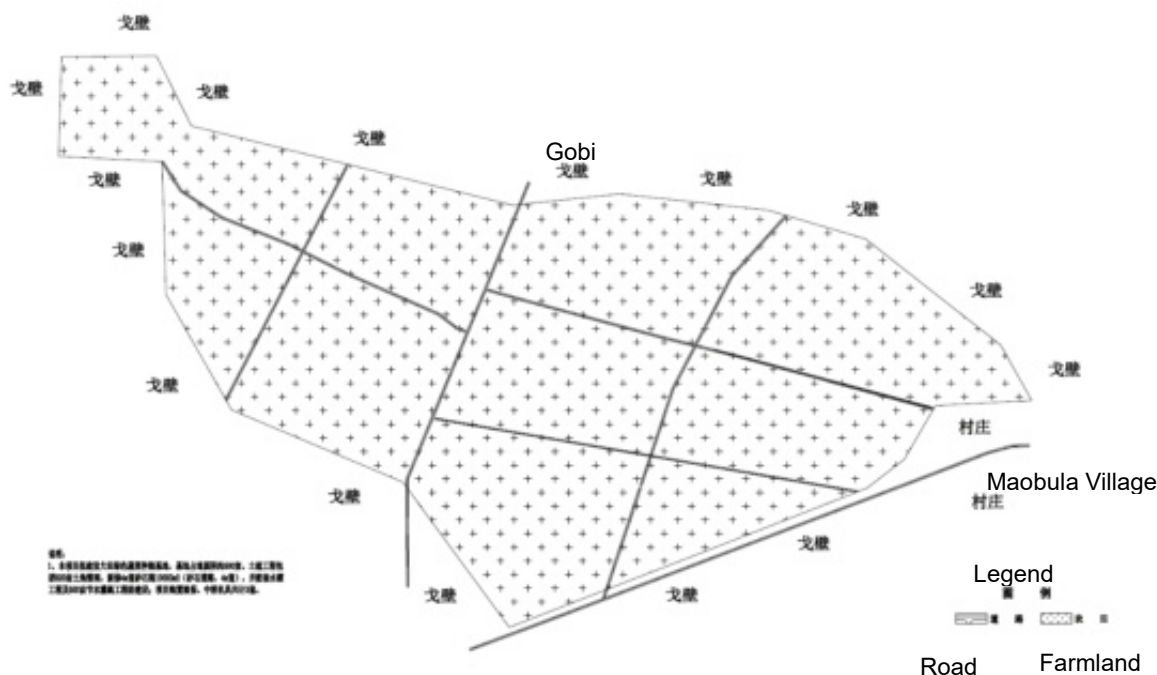
Source: FSR, 2022.

137. The Zhongquan downstream land improvement component will involve land leveling and soil replacement (0.4-0.5 m) of 8,000 mu grass land, abandoned farmland and waste land and 1,200 mu Maobula characteristic economic forest planting. Then the land will be used for potato planting. Besides, 1 agricultural irrigation storage tanks (50,000 m<sup>2</sup>), 4,000 m irrigation water intake channel and 6,000 m Zhongquan water saving irrigation tributary pipes will be built for irrigation of the 1,200 mu Maobula characteristic economic forest. During operation, drip irrigation and integrated water and fertilizer technology will be utilized.

138. The component area is relatively stable with a basic seismic intensity of Grade 6, a peak ground acceleration of 0.05 g, a 10% probability of exceedance in 50 years, and a return period of 475 years. The Grade 6 seismicity intensity will be applied for the design and construction project facilities as per the requirements of the Code for Seismic Design of Buildings (GB 5011-2010).

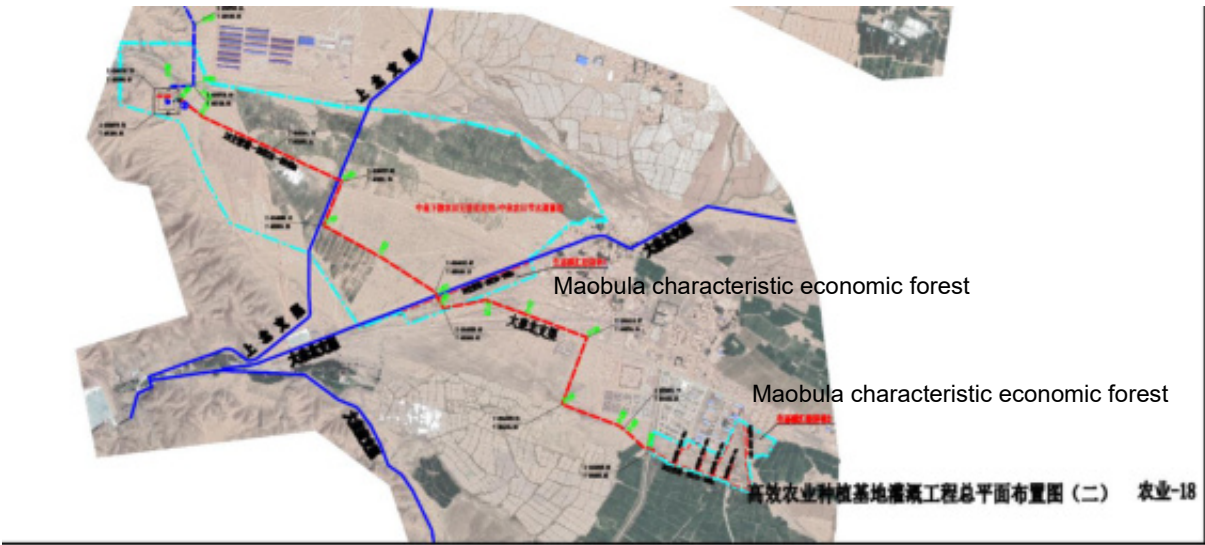
139. During operation, drip irrigation and integrated water and fertilizer technology will be utilized. During operation, organic fertilizer and biological and physical pest control measures will be implemented to reduce the consumption of fertilizer, pesticides and insecticides.

Figure III-31: Layout of the Zhongquan downstream land improvement



Source: FSR, 2022.

Figure III-32: Layout of the irrigation system



Source: FSR, 2022.

140. During operation, the main pollutants will be domestic waste, wastewater, waste package materials (package for fertilizers and pesticides excluded), agricultural waste (plastic film and the packaging of fertilizers and pesticides) and domestic wastewater. Domestic wastewater will be treated by septic tank then recycled. Domestic solid waste will be collected by local sanitary department and transported to the existing Yongchang County Municipal Landfill for treatment. Waste package materials will be sold out for recycling. The waste plastic film will be stockpiled and transported to “plastic film waste recycling centers” under the management of the Gansu Agricultural Department for the production of recycled fine-particle plastic materials. Waste packaging such as chemical fertilizer and pesticide will be collected and recycled by manufacturers.

## f) Village Infrastructure

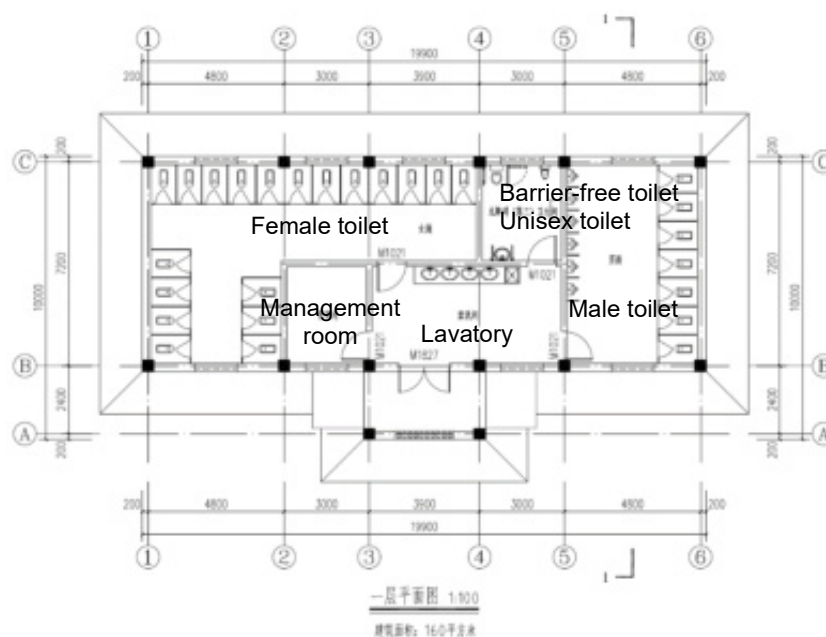
141. The component will be located at Mandula Village of Hongshanyao Town. The component will involve 10,500 m<sup>2</sup> (2,100 m) village roads improvement, 8,000 m<sup>2</sup> (40 places) passing bays along X188 road, 50 solar streetlights, 2 ecological toilets (320 m<sup>2</sup> in total), and 35 m<sup>2</sup> rooftop PV panels.

142. The existing X188 county road will be widened at 40 places for two-way vehicle pass. The main work includes construction of new concrete road (7,000 m<sup>2</sup>) and earth road shoulder (1,000 m<sup>2</sup>). The new concrete road will involve 18cm concrete road surface, 15cm cement-stabilized macadam base (5% cement) and 25cm natural gravel cushion. The layout of the improved road is presented in **Figure III-21**.

143. The existing village road (concrete) in the Maobula Village is 4m wide. The component will expand the village road to 7m wide (asphalt surface). The layout of the improved village road is presented in **Figure III-22**.

144. The component will build 2 ecological toilets. Each toilet will have a floor area of 160 m<sup>2</sup>. Each toilet will be a one-floor building with a height of 5m. The layout of the toilet is presented in **Figure III-33**.

**Figure III-33: Layout of the ecological toilet**



Source: FSR, 2022.

145. The roof of the toilets will be resin tile sloping roof with solar PV system (75 m<sup>2</sup>). Nano negative oxygen ion coating will be used. The external wall will be cavity structure light steel core ribbed wall with 140 mm EPS thermal insulation board. The toilets will be installed with accessible facilities such as wheelchair accessible ramp. Electricity will be used for heating.

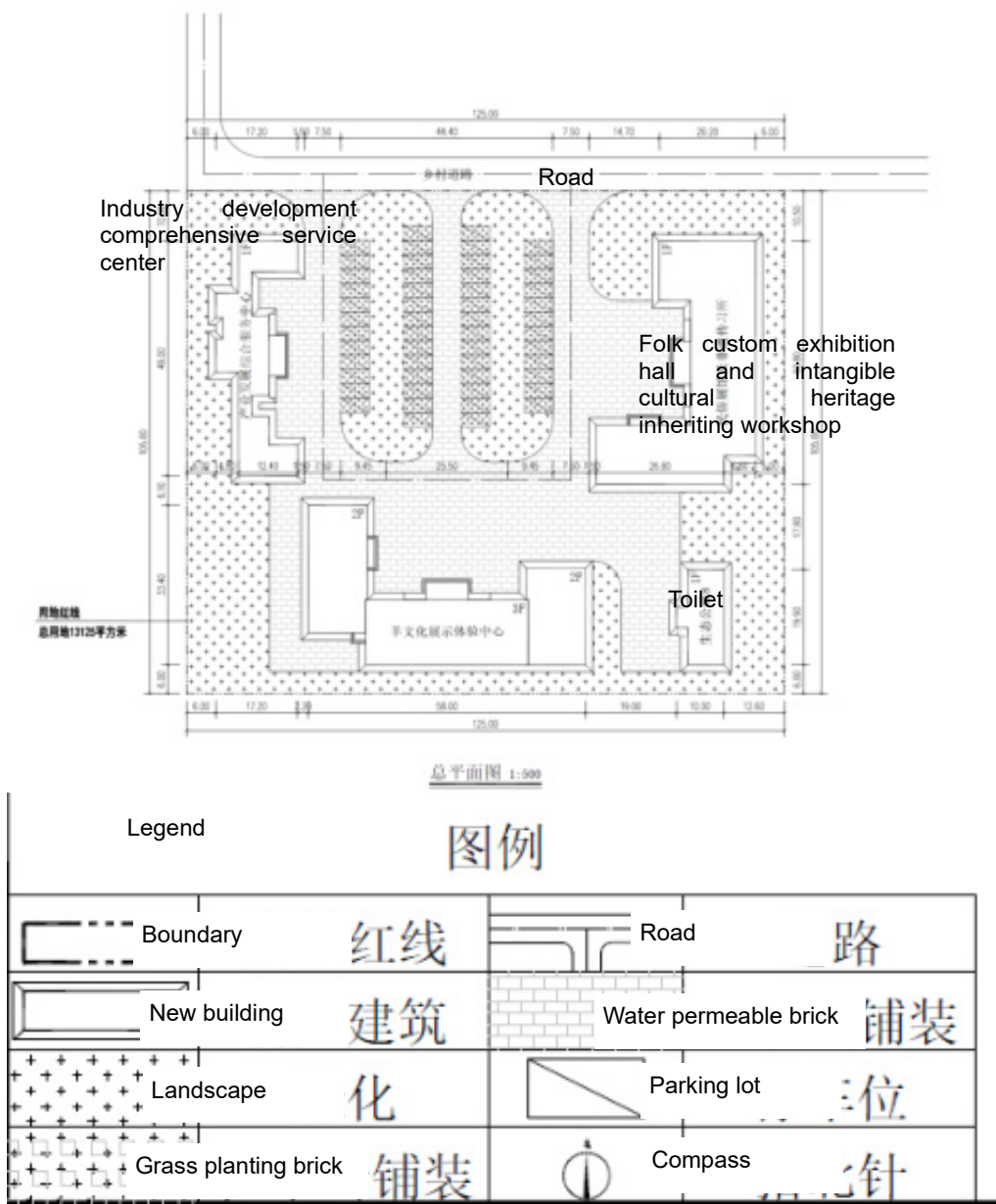
146. The component will also install 50 solar streetlights in Maobula Village.

147. During operation, the main pollutants will be domestic waste and domestic wastewater. Domestic wastewater will be treated by septic tank then recycled. Domestic solid waste will be collected by local sanitary department and transported to the existing Yongchang County Municipal Landfill for treatment.

g) Folk Customs and Intangible Cultural Heritage Exhibition Area

148. The component will be located at Mandula Village of Hongshanyao Town. The component will build one Folk Customs and Intangible Cultural Heritage Exhibition Area, including 440 m<sup>2</sup> industry development comprehensive service center and affiliated facilities, 1,005 m<sup>2</sup> folk custom exhibition hall and intangible cultural heritage inheriting workshops; 2,582 m<sup>2</sup> sheep culture exhibition and experience center; 1 entrance gate, 1 ecological toilet of 160 m<sup>2</sup>, permeable bricks and grass pavement and greening in the exhibition area and farms, 165 solar streetlights, and 3,465 m<sup>2</sup> rooftop PV panels. The layout of the component is presented below.

Figure III-34: Layout of the component

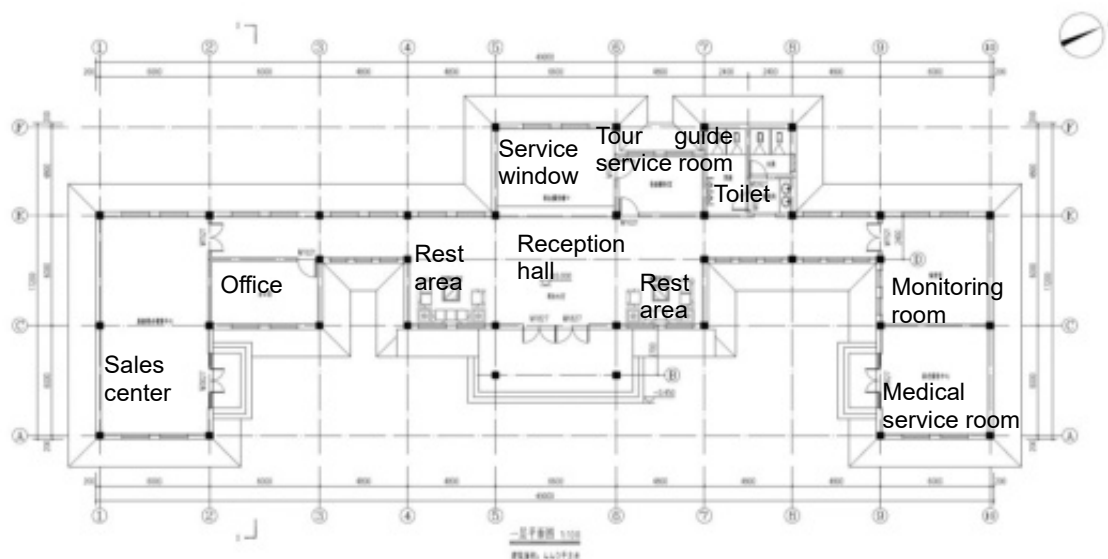


Source: FSR, 2022.

149. The industry development comprehensive service center will be a one-floor building with a floor area of 400 m<sup>2</sup> and a height of 6.725m. The layout of the center is presented below.



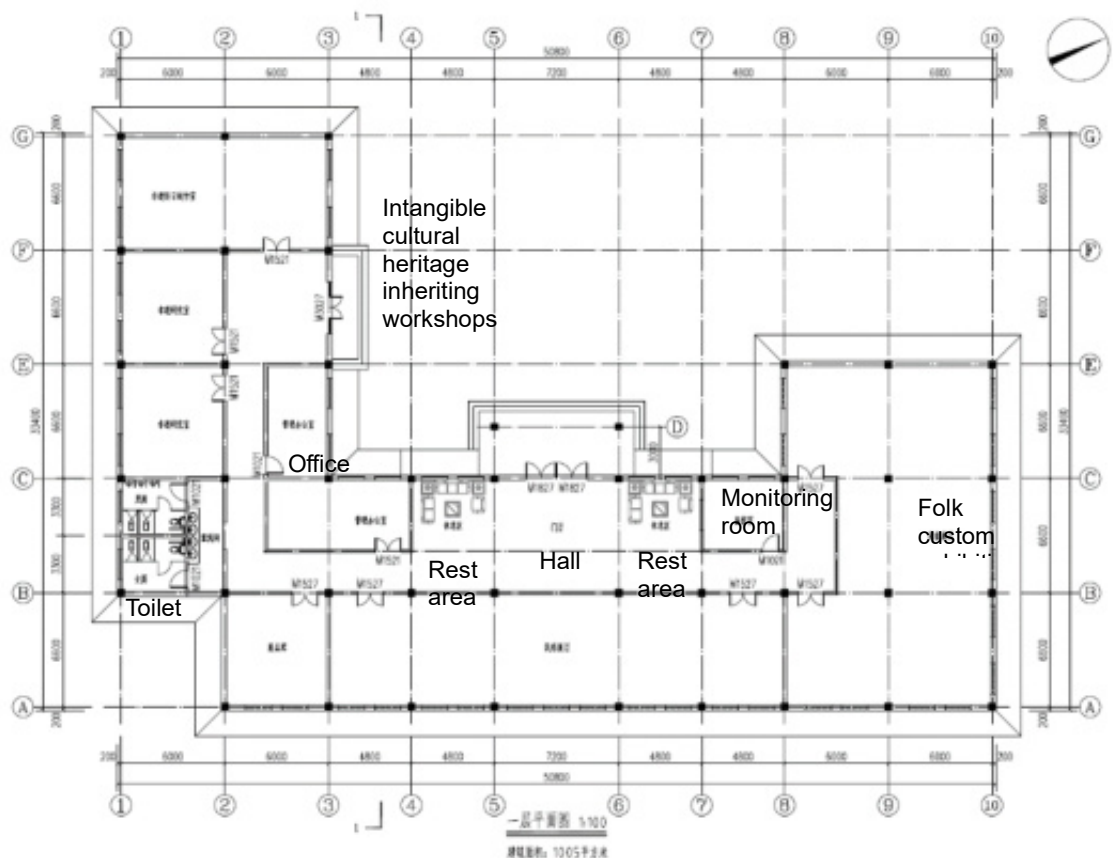
**Figure III-35:** Layout of the industry development comprehensive service center



Source: FSR, 2022.

150. The folk custom exhibition hall and intangible cultural heritage inheriting workshop will be a one-floor steel structure fabricated building with a floor area of 1,005 m<sup>2</sup> and a height of 8 m. The layout of the center is presented below.

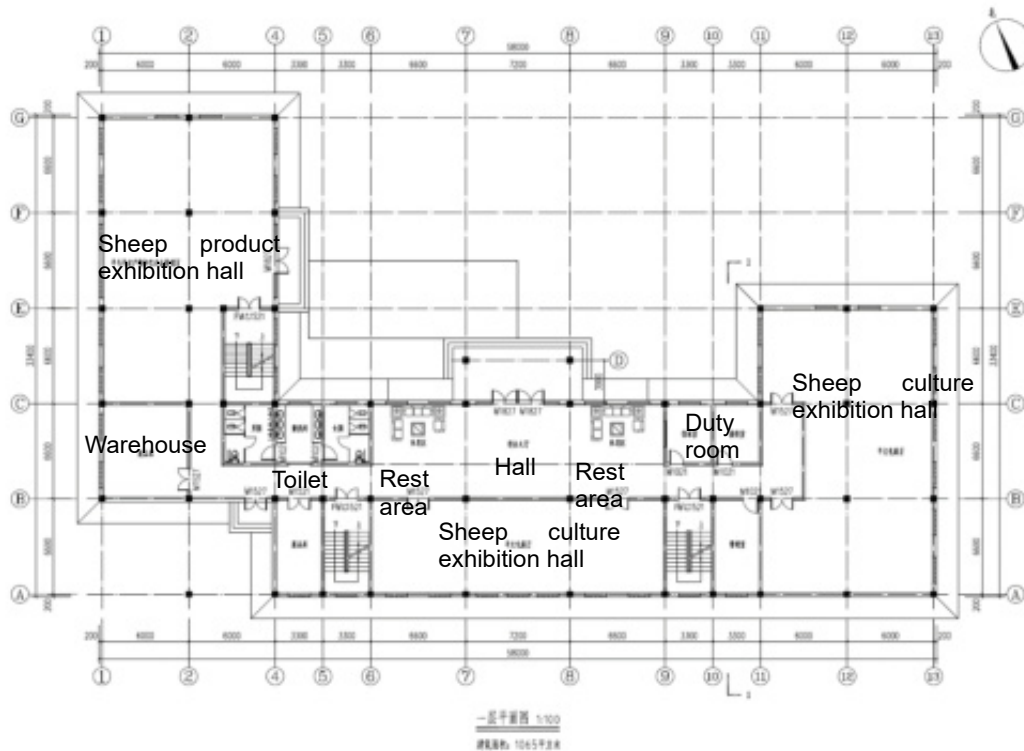
**Figure III-36:** Layout of the folk custom exhibition hall and intangible cultural heritage inheriting workshop



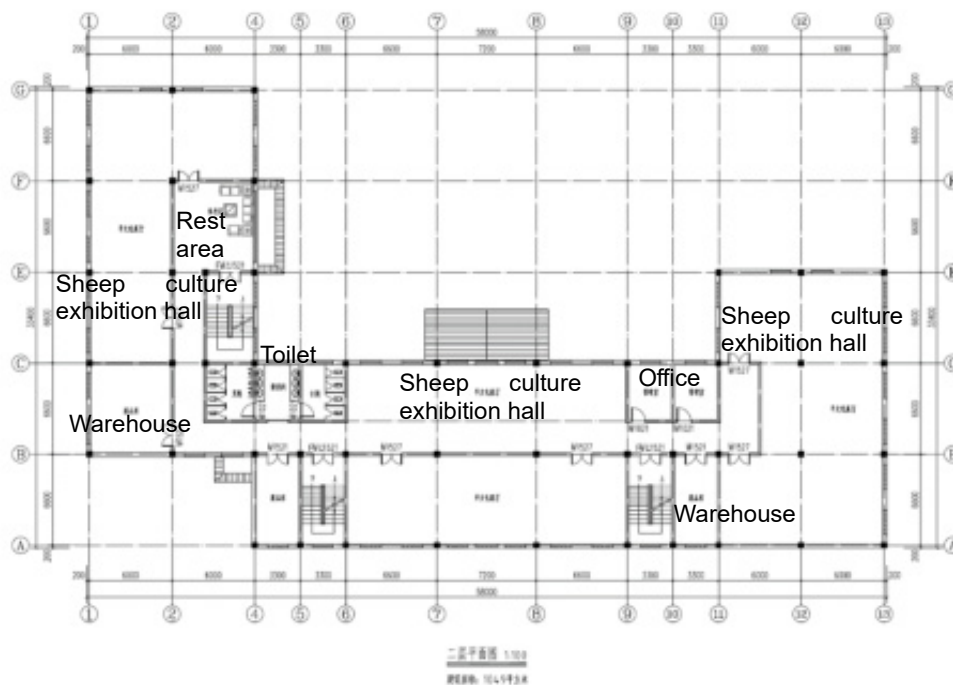
Source: FSR, 2022.

151. The sheep culture exhibition and experience center will be a three-floors steel structure fabricated building with a floor area of 2,582 m<sup>2</sup> and a height of 18.35 m. The layout of the center is presented in **Figure III-37**.

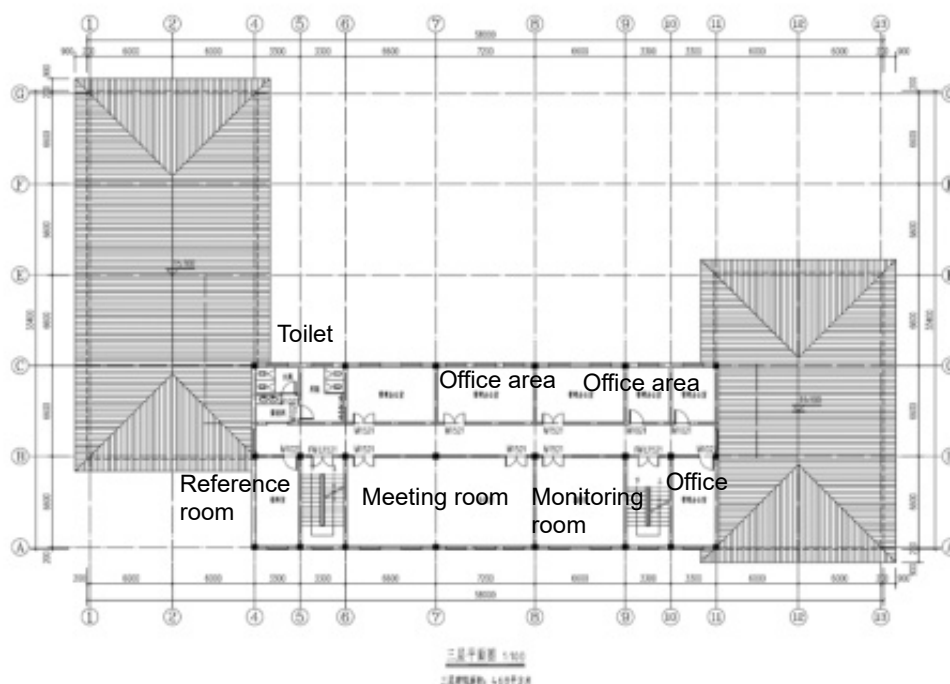
**Figure III-37:** Layout of the sheep culture exhibition and experience center



First floor



Second floor



Third floor

Source: FSR, 2022.

152. The buildings will be installed with accessible facilities such as wheelchair accessible ramp and accessible toilets. The buildings will utilize air source heat pump for heating.

153. These buildings will be constructed in accordance with the one-star standard of the national green building evaluation standard. Green building measures will include: (i) external wall will be cavity structure light steel core ribbed wall with 140 mm EPS thermal insulation board; (ii) the windows will be broken bridge aluminum alloy low radiation insulating glass energy-saving windows (thermal conductivity  $1.8 \text{ w/(m}^2\cdot\text{k)}$ ); (iii) 70 mm foam concrete will be installed at the top of concrete cushion; (iv) the roof will be 120mm thick EPS thermal insulation board (thermal conductivity  $0.04\text{w/(m}\cdot\text{k)}$ ) with solar PV system; and (v) nano negative oxygen ion coating will be used. With these measures, the energy saving effect of the buildings will be more than 72%.

154. The component will also implement green and energy saving renovation for 15 existing households. The measures will include: (i) 80mm EPS thermal insulation board (thermal conductivity is  $0.04\text{w/(m}\cdot\text{k)}$ ) will be installed at the existing brick external wall; (ii) the original flat roof will be transformed into a resin tile sloping roof. The sloping roof structure (from top to bottom) will be: synthetic resin tile (solar PV and solar water heating system will be installed on the south roof), 4mm thick SBS modified asphalt membrane waterproofing layer, 25mm thick wooden roof boarding, 120mm thick EPS thermal insulation board (thermal conductivity  $0.04\text{w/(m}\cdot\text{k)}$ ), supporting net,  $60\times 40\times 3.0$  square steel pipe purlin. After the renovation, the heat transfer coefficient of the roof will be  $0.38\text{w/(m}^2\cdot\text{k)}$ ; (iii) the existing external windows will be changed to broken bridge aluminum alloy low radiation insulating glass energy-saving windows (thermal conductivity  $1.8 \text{ w/(m}^2\cdot\text{k)}$ ); (iv) the external doors will be changed to stella insulation door (thermal conductivity  $2.0 \text{ w/(m}^2\cdot\text{k)}$ ); (v) interior walls will be painted with nano negative oxygen ion environmental protection coating; and (vi) the coal based heating will be changed to electricity heating and solar heating system will be installed.

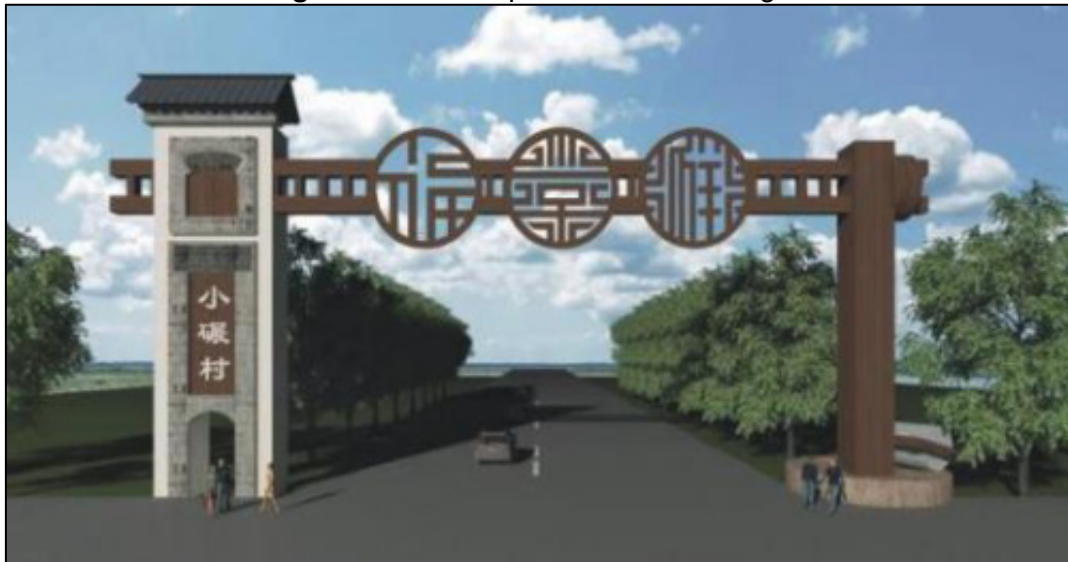
155. Besides, landscape and permeable brick will be installed around the 25 households. The households renovation quantities is presented below.

**Table III-8:** Households renovation quantities.

Item	Unit	Quantity
External wall thermal insulation board installation	m <sup>2</sup>	1,900
External window replacement	m <sup>2</sup>	250
External door replacement	m <sup>2</sup>	300
Roof	m <sup>2</sup>	300
Solar PV	m <sup>2</sup>	1500
Solar heating system at the roof	Set	25
Landscape	m <sup>2</sup>	525
Permeable brick installation	m <sup>2</sup>	460
Solar lights	na	15

Source: FSR, 2022.

156. One entrance gate will be built at the entrance of Maobula Village. The gate will consist of two columns and one beam. One column will be dry-hanging sesame white granite and cyan granite exterior wall and the top is gray tile roof, The other column will be a steel column with a coffee-colored imitation solid wood board, and the beam is a steel beam with a coffee-colored imitation solid wood board. The layout of the gate will be 10x1.2 m.

**Figure III-38:** Sample of the entrance gate

Source: FSR, 2022.

157. During operation, the main pollutants will be domestic waste and domestic wastewater. Domestic wastewater will be treated by septic tank then recycled. Domestic solid waste will be collected by local sanitary department and transported to the existing Yongchang County Municipal Landfill for treatment.

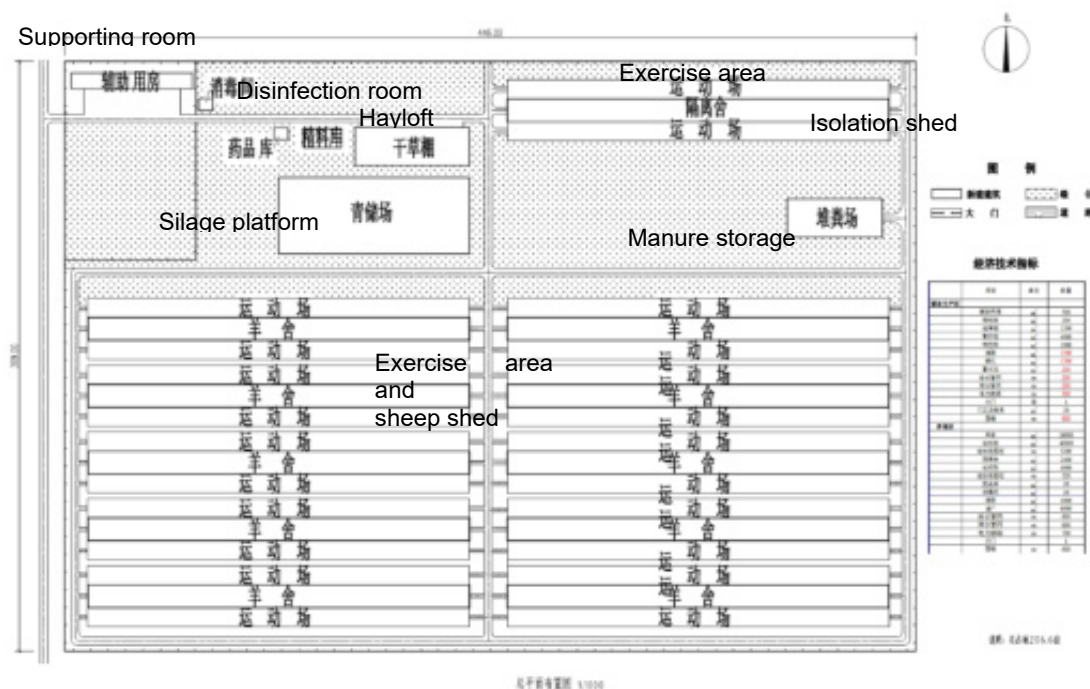
#### **h) Featured Breeding Base**

158. The component will be located at Mandula Village of Hongshanyao Town. The component will involve one meat sheep breeding farm (138,000 m<sup>2</sup>) and one sheep manure comprehensive treatment plant (10,170 m<sup>2</sup>).

159. The layout of the sheep breeding farm is presented below. The farm will involve: (i) Breeding Area, including 24,000 m<sup>2</sup> sheep shed, 40,000 m<sup>2</sup> playground, 5,200 m fences, 2,400 m<sup>2</sup> isolation shed, another 4,000 m<sup>2</sup> playground and 520 m fences, 1,000 m<sup>2</sup> manure storage workshop, 4,000 m internal roads, 6,000 m<sup>2</sup> greening/ landscaping, 600 m water supply pipeline, 600 m drainage pipeline, 700 m power supply lines; (ii) Auxiliary Production Area,

including 500 m<sup>2</sup> production rooms, 20 m<sup>2</sup> disinfection room, 100 m<sup>2</sup> fine material storage and repairing room, 1,200 m<sup>2</sup> hayloft, 4,000 m<sup>2</sup> silage platform, 1 entrance/exit gates, , 800 m outside walls, 1,500 m<sup>2</sup> greening/ landscaping 200 m water supply pipeline, 200 m drainage pipeline, 300 m power supply lines; and (iii) Equipment, including 1 weighbridge, 1 set of office equipment, 1 set of cleaning and sanitation equipment, 1 set of veterinary equipment, 1 grinder, 1 forklift, 1 TMR, 1 multifunctional grass picking cart, 1 drinking water tank, 1 manure cleaning truck, 1 set of disinfection equipment, 1 set of monitoring equipment and 1 set of digital monitoring system.

**Figure III-39: Layout of the sheep breeding farm**



Source: FSR, 2022.

160. The component is mainly for sheep breeding. The stock capacity of the component will be 7,000 sheep. The fattened sheep will be sold out nearby slaughter plants. Green building construction techniques including roof Solar PV equipment will be utilised. During operation, the farm's manure will be recycled into organic fertilizer which will be used as a replacement for existing chemical fertilizers. The organic fertilizer will be primarily used in nearby corn farmlands. The corn will then be used for fodder and silage production which will in turn be used back in the sheep farm.

161. Sick sheep will be quarantined if observed, then sheep sheds will be disinfected and the sheep in the same flock will be observed and treated to avoid infection. Medical care will be provided to the sick sheep by the veterinarians. Waste from sick sheep including manure and dead sheep will be treated by 3<sup>rd</sup> party certificated dead livestock treatment center.

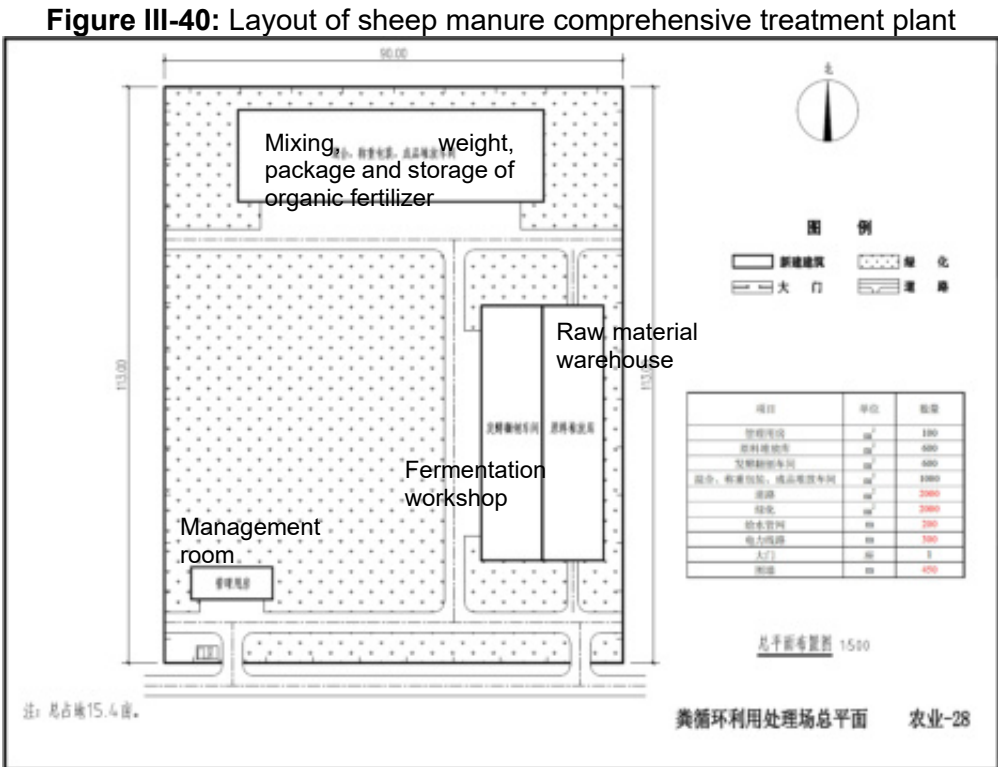
162. Manure storage area and sheep shades will be installed with ceilings, windbreaks and intercepting drains. These basins will have leakage proofing treatment and overflow prevention measures.

163. A clay layer with a thickness of 25 cm will be applied to sheep shades and sick and dead sheep waste temporary storage area at the depth of 35cm beneath the sheepfold to prevent the infiltration of urine into groundwater. The soil cover on top of the clay layer will be regularly removed and replaced. Dry feces will be regularly cleaned with the dry-cleaning method.



164. Water proof measures will be implemented on medical waste storage rooms, and temporary feces storage basins. High density polyethylene with a thickness of 2-mm will be installed on the storage basins and facility for water proofing and leakage prevention.

165. The component will build one sheep manure comprehensive treatment plant for treatment of the sheep manure in Maobula Village including the sheep breeding farm. The layout of the plant is presented in **Figure III-40**.



Source: FSR, 2022.

166. The process is described below. First, the manure is mixed with auxiliary materials, then bacteria is added. Then the mixture will be sent to mixer for mix and fermentation. The maximum fermentation temperature will be below 65°C. After continuous fermentation for a period of time, the products will be screened as organic fertilizer products, then the products will be measured, packaged and stored.

167. The component area is relatively stable with a basic seismic intensity of Grade 6, a peak ground acceleration of 0.05 g, a 10% probability of exceedance in 50 years, and a return period of 475 years. The Grade 6 seismicity intensity will be applied for the design and construction project facilities as per the requirements of the Code for Seismic Design of Buildings (GB 5011-2010).

168. During operation, the main pollutants will be domestic waste, medical wastes from veterenarian treatment, manure, waste from dead sheep and sick sheep, waste package material and domestic wastewater. Domestic wastewater will be treated by septic tank then recycled. Domestic solid waste will be collected by local sanitary department and transported to the existing Yongchang County Municipal Landfill for treatment. Waste from dead sheep and sick sheep will be temporally stored at designated area with anti-seepage measures and waterproof measures, then transported and treated by a 3<sup>rd</sup> party certified dead livestock treatment center following PRC technical specifications for harmless treatment of sick and dead animals. Medical wastes will be temporally stored at a storage facility following PRC's GB18597-2001. Medical wastes will be transported and treated by an independent company

certificated for medical waste treatment. Manure will be transported to the sheep manure comprehensive treatment plant to produce organic fertilizer.

#### i) Village Facilities

169. The component will purchase sanitation Facilities for the two towns. The facilities include 3 electricity garbage trucks and 3 sprinkling trucks, 220 waste collection bins, 15 electric sightseeing vehicles, 12 solar signs and 50 signals; 361 solar streetlights and 106 solar water heaters.

170. During operation, the main pollutants will be domestic wastewater, domestic waste, hazardous waste, and waste parts from the trucks and vehicles. Domestic wastewater will be treated by the existing WWTs. Domestic solid waste will be collected by local sanitary department and transported to the existing Yongchang County Municipal Landfill for treatment. Hazardous waste will be treated by 3<sup>rd</sup> party certificated company for medical waste treatment. Waste parts from the trucks and vehicles will be recycled by the manufactures.

#### D. Associated and Existing Facilities

171. The subproject due diligence considered two types of facilities as per ADB's SPS: (i) associated facilities – those which are not funded by the project but whose viability and existence depend exclusively on the project and whose operation and services are essential for the successful operation of the project; and (ii) existing facilities – those which are already established and will be necessary for the project operations, but whose operation does not depend on the project and therefore do not meet the SPS definition of *associated* facility. These existing facilities are not part of the project scope and will not be subject to any ADB-funded construction, operation, upgrade, rehabilitation, or other activities. Nonetheless, due diligence must be conducted for both associated and existing facilities.

172. The subproject involves two existing facilities, the Yongchang County Municipal Landfill (which will receive the domestic waste from the subproject during construction and operation) and Yongchang County WWTS (which will receive the domestic wastewater during operation).

173. **Yongchang County Municipal Landfill.** It has a total area of 7.67 ha, a landfill capacity of 0.5 million tons, a design daily capacity of 125 ton/d, and a projected service life of 20 years. The landfill has high-density polyethylene (HDPE) lining to prevent leachate and a network of drainage channels and collection pipes from capturing the leachate. Leachate is treated in an on-site plant to standard of GB 16889-2008. The treated leachate is used for the greening of the land within the landfill property. There is no discharge of leachate to soil outside the landfill property or to any waterways.

174. **Carcass Disposal.** Carcasses from the sheep farm will be collected, transported and treated by 3<sup>rd</sup> party certified dead livestock treatment center following PRC technical specifications for harmless treatment of sick and dead animals. This facility has not yet been selected.

175. **Yongchang County WWTS.** The DEIA was prepared for the WWTS and approved by local EEB in 2010. Operational capacity and current operation of the Yongchang County WWTS is presented in **Table III-9**, which has sufficient capacity to receive the incoming wastewater from the subproject. No due diligence issues were documented.

**Table III-9:** Information of the WWTS.

Name	Treatment process	Effluent standard	Design capacity(m <sup>3</sup> /d)	Actual operational capacity (m <sup>3</sup> /d)	Wastewater volume from subproject (m <sup>3</sup> /d)	Status	EIA approval date	Service scope
Yongchang County WWTS	CASS	Class I-A	12,000	8,700	21.2	Operational from 2012	November 2010	Urban area

CASS= cyclic activated sludge technology; WWTS = wastewater treatment station.

Source: FSR.

176. **Water supply.** The subproject will source domestic water and production water from municipal water supply system and the irrigation water from the existing irrigation water system. The municipal water and irrigation water of the two towns are mainly from Jinchuanxia Reservoir and Hongshanyao Reservoir. Available water resources in Jinchang are 0.77 billion m<sup>3</sup>. In recent years, Jinchang City has developed high-efficiency water-saving modern agriculture and the total water consumption of Jinchang City was reduced to 0.66 billion m<sup>3</sup> in 2021 from 0.76 billion m<sup>3</sup> in 2017. Besides, the subproject will result in water savings, thus water supply of the subproject can be guaranteed.

### E. Implementation Arrangements

177. The project will be implemented over a 6-year period from 2023 to 2028. The Gansu Provincial Government will be the executing agency (EA) for the project and has established a provincial project management office (PPMO) under Gansu Culture Tourism Industry Co. Ltd. (GCT) to manage project preparation and implementation. The implementing agency (IA) of Yongchang County subproject will be Yongchang County Government and the IAs for other subprojects will be Ganzhou District Government for project components in Ganzhou District, Pingchuan District Government for project components in Pingchuan District, Lintao County Government for project components in Lintao County, and Tianshui City Economic Development Investment and Financing (Group) Co., Ltd. for project components in Qinzhou District. A Project Steering Committee (PSC) was established to provide high level guidance, supervision and coordination for the project. The PSC is led by the EA.

178. The PPMO will be suitably staffed, including a qualified Environment, Health and Safety Officer (PPMO EHSO), who will take overall responsibility for supervising the implementation of environment mitigation measures, coordinating the project level GRM and preparing monitoring reports for submission by the PPMO to ADB.

179. Each IA will establish a Sub-PMO to manage implementation of the relevant subprojects. The Sub-PMOs will designate staff to its Sub-PMO to ensure appropriate and efficient project implementation. The IAs will establish environmental management units (EMUs) within each Sub-PMO which will take overall responsibility for supervising the implementation of the EMP, including mitigation measures, coordinating the project level GRM, and preparing monitoring reports for submission by the PPMO to the ADB. The EMUs will consist of one qualified environment officer and an appropriate number of designated environmental staff from the components (one staff for one component).

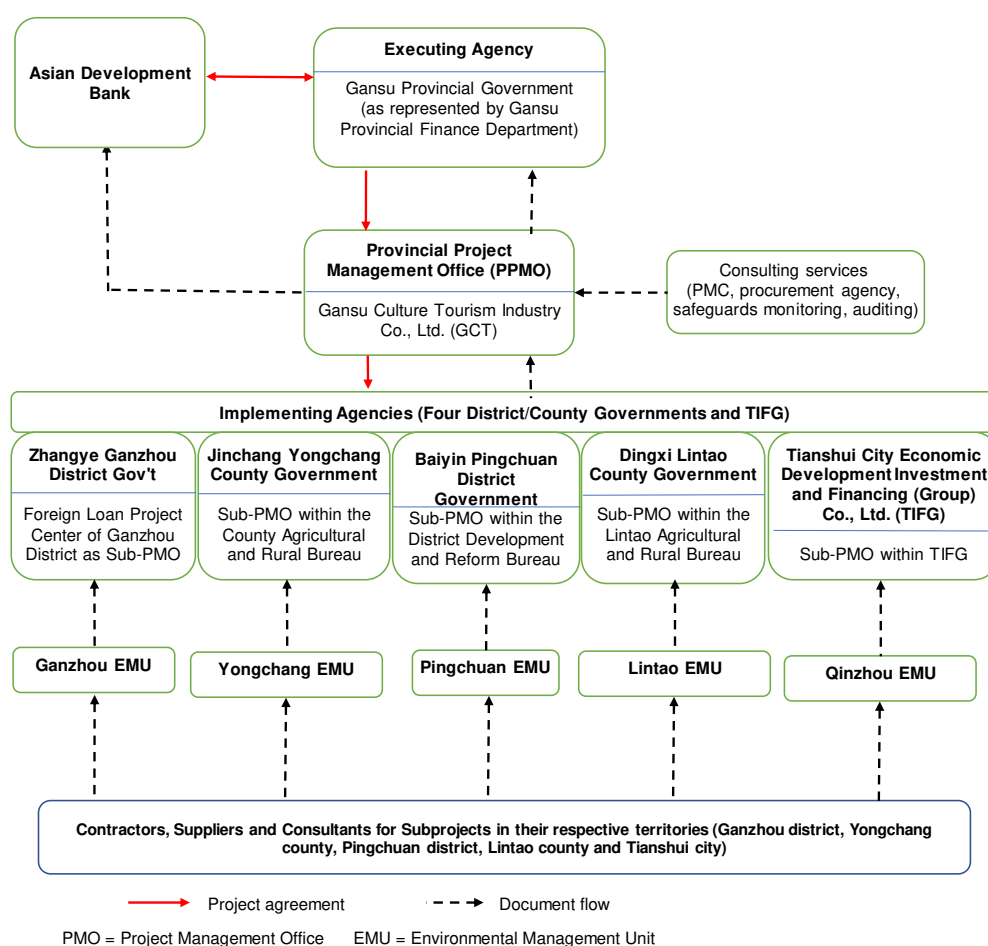
180. The PPMO will recruit a Project Management and Capacity Development Consultants (PMC) to assist with project management, technical support, safeguards monitoring and implementation of the social development action plan, and the communication strategy. The PMC will also cater to the reporting needs of ADB. The PPMO will engage (i) a loan implementation start-up consultant (environment) on a short-term basis, to assist the PPMO with early establishment of the EMP immediately after project effectiveness, and (ii) a loan implementation environment consultant (LIEC) prior to the engagement of construction contractors, who will support the PPMO and Sub-PMO in mitigation implementation,



environmental monitoring, reporting, and addressing any environment-related issues that arise including grievances. The LIEC will also support contractors in developing CEMP prior to construction and operation.

181. The PPMO will recruit a Project Management and Capacity Development Consultants (PMC) to assist with project management, technical support, safeguards monitoring and implementation of the social development action plan, and the communication strategy. The PMC will also cater to the reporting needs of ADB. The PPMO will engage (i) a loan implementation start-up consultant (environment) on a short-term basis, to assist the PPMO with early establishment of the EMP immediately after project effectiveness, and (ii) a loan implementation environment consultant (LIEC) prior to the engagement of construction contractors, who will support the PPMO and Sub-PMO in mitigation implementation, environmental monitoring, reporting, and addressing any environment-related issues that arise including grievances. The LIEC will also support contractors in developing CEMP prior to construction and operation.

**Figure III-41: Project organization chart.**



Source: TrTA consultant

182. The EMUs will implement project components, administer and monitor contractors and suppliers, and be responsible for construction supervision and quality control. The EMUs will ensure that the EMP is implemented proactively and responds to any adverse impact beyond those foreseen in the domestic EIA and this IEE. The EMUs will also attend to requests from relevant agencies and ADB regarding the mitigation measures and monitoring program. Each

EMU will include one qualified environment officer to (i) supervise contractors and ensure compliance with the EMP; (ii) conduct regular site inspections; (iii) coordinate periodic environmental quality monitoring in compliance with the approved monitoring plan; (iv) act as local entry point for the project GRM; and (v) submit annual monitoring results to the PPMO, and further to ADB by PPMO. The EMUs will also engage an environmental monitoring agency (EMA) to undertake construction and operation phase ambient environmental monitoring, as per the requirements of the environmental monitoring plan presented in this EMP.

183. The Sub-PMO and EMU environment officers with support of the LIEC will (i) provide overall coordination and support on environmental aspects; (ii) supervise contractors and construction supervision companies (CSC) and their compliance with the EMP; (iii) conduct regular site compliance inspections; (iv) act as PPMO entry point for the project GRM; (v) collect and submit environmental monitoring data provided by (a) contractors and/or CSCs to the PPMO, and (b) the EMA to the PPMO; and (vi) support PPMO with preparation of EMP progress section as a part of semiannual project progress reports and annual environmental monitoring reports (EMR). The EMUs will be responsible for EMP implementation during operation.

184. Construction contractors will be responsible for implementing the mitigation measures during construction under the supervision of the EMUs, Sub-PMO and PPMO. In their bids, the contractors will prepare CEMPs which detail how the contractors will comply with the EMP. Each contractor will engage Environment, Health and Safety Officer, who will oversee CEMP implementation, take all reasonable measures to minimize the impact of construction activities on the environment, develop and prepare monthly reports for submission to the IA. Contractors are also required to report any spills, accidents, and grievances received, and take appropriate action. The Environment, Health and Safety Officer will also be responsible for developing CEMPs and an Occupational Health and Safety Plan.

185. CSCs will be responsible for supervising and guiding construction contractors during the project construction phase. CSCs will have a qualified Environment, Health and Safety Officer who will be responsible for supervising construction contractors to ensure proper the implementation of EMP and CEMPs; and preparing and submitting consolidated quarterly EMRs to Sub-PMO based on the CEMPs implementation.

186. Environment related implementation arrangements are discussed in more detail in the EMP (**Appendix I**).

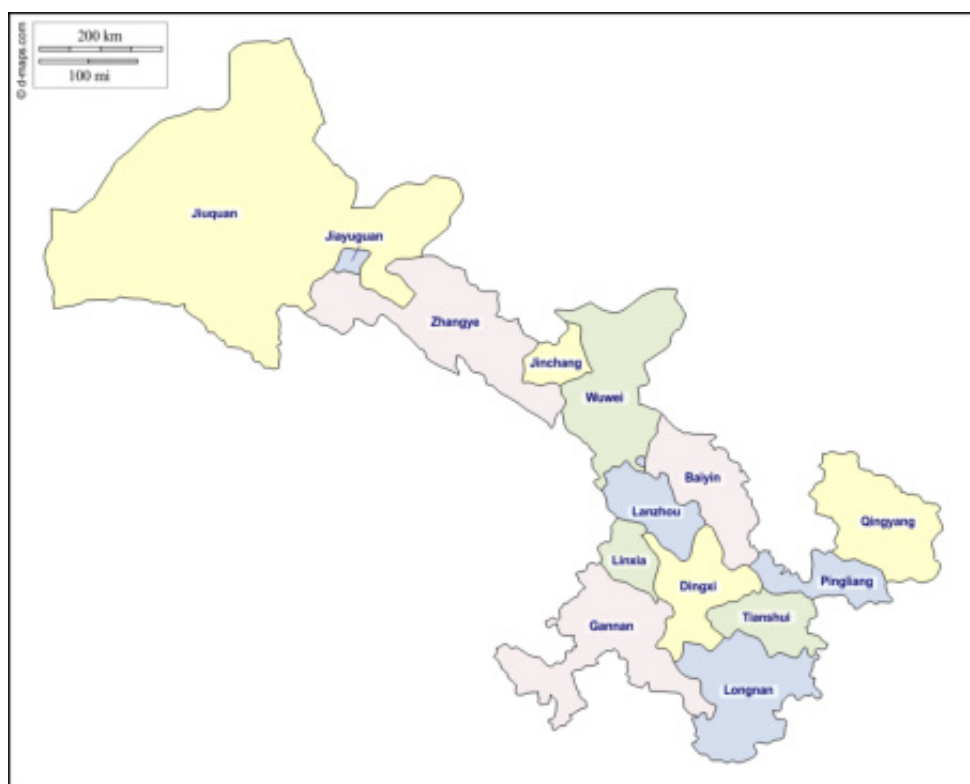
## IV. DESCRIPTION OF THE ENVIRONMENT

### A. Location and Setting

187. The subproject will be implemented in Chengguan Town and Hongshanyao Town, Yongchang County, Jinchang City in Gansu Province the People's Republic of China (PRC).

188. Overview. Gansu Province is located in the northwest of the PRC, between the Tibetan and Loess plateaus. It has an area of 454,000 square km and borders the provinces of Inner Mongolia, Ningxia, Xinjiang, and Qinghai, as well Mongolia. Most of its land is more than 1,000 m above sea level (asl). The Yellow River passes through the southern part of the province. Gansu is divided into 14 prefecture-level divisions: 12 prefecture-level cities and two autonomous prefectures. The 14 prefecture-level divisions of Gansu are subdivided into 82 county-level divisions (17 districts, 4 county-level cities, 58 counties, and 3 autonomous counties) (**Figure IV-1**). The province contains the geographical center of the PRC, marked by the Center of the Country Monument at 35°50'40.9"N 103°27'7.5"E.

**Figure IV-1:** Map of Gansu Province administrative divisions



Source: <http://d-maps.com>

189. **Topography.** Topography and soils are variable in the province, with varied landforms including medium to high-mountains, hills, plateau, river valleys, and deserts. The landscape in Gansu is mountainous in the south and flat in the north. The mountains in the south are part of the Qilian Mountains, while the far western Altyn-Tagh contains the province's highest point, at 5,830 masl. A natural land passage known as Hexi Corridor, stretching some 1,000 km from Lanzhou to the Jade Gate, is situated within the province. It is bound from the north by the Gobi Desert and Qilian Mountains from the south. Within the subproject areas the landforms can be categorized mainly into two types: the loess plateau with a few outstanding rocky peaks amongst deep loess sediments in the middle to northeast, and with an average elevation of 1200–1800 m above asl; and mountains with alternating steep slopes and deep gullies, from about 1000 m asl up to more than 4000 m asl in the highest peak.

190. **Soils.** The soil types in the project areas include cultivated loessal soils and sierozem both developed on top of the parental loess deposits in the loess plateau, and light to dark brown soils distributed mainly at the southeast mountainous areas. Part of the Gobi Desert is located in Gansu, as well as small parts of the Badain Jaran Desert and the Tengger Desert.

191. **Climate.** The climate in the province is mainly continental, covering sub-humid to sub-arid temperate zones, and varying from warm and humid in the southeast to cold and dry in the northwest. In the subproject areas the annual mean temperature ranges from 14 °C in the southeast down to 6 °C in the north, and the frost-free period of the year lasts between 220 days in the southeast and 160 days in the north. Annual mean precipitation varies between 700 mm in the southeast and 400 mm in the north, concentrating more than half of the annual rainfall in the mid-summer season from June through early September. Strong or gentle winds blow from the west or northwest, occasionally in springtime with clouds of dust over the sky.

192. **Water resources.** The main river basins in the province include the Yellow River basin, the Yangtze (Changjiang) River basin, and some subsidiary inland river basins. Most of the flow of the Yellow River passes through Gansu. Water resources in Gansu are not abundant, with the surface water at a level of 28.214 billion m<sup>3</sup> and the groundwater at a level of 0.730 billion m<sup>3</sup> in 2014, reaching a total amount of 28.944 billion m<sup>3</sup> in the province (**Table IV-1**). However, the spatial distribution of the water resources in the province is not even, featuring abundance in the southeast and scarcity in the north to the northwest.

**Table IV-1: Water Resources of Gansu Province**

River Basin	Surface Water (million m <sup>3</sup> )			Groundwater (million m <sup>3</sup> )	Total Water Resources (MCM)	Percentage of Total	Water Yield Coefficient (10,000 m <sup>3</sup> /km <sup>2</sup> )
	Local	Inflow	Outflow				
Yellow River	12,516	23,964	34,108	263	12,779	44.1	87.6
Yangtze River	10,037	3,359	13,127	0	10,037	34.7	260.8
Other inland rivers	5.662	1,410	999	468	6,129	21.2	22.7
Province Totals	28,214	28,733	48,235	730	23,944	100	63.7

Source: TrTA Consultant.

193. **Ecological resources and land management.** Gansu Province has approximately 822 vertebrate fauna species, of which 105 are classified as rare or threatened vertebrate fauna (of which 54 are nationally listed as rare, threatened and/or protected); 59 protected areas (including 13 national-level and 40 provincial-level), which encompass about 9,952,500 ha (amounting to 22.1% of the total provincial territory); and, 39.65 million ha of forest cover (amounting to 9.4% of the total provincial territory).<sup>20</sup>

194. The loess soils of eastern Gansu are deeply eroded with steep hillsides and gullies, from which soil is lost during rainstorms, increasing siltation of dams and reservoirs, and increasing maintenance costs of drainage and rural roads. Reforestation efforts have been ongoing in Gansu – especially in the southern parts of the province, where five subprojects are located. Planting of native and agro-forestry species of trees and shrubs to reduce erosion on degraded hillsides has been well researched and National standards have been promulgated for this activity. The species usually planted, depending on altitude and climatic harshness are (i) *Pinus tabulaeformis* (Chinese Pine) and *Robinia pseudoacacia* (Black Locust) on sites lower than 1800m asl.; (ii) *Betula* spp. (Birch), *Pinus armandii* (Ba Shan Pine), *Larix chinensis* (Chinese Larch) and *Larix kaempferi* (Japanese Larch) on sites higher than 1800m asl.; and (iii) *Xanthoceras sorbifolia* (Shiny Yellow Horn) in the arid, cold, high elevation, and poor soil

20 Data sources: [http://www.gsep.gansu.gov.cn/showpage/news\\_detail.aspx?arc\\_id=2227](http://www.gsep.gansu.gov.cn/showpage/news_detail.aspx?arc_id=2227);  
<http://www.cnwildlife.com/Article/Class1/Class2/200603/20060328091432.html>  
<http://www.wildlife.gov.cn/index.php>; <http://www.cnki.com.cn/Article/CJFDTOTAL-GHDL200101007.htm>;  
<http://www.xjtour.net/filebase/xjgl/2008411123549.htm>

sites in Dingxi county. Sea-buckthorn is added to the mix where grazing pressure is high.

195. Gansu's population is 92% Han and also has Hui, Tibetan, Dongxiang, Tu, Yugur, Bonan, Mongolian, Salar, and Kazakh minorities.

196. Jinchang City is located in central Gansu province, west of the Yellow River, north of the Qilian Mountains, and south of the Alashan Plateau. The southwest of the city borders Qinghai Province and the northwest borders Inner Mongolia. The area is 8,896 km<sup>2</sup>. Jinchang has 1 district and 1 county. It neighbors Wuwei on the southeast within the province and shares boundaries with Qinghai Province to the southwest and Inner Mongolia to the northwest. Jinchang is an important node city of the ancient Silk Road and one of the major cities of Hexi Corridor. It is famous as the nickel capital of China for its rich nickel reserve.

197. Yongchang County is a county located in the southern half of the prefecture-level city of Jinchang, bordering Qinghai to the south.

**Figure IV-2: Administrative divisions of Jinchang City**



Source: Wikipedia, 2022

## **B. Physical Resources**

198. **Topography.** The longest distance from east to west in Yongchang County is 144.8 km, the widest distance from north to south is 144.55 km, and the total area is 7439.27 km<sup>2</sup>. The terrain in Yongchang County is mainly mountainous and plateau, which is the main grain-producing area of the Hexi Corridor. The maximum elevation in Yongchang County is 4,442 m while the minimum is 1,327m.



**Figure IV-3:** Topography in Yongchang County, Jinchang City.



Source: Google Maps, 2022.

199. **Soils.** The soil types in Yongchang are roughly alpine cold desert soil → alpine meadow soil → sub-Alpine meadow soil → gray cinnamon soil → chestnut calcium soil → gray calcium soil → irrigated desert soil → gray brown desert soil → aeolian sand soil → saline soil.

200. The forest-pastoral area of the southern Qilian Mountains includes the western grassland, the southern grassland and the grazing land along the Qilian Mountains in 6 townships and towns of Hongshanyao, Xinchengzi, Jiaozhuang, Chengguan, Dongzhai and Nanba, accounting for 27.06% of the county's land area. The soil types are alpine cold desert soil, alpine meadow soil, subalpine shrub meadow soil, chernozem soil and chestnut soil.

201. The central low-mountain and remnant hills pastoral area includes grazing land in Hongshanyao, Jiaojiazhuang, Chengguan, Hexibao, Shuiyuan, Zhuwangbao and other townships, and the land area accounts for 28% of the county's land area. The soil is dominated by gray-brown desert soil, followed by lime-zinc soil and chestnut soil.

202. The land area of the northern desert Gobi difficult-to-use area accounts for 17.05% of the county's land area. The soil is mainly gray-brown desert soil, aeolian sandy soil and saline soil, which is a soil type area that is difficult to develop and utilize.

203. The oasis agricultural area of the corridor plain includes part of the reclaimable wasteland between the agricultural areas of each township and the oasis, and the land area accounts for 27.89% of the county's land area.

204. The common soil types at the subproject area are alpine cold desert soil, alpine meadow soil, subalpine shrub meadow soil.

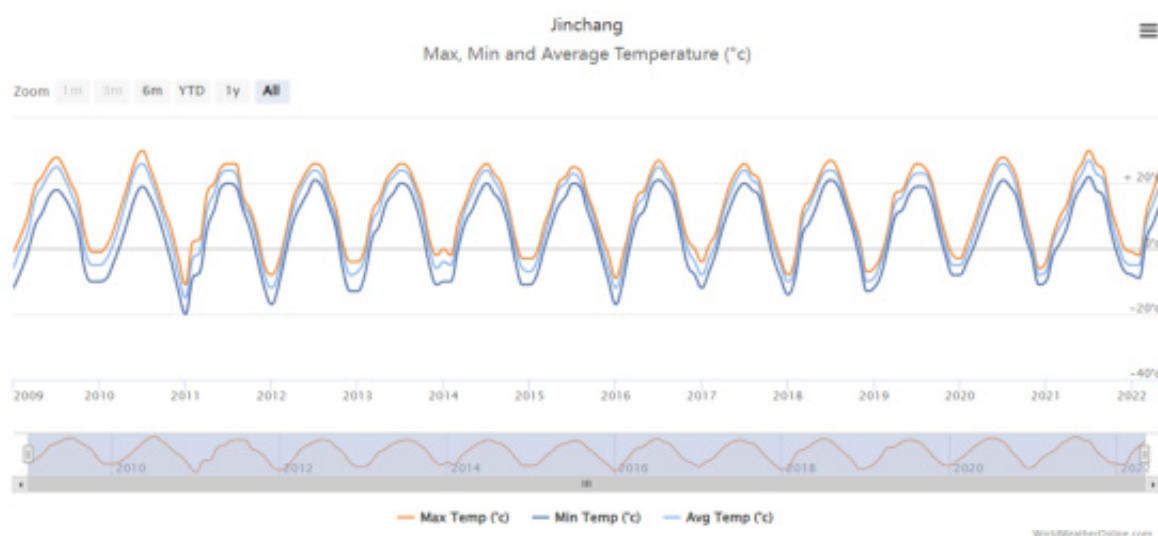
205. **Seismicity.** The PRC classifies seismic intensity into 12 grades under the China Seismic Intensity Table (GB/T 17742-2008) based on the severity of "shaking" of the earth's surface and the extent of potential impacts. According to the China Seismic Ground Motion Parameters Zoning Map (GB18306-2015), the subproject area is relatively stable with a basic seismic intensity of Grade 6, a peak ground acceleration of 0.05 g, a 10% probability of exceedance in 50 years, and a return period of 475 years. The Grade 6 seismicity intensity

will be applied for the design and construction project facilities as per the requirements of the Code for Seismic Design of Buildings (GB 5011-2010).

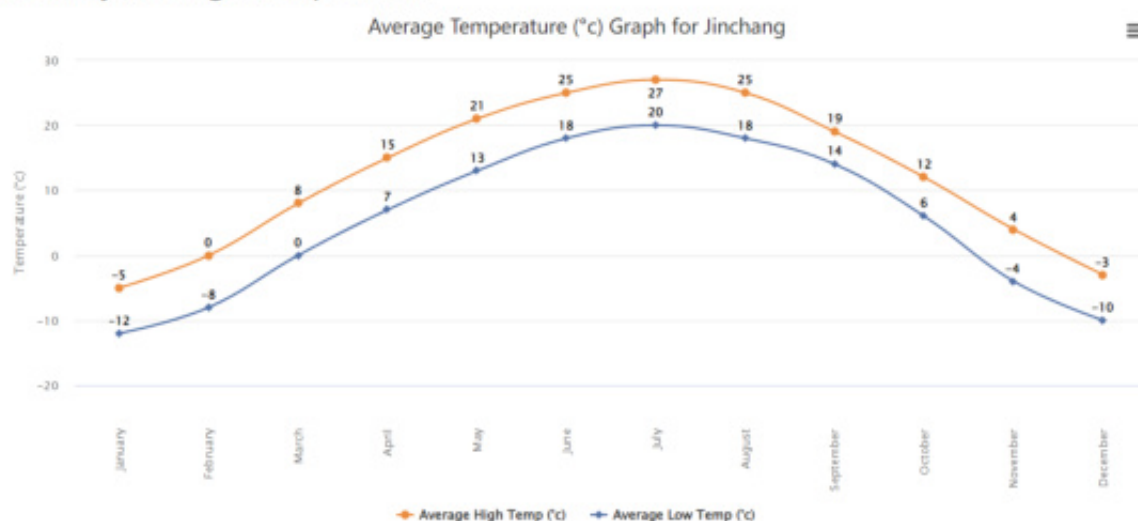
206. **Climate.** Yongchang County has a cold-arid climate zone, with very warm summers and cold and very dry winters. The monthly 24-hour average temperature ranges from  $-26.7^{\circ}\text{C}$  in January to  $32.4^{\circ}\text{C}$  in July. The mean annual temperature is  $4.8^{\circ}\text{C}$ , while annual rainfall is 188 mm almost all of which falls from May to September. The winters are so dry that snow is extremely rare. The annual frost-free period is 130-140 days. The annually sunshine hours are 2,884 hours.

**Figure IV-4:** Temperature and rainfall data for Jinchang City, 2009 to 2022

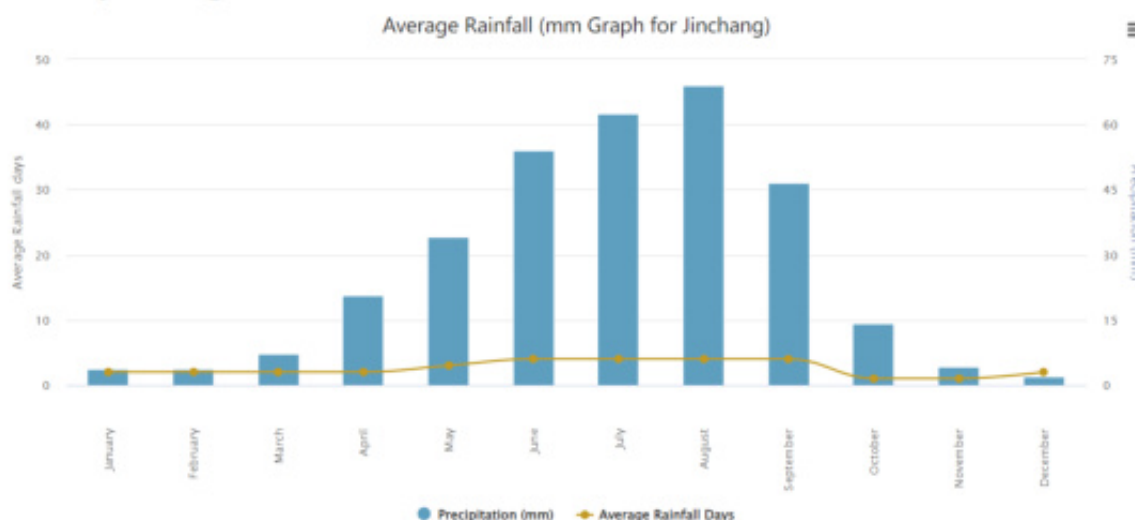
### Max, Min and Average Temperature



### Monthly Average Temperature

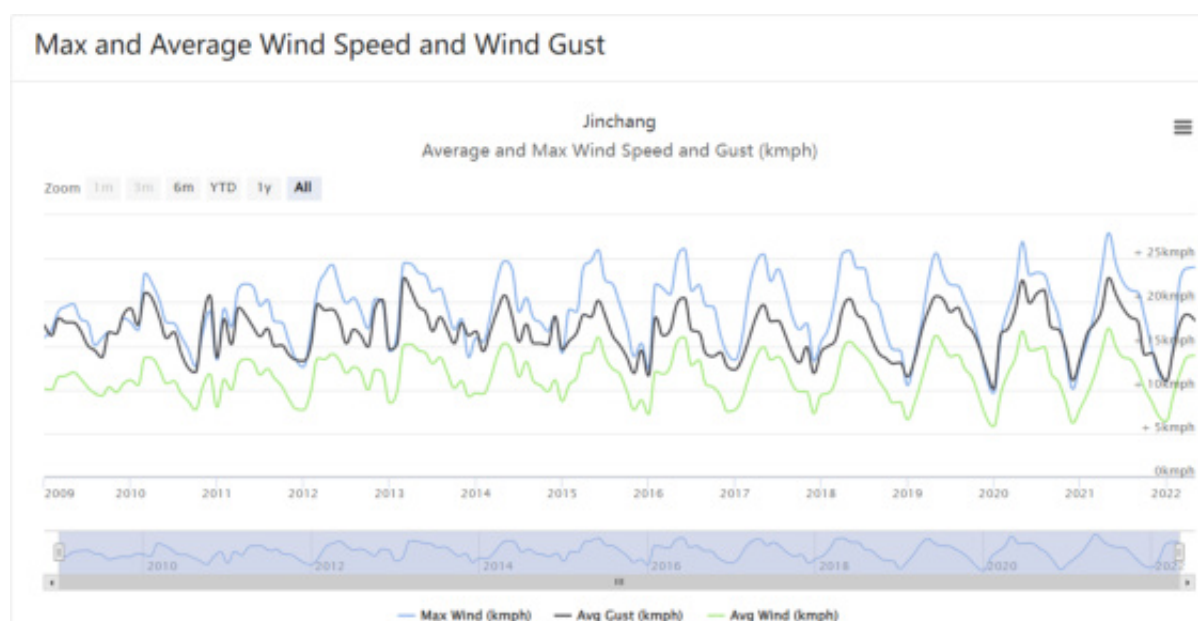


## Monthly Average Rainfall



Source: <https://www.worldweatheronline.com/Jinchang-weather-averages/gansu/cn.aspx>

**Figure IV-5:** Monthly average windspeed data for Jinchang City, 2009 to 2022



Source: <https://www.worldweatheronline.com/Jinchang-weather-averages/gansu/cn.aspx>

207. **Hydrology.** Yongchang County belongs to the inland river Shiyang River system. The surface water is composed of atmospheric precipitation and ice and snow melt water in the Qilian Mountains, forming Dongdahe, Xidahe and 18 Xiaogou rivers, which run through the county from north to south. The annual average total resource of surface water is 500 million m<sup>3</sup>.

208. The Dongda River originates from the northern foot of Lenglongling in the Qilian Mountains and enters from the south of the county seat. It has a total length of 67 kilometers and an annual average runoff of 320 million m<sup>3</sup>. The maximum wet year is 498 million m<sup>3</sup> and the dry year is 235 million m<sup>3</sup>.

209. The Xida River originates from the north slope of Lenglongling Mountain in Qilian Mountains and enters from the southwest of the county. It has a total length of 61 kilometers



and an average annual runoff of 154 million m<sup>3</sup>. The total area of Xiaogou Xiaohe is 127 square kilometers, the average annual flow is 0.81m<sup>3</sup>/s, and the annual runoff is 26 million m<sup>3</sup>.

210. The groundwater in Yongchang County is mostly transformed from surface water. According to the water resources survey, the total amount is 277 million m<sup>3</sup>. The groundwater runoff recharge is dominated by the infiltration of water from the Xida River and Dongda River, accounting for more than 70% of the total groundwater recharge.

### C. Ecological Values

211. **Flora and Fauna.** The natural vegetation of Yongchang County includes alpine meadows and forests in the south to semi-desert and desert grasslands in the north, and can be roughly divided into five categories: natural forests, halophyte and desert landscapes. There are 24 families and 45 genera, and more than 70 species of natural growth and artificial cultivation. There are natural forests in the southern Qilian Mountains, and the main tree species are spruce and cypress. The shrubs in the area are widely distributed, mainly in the Yongchang Beishan and other areas, mainly in the willow family. Grasses are sparsely distributed, dominated by grasses of the family Poaceae. Maying Beach at the northern foot of Qilian Mountains in the west is an excellent natural pasture with large grassland area and high quality pasture. Wild plants are mainly oat grass, mugwort, Jijie grass, etc. In desert areas, there are sand plants Haloxylon, camel thorn, white thorn, etc.

212. The main tree species in Yongchang County are poplar, tamarisk, white thorn, sand jujube, red willow and so on. The drought-resistant and alkali-resistant plant communities include reed, Shaguai jujube, green thorn, and ice grass, and artificially introduced tree species include tabulaeformis, Xinjiang poplar, silver white poplar, oriental orientalis, Chinese locust, and white elm.

213. Wild animals mainly include wild camels, wild asses, green sheep, deer, deer, marmots, yellow sheep, pheasants, rabbits, hedgehogs, magpies, gray cranes, rhododendrons, swallows, etc.

214. Based on site visits, all subproject components are located in existing villages, residential area, waste land and abandoned farmland which are highly developed and modified with little or no vegetation cover. Original vegetation cover has been previously removed, and existing site vegetation is typically completely absent as they are developed industrial and urban sites, or disturbed dirt with little or no vegetation cover. There are no known ecological and/or sensitive resources in or near the component sites based on site visits and domestic EIAs.

215. **Land Use.** Land use in the subproject sites is presented below.

**Table IV-2: Land use conditions**

Component No.	Land use
1	Farm land, unused collective land and road
2	Farm land, unused collective land and collective land
3	Farm land, unused collective land and forest land
4	State owned land and grass land
5	Farm land, grass land and unused collective land
6	Road and collective land
7	Farm land, grass land and collective land
8	Collective land
9	Collective land

Source: Consultants

216. Based on the locations of the subproject and site visit, all the component are not located within any existing protected areas except component 4.

217. The component 4 are located within the class II protection zone of Jinchuanxia Reservoir. Based on Provisions on the Management of Pollution Prevention and Control in Drinking Water Source Protection Areas, the general requirements of drinking water protection zone are described below: (i) activities which will damage water environment ecological balance and water resource protection vegetation are prohibited; (ii) dumping of industrial waste, manure and domestic waste are prohibited; (iii) consumption of highly toxic and highly residual pesticides within the zones are prohibited; and (iv) transportation of hazardous and noxious substances, oils, manure without a permit are prohibited. The requirements of class II drinking water protection zone are: (i) activities with pollutant emission are prohibited; (ii) construction of piers for loading and unloading waste, manure, oil and toxic substances are prohibited.

218. The component activities are compliance with the requirements. During the domestic EIA preparation process, the domestic EIA institute has communicated with the local EEB on the activities and obtained confirmation letter from the local EEB.

#### D. Social and Economic Conditions

219. **Area and Population.** Gansu has an area of 453,700 km<sup>2</sup> and a population of 25,019,831 (2020). Jinchang City has an area of 8,896 km<sup>2</sup> and a population of 435,300 (2020), of which approximately 341,400 live in urban areas giving an urbanization rate of 78.43%; of which 51.51% are male and 48.49% are female.

**Table IV-3: Population, Area and Density by District of Jinchang.**

Name	Population (2020)	Area (km <sup>2</sup> )	Density (p/km <sup>2</sup> )
Jinchuan District	261,000	3,017	86.5
Yongchang County	174,300	5,879	29.6
Total	435,300	8,896	48.9

Source: Consultants

220. **Economy.** According to China's National Bureau of Statistics, in 2021 Gansu's GDP was CNY 1,024.33 billion, and its per capita GDP was CNY 41,046. Its GDP is ranked 27 out of China's 31 provinces, municipalities, and autonomous regions. Gansu's primary industries accounted for approximately 13.3% of GDP, secondary industries was 33.8% of GDP and tertiary industries was 52.8 % of GDP.

221. Jinchang's GDP was CNY 42.861 billion in 2021, a year-on-year increase of 8.0%. Of this, the output value ratio of primary, secondary, tertiary industries was 7.7/66.6/25.7. Jinchang's per capita GDP was CNY 98,205 in 2021, higher than the provincial average and national average (**Table IV-4**).

**Table IV-4: Summary of GDP and income in 2021.**

Administrative Region	GDP (billion CNY)	GDP per Capita (CNY)
PRC	1,133,518	80,976
Gansu	1,024.33	41,046
Jinchang	42.861	98,205

Source: China's National Bureau of Statistics, 2021.

222. Per capita disposable income of Jinchang urban persons in 2021 was lower than the national average and lower than national average, while per capita disposable income of Jinchang rural persons was higher than the provincial average but lower than national average.

As with the rest of China urban incomes were considerably higher than rural ones (**Table IV-5**).

**Table IV-5:** Comparison of per capita disposable income in 2021.

Administrative Region	Per Capita Disposable Income (CNY)	
	Urban	Rural
PRC	47,412	18,931
Gansu	36,187	11,433
Jinchang	45,649	18,500

Source: China's National Bureau of Statistics, 2020.

## E. Environmental Baseline Quality

223. Environmental baseline monitoring undertaken during the preparation of the domestic EIA (DEIA) included: (i) surface water quality of the rivers near the site; (ii) ambient air quality at the site; (iii) groundwater quality at the site; and (iv) noise levels at the site.

### a) Surface Water Quality

224. The nearest surface water body near the subproject is Jinchuanxia Reservoir. Monthly surface water sampling of Jinchuanxia Reservoir was conducted by the Jinchang City EEB. Based on Monthly monitoring reports of Surface Water Quality in Jinchang City in 2021, the water quality of the Jinchuanxia Reservoir met the Class III standard of the PRC's Surface Water Ambient Quality Standards (GB3838-2002, there are no World Bank EHS guidelines)<sup>21</sup>. Overall, the surface water quality near the subproject is good.

### b) Groundwater Quality

225. Groundwater sampling and analysis was carried out by the DEIA Institute in March 2022. The results are presented below. The quality of the groundwater complies with the Grade III of the PRC Groundwater Quality Standard GB/T14848-2017 (there are no World Bank EHS guidelines).

**Table IV-6:** Groundwater quality of Beihaizi Village unit: mg/L, except pH

Item	Concentration range	Limit	Standard compliance
pH	7.32-7.51	6.5-8.5	Yes
Ammonia nitrogen	0.11-0.18	≤0.5	Yes
DO	4.32-4.90	≥3.0	Yes
Sulfate	35.1-63.2	≤250	Yes
Chloride	45.7-96.2	≤250	Yes
Nitrate	3.1-6.2	≤20.0	Yes
Cadmium	0.0005 L	≤0.005	Yes
Chromium VI	0.004 L	≤0.05	Yes
Arsenic	0.001 L	≤0.01	Yes
Lead	0.2 L	≤0.01	Yes
Nickel	0.005 L	≤0.02	Yes
Copper	0.05 L	≤1.0	Yes
Zinc	0.05 L	≤1.0	Yes

Note: ND means no detection and L means detection limit.

Source: DEIA (2022).

21 Class III of Surface Water Ambient Quality Standard (GB3838-2002) is suitable for drinking water sources in Class II protection areas, wintering grounds for fish and crustaceans, migration routes, water bodies for aquaculture and capture fishery, and swimming activities.

**Table IV-7:** Groundwater quality of Jinchuan East Village, unit: mg/L, except pH

Item	Concentration range	Limit	Standard compliance
pH	7.21-7.65	6.5-8.5	Yes
Ammonia nitrogen	0.07-0.11	≤0.5	Yes
DO	4.21-4.65	≥3.0	Yes
Sulfate	23.4-42.6	≤250	Yes
Chloride	35.2-77.5	≤250	Yes
Nitrate	1.5-3.4	≤20.0	Yes
Cadmium	0.0005 L	≤0.005	Yes
Chromium VI	0.004 L	≤0.05	Yes
Arsenic	0.001 L	≤0.01	Yes
Lead	0.2 L	≤0.01	Yes
Nickel	0.005 L	≤0.02	Yes
Copper	0.05 L	≤1.0	Yes
Zinc	0.05 L	≤1.0	Yes

Note: ND means no detection and L means detection limit.

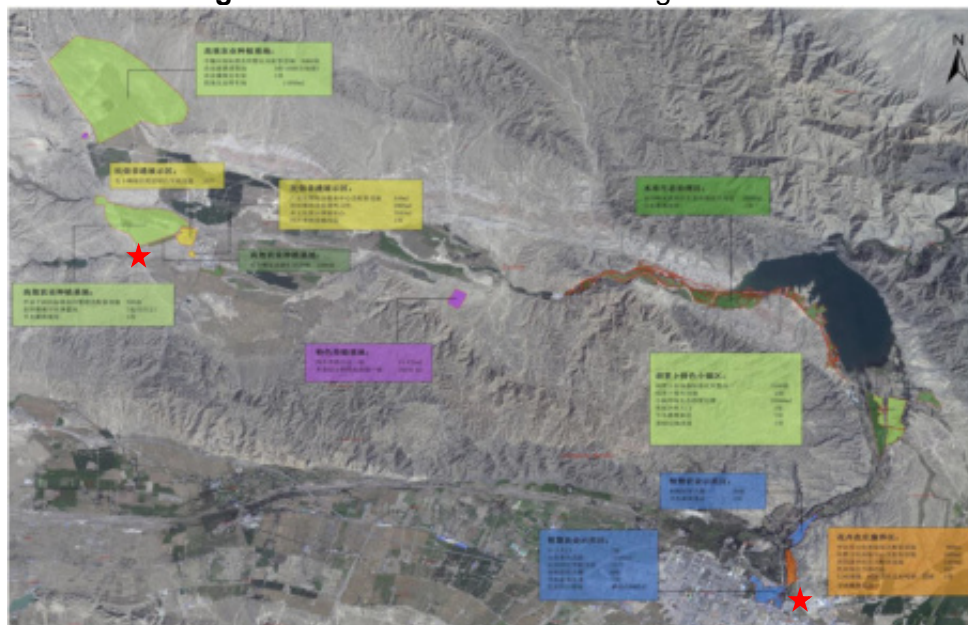
Source: DEIA (2022).

**Table IV-8:** Groundwater quality of Maobula Village, unit: mg/L, except pH

Item	Concentration range	Limit	Standard compliance
pH	7.41-7.58	6.5-8.5	Yes
Ammonia nitrogen	0.15-0.25	≤0.5	Yes
DO	4.51-5.11	≥3.0	Yes
Sulfate	23.5-48.9	≤250	Yes
Chloride	54.6-85.3	≤250	Yes
Nitrate	2.7-4.8	≤20.0	Yes
Cadmium	0.0005 L	≤0.005	Yes
Chromium VI	0.004 L	≤0.05	Yes
Arsenic	0.001 L	≤0.01	Yes
Lead	0.2 L	≤0.01	Yes
Nickel	0.005 L	≤0.02	Yes
Copper	0.05 L	≤1.0	Yes
Zinc	0.05 L	≤1.0	Yes

Note: ND means no detection and L means detection limit.

Source: DEIA (2022).

**Figure IV-6:** Groundwater monitoring locations

Source: DEIA (2022).

### c) Air Quality

226. According to the “Environmental Quality Report of Jinchang City in 2020, the pollutants PM<sub>10</sub>, PM<sub>2.5</sub>, SO<sub>2</sub>, NO<sub>2</sub>, CO and O<sub>3</sub> of Jinchang met Grade II of the PRC Ambient Air Quality Standard GB3095-2012. The data are from the ambient air quality on-line monitoring systems located in the urban area of Jinchang. The PRC’s Technical Guideline of Environmental Impact Assessment - Ambient Air Quality (HJ2.2-2018) stipulates that “in an EIA study, data from regional automatic monitoring points that with similar geographical location, topography and climatic conditions of the project area can be used in the EIA.” The annual average monitoring data from the local auto-monitoring systems conform to the provisions of HJ664 Guideline. Based on **Table IV-9**, the air quality of the urban area meets the Class II standards of PRC Ambient Air Quality Standards of GB3095-2012 and WHO guidelines IT-1 values.

**Table IV-9:** Jinchang urban area ambient air quality, 2020(mg/m<sup>3</sup>).

Item	Monitoring results (annual average)					
	SO <sub>2</sub>	NO <sub>2</sub>	PM <sub>10</sub>	CO	O <sub>3</sub>	PM <sub>2.5</sub>
Jinchang (2020)	14	13	57	0.9	122	20
Grade II Standard value of GB3095-2012	60	40	70	4	160 (8-hour)	35
Standard compliance	Yes	Yes	Yes	Yes	Yes	Yes

Source: Domestic DEIA, 2022.

### d) Acoustic environment

211. Noise baseline monitoring was undertaken by the DEIA Institute in March 2022 at four villages. The results in **Table IV-10** show that noise baseline at all points met the PRC Class II standards in PRC Environmental Quality Standards for Noise (GB3096-2008).

**Table IV-10:** Noise monitoring data. Unit dB(A).

No.	Location	Monitoring time	Monitoring result	PRC Limit	Standard compliance
1	Beihaizi Village	Daytime	41.1-45.3	60	Yes
		Nighttime	39.2-42.1	50	Yes
2	Jinchuan East Village	Daytime	40.1-45.2	60	Yes
		Nighttime	37.6-40.2	50	Yes
3	Maobula Village	Daytime	42.3-46.5	60	Yes
		Nighttime	38.6-41.3	50	Yes
4	Jinchuan West Village	Daytime	40.1-46.4	60	Yes
		Nighttime	35.4-38.9	50	Yes

Source: DEIA, 2022.

### e) COVID-19 outbreak

227. From January 23, 2020, to June 1, 2022, there were 1 confirmed Covid-19 cases in Jinchang, of which 1 case was recovered.<sup>22</sup> As of June 1, 2022, no new cases have been found since January 28, 2020, and the 1 confirmed case was recovered before January 28, 2020. Nonetheless, Jinchang City is required to follow the PRC and Gansu Province requirements to strictly control and monitor public movements within, and in and out of, Jinchang City. Body temperature scanners were installed at bus stations, and persons who enter Jinchang City via all methods (car, train, plane, bus) are required to provide a Health Code, which has been assigned by the PRC’s State Council’s APP for each person, to demonstrate that the persons have not visited the medium-risk or high-risk areas in last 14

22 [https://news.sina.cn/project/fy2020/yq\\_province.shtml?wm=3049\\_0016&city=CN62030000000000](https://news.sina.cn/project/fy2020/yq_province.shtml?wm=3049_0016&city=CN62030000000000)

days (these areas are updated and published on a daily basis by the State Council). If the persons have visited medium risk or high-risk areas in last 14 days without negative nucleic acid detection certification, the person cannot enter Jinchang or is allowed to enter Jinchang.

228. Jinchang also implemented COVID-19 prevention and control measures following the PRC and Gansu Province's requirements, including disinfection/cleaning of public space, temperature checks at entrances of facilities, social distancing measures, mandatory use of personal protective equipment such as facemasks and procedures to be adopted in the event any person is infected with COVID-19.

229. The project EMP includes the requirement for a COVID-19 health and safety plan to address health risks. An outline and minimum requirements for the plan are given in Appendix 3, based on international and national guidelines.

## V. POTENTIAL ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

### A. Subproject Area of Influence and Sensitive Receptors

230. The subproject zone of influence, the total area which might be subject to adverse impacts of the project, is defined as:

- i) A 200 m zone around the boundary of all subproject sites with respect to noise during construction and operation;
- ii) A 200 m zone around the boundary of all subproject sites with respect to air pollution during construction and operation; and
- iii) A 100 m zone around the boundary of the subproject with respect to local terrestrial and aquatic ecology.

231. Sensitive receptors, defined as settlements and/or environmental values that might be affected by the subproject construction and/or operation, were also identified. These comprise (i) villages and communities potentially subject to construction or operational noise, air pollution, altered water quality, and/or environment-related social impacts; (ii) public service facilities vulnerable to disturbance or pollution; and (iii) vegetation, fauna habitats, and agricultural lands. The sensitive receptors related to the subproject are identified and summarized in **Table V-1**. Component 1, 2, 3, 6, 7 and 9 will be located at the residential area of subproject area. Other components will be far from the sensitive receptors. For the sheep farm, the distance between the nearest sensitive receptor and sheep farm is about 2.3 km.

**Table V-1:** Subproject environmentally sensitive receptors.

Sensitive Receptor	Distance (m)
Beihaizi Village	Components are located within the area
Jinchuan East Village	Components are located within the area
Maobula Village	Components are located within the area
Jinchuan West Village	Components are located within the area

Source: DEIA, 2022.

### B. Pre-construction Phase Impacts and Mitigation Measures

232. The following measures will be implemented in the engineering design and pre-construction phase to ensure the project's environment management readiness.

- (i) **Land acquisition.** The subproject will permanently occupy 100 mu (106,667 m<sup>2</sup>) of land. There will be no physical house relocation. In addition, temporary land occupation will occur during construction period. The project will not involve any physical house relocation. In addition, the subproject will use 11,787 mu of land through land use rights transfer (LURT) for agricultural development on a voluntary negotiation basis. One resettlement plan was prepared in line with ADB's SPS and PRC's laws and regulations, supported by a due diligence review by ADB social safeguard specialists. Each Sub-PMO will designate resettlement staff and the project implementation consultants will provide training and support. An external agency will be engaged to monitor and evaluate the implementation of the resettlement plans and corrective actions and submit reports to ADB.
- (ii) **Institutional strengthening.** (a) The Sub-PMO will appoint at least one full-time and qualified environment officer in the team. This officer will lead the coordination of the EMP and EMU; (b) each EMU will include one qualified environment officer and an appropriate number of designated environmental staff from the components (one staff for one component); and (c) under the loan consulting services, the PPMO will hire a loan implementation environment consultant (LIEC) to provide external support.

- (iii) **Safety measures for COVID-19.** Prior to the arrival of external subproject personnel (e.g., workers and consultants), the PPMO will implement safety procedures and screening to ensure that all staff are tested negative for COVID-19 and do not pose a threat to local populations, as per the COVID-19 measures in the EMP.
- (iv) **Updating the EMP.** In case of any changes in the detailed subproject design, the EMP will be updated as needed, including the mitigation measures and monitoring plan. This will be the responsibility of the Sub-PMO/EMUs, and LIEC.
- (v) **Training in environmental management.** The LIEC will give training in the implementation and supervision of environmental mitigation measures to contractors and the CSCs.
- (vi) **Grievance Redress Mechanism (GRM).** The Sub-PMO and EMUs will implement the project wide GRM at least two months before the start of construction to ensure that the surrounding residential communities, villages, schools and hospitals are well informed and have the opportunity to discuss any concerns. This is further to the public consultations already conducted during subproject preparation (see Section VI).
- (vii) **Bidding documents and contract documents.** The subproject EMP (Appendix 1) will be included in all the bidding documents and contracts for procurement of civil works, goods and services. All contractors and subcontractors will be required to comply with the EMP.
- (viii) **Contractor obligations.** All contractors, in their bids, will respond to the environmental clauses in the bidding documents for EMP requirements. Prior to construction, each contractor will develop its site EMP based on the subproject EMP, and assign a Contractor's Environment, Health and Safety (EHS) Officer. The site EMP shall at minimum include: (a) surface water and ecosystem protection; (b) spill control and management; (c) site drainage and soil erosion protection; (d) temporary traffic management; (e) construction site access control; (f) health and safety and emergency response; (g) all other mitigation measures listed in the subproject EMP; (h) contractor performance targets; and (i) safety measures for COVID-19 in the EMP. The site EMP will be submitted to the Sub-PMO environment officer and EMU environment officers for approval, with the support from the EEB of Jinchang.
- (ix) **Environmental management preparation.** Ensure that prior to the start of construction, the Sub-PMO and EMU environment officers, together with environmental supervision engineers from CSCs, are mobilized and prepared to be responsible for their EMP supervision responsibilities. Also ensure that contractor's EHS Officer is mobilized and prepared for their site EMP implementation responsibilities.
- (x) **Baseline information update.** Baseline data will be updated if there are significant project delays to accurately reflects actual conditions prior to subproject commencement.

### C. Construction Phase Impacts and Mitigation Measures

233. Potential negative construction phase environmental impacts are short-term and localized, and are associated with fugitive dust, construction noise, potential water quality degradation, wastewater, solid waste, disruption of traffic, and risks to worker and community health and safety. These impacts will be effectively mitigated through good construction and health and safety practices, including construction soil and spoil management; dust controls including site watering and the use of ready-mix concrete; noise controls including limiting times and seasons when noisy activities can occur, selecting low noise equipment and scheduling materials delivery to avoid densely populated or sensitive areas; water quality protection measures including managing site runoff, provision of worker sanitary facilities to reduce the impacts to the nearby surface water body; good solid and hazardous waste management practices; and good health, safety and emergency response procedures. Construction will not affect any parks, protected areas (except Jinchuanxia Reservoir) or rare



or threatened flora or fauna species. The mitigation measures on Jinchuanxia Reservoir protection during construction phase have been developed and included in the EMP.

234. Potential construction phase impacts and mitigation measures are discussed below. Detailed mitigation measures including responsibilities for implementation and oversight are presented in the EMP (**Appendix I**).

#### a) Soil Erosion and Earthwork Balance

235. **Soil erosion.** Erosion may result from construction works at subproject sites, and from unprotected stockpiles of soil and spoil. Erosion can also occur after completion of construction if site restoration is inadequate.

236. **Spoil.** The estimated spoil generated during the construction period is presented in **Table V-2**. Spoil will be temporally stored and re-used to the maximum extent as back-fill possible.

**Table V-2:** Estimated subproject spoil balance.

Item	Volume of soil to be excavated (m <sup>3</sup> )	Volume of soil to be reused (m <sup>3</sup> )	Surplus volume (spoil, m <sup>3</sup> )
Component 1	24461	22015	2446
Component 2	59005	53105	5900
Component 3	98943	89049	9894
Component 4	134420	134420	0
Component 5	659679	659679	0
Component 6	18532	16679	1853
Component 7	6865	6865	0
Component 8	79200	71280	7920
Total	1081105	1053092	28013

Source: DEIA, 2022.

237. **Mitigation Measures.** Subproject erosion and spoil will be effectively managed through good practice construction and soil and spoil management practices, including good stormwater management and drainage systems with on-site settling ponds, minimizing the area of soil exposed to potential erosion during earthworks, carefully defining spoil and borrow sites, re-using spoil to the maximum extent possible, restoration of disturbed sites, and appropriate disposal of spoil that cannot be reused.

- (i) The potential for construction site storm water runoff will be assessed, and appropriate storm water drainage systems to minimize soil erosion will be implemented, including perimeter bunds, temporary detention and settling ponds to control topsoil runoff, and intercept channels to prevent construction runoff from entering the nearby river.
- (ii) Land excavation and filling will be balanced so as to minimize the requirement for fill material sourcing and transportation.
- (iii) Spoil will be reused on-site to the maximum extent feasible as fill. During the land leveling much of the spoil will be used for back-fill and soil replacement. Excess spoil that cannot be used on-site will be transported for disposal at the approved spoil disposal sites. If any additional sites are needed, the new sites will be screened for compliance with selection criteria (see below).
- (iv) Temporary spoil storage sites (and storage containers at lane modification and stations construction sites) will be identified, designed, and operated to minimize impacts. Temporary spoil sites will be restored at the conclusion of storage activities.
- (v) Construction and material handling, in particular for the excavation works, will be limited during rain (rainy season is May to September) and high winds.

- (vi) During earthworks, the area of soil exposed to potential erosion at any time will be minimized through good project and construction management practices.
- (vii) Spoil and aggregate (which will be purchased from the local suppliers) piles will be covered with landscape material and/or regularly watered.
- (viii) Waste construction material such as residual concrete, asphalt, etc., will be properly handled for reuse or disposal.
- (ix) Earthwork areas will be stabilized within 15 days after earthworks have ceased at the sites.
- (x) Construction camps and storage areas will be situated to minimize land area required.
- (xi) Construction wastes will be removed from the site to approved disposal sites.

238. Detailed mitigations are presented in the EMP (**Appendix I**).

239. **Measures for disposal of surplus spoil.** In the event that surplus spoil cannot be re-used and must be disposed of (currently estimated at 28013 m<sup>3</sup>), preference will be to use existing and Jinchang EEB approved disposal sites. In the event no such suitable sites are available, disposal sites will be selected based on compliance with the following criteria:

- (i) Situated as close as possible to the work sites, to minimize transport costs, vehicle emissions, and risks associated with more distant transport of spoil, e.g., vehicle accidents, dislodging of spoil onto roads, and inadvertent transfer of invasive species or disease vectors;
- (ii) Located at least 500 m from the rivers, to avoid impacts to river banks or siltation after rainfall;
- (iii) Avoidance of any protected areas, wetlands, waterways, flood retention areas, or other sensitive receptors,
- (iv) Compliance with land zoning for appropriate land use, and
- (v) Compliance approvals issued by the EEB and Urban Administration Bureau, subject to their site inspections and endorsement prior to any disposal of project surplus spoil.
- (vi) It is currently understood that no borrow materials will be required for the subproject, and no borrow sites will be established. If any borrow materials are required, they will be sourced only from existing and certified borrow yards. Prior to using these sites, the IA will confirm again with relevant local agencies that sites contain sufficient capacity to provide the project needs.
- (vii) In the event that new disposal or borrow sites need to be established for the project, this will be subject to domestic environmental assessments and approvals. ADB will be notified in such case to ensure the new sites and procedures for use comply with the measures in this EMP. The new borrow sites should be rehabilitated/revegetated after the works have been undertaken.

240. Detailed mitigations are presented in the EMP (**Appendix I**).

#### **b) Soil and Water Contamination**

241. Soil and water contamination can result from inappropriate transfer, storage, and/or disposal of chemicals, (e.g., gasoline, diesel and lubricant), and solid wastes. The risk of contamination will be effectively managed through good hazardous materials and waste management practices, and spill response procedures.

242. **Measures to avoid pollution from works.** To reduce the risk of soil and water contamination contractors will:

- (i) Store petroleum products, hazardous materials and wastes on impermeable surfaces in secured and covered areas, >500 m from waterways.
- (ii) Remove all construction wastes from the site to approved waste disposal sites.

Construction waste will be regularly transported off-site by the contractor for disposal at the certified sites, where the construction spoil (waste concrete, waste bricks and other solid waste) will be disposed (see also "solid wastes" below).

- (iii) Establish emergency preparedness and response actions (see below).
- (iv) Provide spill cleanup measures and equipment at each construction site (see below).
- (v) Train contractors and construction workers in emergency spill response procedures.

243. Detailed mitigations are presented in the EMP (**Appendix I**).

### **c) Reservoir contamination**

244. Construction may result in Jinchuanxia Reservoir pollution from construction activities and solid wastes. **Measures to avoid Reservoir pollution.** To reduce the risk of soil and water contamination contractors will:

- (i) Requirements of "Regulations on pollution Prevention and Control of Drinking Water Source Protection Areas" and "Guidelines for Environmental Protection of Centralized Drinking Water Sources" will be fully considered and mitigation measures will be developed and incorporated in the design.
- (ii) Store petroleum products, hazardous materials and wastes on impermeable surfaces in secured and covered areas, >500 m from the reservoir.
- (iii) Remove all construction wastes from the site to approved waste disposal sites. Construction waste will be regularly transported off-site by the contractor for disposal at the certified sites.
- (iv) Earthworks near the reservoir will be accompanied by measures on minimizing the sediment runoff into the water bodies, including silt fences and sediment traps
- (v) Temporary interception and drainage ditch and waste water collection tank will be installed at the sites near the reservoir.
- (vi) Construction activities will be stopped before and in the rainy days.
- (vii) Construction equipment will be washed, maintenance and repaired at another site.
- (viii) Construction camp will not be built in the class II protection zone of the reservoir.
- (ix) Train contractors, CSCs, and construction workers, Sub-PMO/EMU and IA on reservoir protection including relevant regulations such as "Regulations on pollution Prevention and Control of Drinking Water Source Protection Areas" and "Guidelines for Environmental Protection of Centralized Drinking Water Sources".
- (x) Establish emergency response on spill response procedures.

### **d) Air Quality**

245. Potential subproject construction air pollution sources will include: (i) fugitive dust from earth excavation, filling, loading, hauling, bare earth surfaces, uncovered construction areas, and vehicle movements on unpaved roads, especially in windy days; (ii) fugitive dust from aggregate preparation and concrete-mixing; and, (iii) vehicle and machinery emissions (gaseous CO, hydrocarbon and NO<sub>2</sub>) during works, including asphalt road paving.

246. The quantity of dust generated during construction will depend on wind, humidity, the moisture content of material and the soils, and the general state of the site. It is estimated that under general on-site conditions (average wind speed 1.7 m/s, and average humidity of 74%) dust dispersion distance is 70 m downwind. For dust generated by transporting earth and other construction materials, the impact zone may exceed 50 m on each side of the route. Based on the locations of sensitive receptors (Section V.A), some residents and villagers in the subproject areas may be subject to dust-related disturbance during construction period.

247. Modern asphalt mixing equipment in the PRC releases typical flue gas emission concentrations of 30 mg/m<sup>3</sup>, which complies with discharge requirements of 80-150 mg/m<sup>3</sup> of

the PRC Atmospheric Pollutant Emission Standard (GB16297-1996) and PRC Ambient Air Quality Standard (GB3095-2012), which limits the concentration of benzopyrene at 0.0025  $\mu\text{g}/\text{m}^3$  (daily average at 100 m downwind from the asphalt mixing station).

248. The potential for impacts to air quality at the subproject site is considered to be low due to: (i) the local weather regime, which is generally rainy rather than windy, with high relative humidity (average annual relative humidity of 64%); (ii) the annual average wind speed is only 2.5 m/s; (iii) high ground soil moisture and high vegetation coverage, which result in a reduction of fugitive dust; and (iv) since January 2017 the PRC has implemented increased controls on vehicle/machinery emissions to protect ambient air quality (GB18352-2005, GB17691-2005, GB11340-2005, and GB18285-2005), and all vehicles and construction machinery must comply with the PRC Grade V or higher emission standard.

249. To minimize fugitive dust production good practice air quality construction measures will be implemented, including controlling vehicle speeds, covering loads, maintaining construction roads watering dust producing surfaces. With mitigation measures the amount of dust can be reduced by 70% or more. Particular attention will be paid to dust suppression near sensitive receptors identified. On-site asphalt batching can generate toxic fumes, so only pre-mixed commercial asphalt will be procured negating the need for asphalt mixing at construction sites, and asphalt fumes will only be generated during road paving. Detailed air quality mitigations are presented in the EMP (**Appendix I**). Overall air quality impacts will be short-term and localized, and in line with typical construction works that occur on a daily basis in all cities.

250. Mitigation measures to reduce impacts on air quality are as follows.

- (i) Spraying of water daily at construction sites where fugitive dust is being generated. Particular attention will be paid to dust suppression near sensitive receptors identified.
- (ii) Storing petroleum or other harmful materials in the appropriate places and covering to minimize fugitive dust and emission.
- (iii) Transport vehicles will be limited to low speeds at construction sites.
- (iv) Loads will be covered during truck transportation to avoid spillage or fugitive dust generation. Fine materials will be transported in fully contained trucks to avoid spillage or dust generation.
- (v) Construction site roads will be well maintained and watered and swept on an as-needed basis. Construction site road entry points will be equipped with truck drive through wash ponds.
- (vi) Transport routes and delivery schedules will be planned to avoid densely populated and sensitive areas, and high traffic times.
- (vii) Provide regular maintenance to vehicles in order to limit gaseous emissions (to be done off-site). All vehicles and construction machinery must comply with the PRC Grade V or higher emission standard.
- (viii) Temporary fencing will be erected around dusty activities.
- (ix) Construction spoil, aggregate other construction materials will be temporary stored using containers, but they may have the potential to generate dust. Thus, containers will be covered and/or watered if necessary. Powdered materials such as cement and lime will be stored in sealed bags or containers.
- (x) Muddy or dusty materials on public roads outside the exits of works areas will be cleaned immediately.
- (xi) On-site asphaltting and concrete batching are prohibited.
- (xii) Disturbed site will be revegetated as soon as possible after the completion of works.

251. Detailed mitigations are presented in the EMP (**Appendix I**).

### e) Noise

252. The construction phase will result in increased noise levels from excavators, bulldozers, graders, concrete-mixers, rollers, and other heavy machinery. Construction noise will be temporary and localized.

253. **Estimation of noise levels.** Typical construction noise values at 5 m distance from the machinery and vehicles are presented in **Table V-3**.

**Table V-3:** Test values of construction machinery noise.

No.	Machine Type	Maximum Sound Level Lmax (B)
1	Excavator	85-95
2	Bulldozer (100 horse-power)	78-96
3	Scraper	85-95
4	Heavy-duty truck	88-93 (speed up), 84-89 (steady speed)
5	Medium-duty truck	85-91 (speed up), 79-85 (steady speed)
6	Drilling machine	96
7	Wheel loader	85-92
8	Vibrating roller	86
9	Two-wheeled two-vibrator roller	81
10	Generator set	88-92

Source: DEIA, 2022.

254. Construction equipment generates noise as a point source. An analysis was undertaken utilizing the sound impact model in the Technical Guidelines for Noise Impact Assessment HJ2.3-2009:

$$L_i = L_0 - 20 \lg \frac{R_i}{R_0} - \Delta L$$

Where,  $L_i$  and  $L_0$  are equipment noise levels at  $R_i$  and  $R_0$ , respectively.  $\Delta L$  is additional diffusion attenuation produced by barriers, vegetation and air.

255. For the impact of multiple construction machine superposition of the sound level is needed:

$$L = 10 \lg \sum 10^{0.1 \times L_i}$$

256. **Predicted impacts.** Noise levels at different distances were derived after calculating the impact scope of equipment noise during construction, as defined in Table V-4. The PRC Standard of Noise Limits for Construction Sites (GB12523-2011, revised) specifies the noise limit in Class II areas as 70 dB (A) during daytime and 55 dB (A) during nighttime. The standard compliance noise impact scope (m) of different machineries is listed in **Table V-4**.

**Table V-4:** Noise values of construction machineries at different distances [dB(A)].

Machinery Name	Distance to Machinery								
	15m	20m	40m	60m	80m	100m	130m	150m	200m
Excavator	71	69	63	59	57	55	53	51	49
Bulldozer	72	70	64	60	57	56	54	52	50
Loader	61	59	53	49	47	45	43	41	39
Heavy truck	69	67	61	57	55	53	51	49	47

Machinery Name	Distance to Machinery								
	15m	20m	40m	60m	80m	100m	130m	150m	200m
Drilling machine	72	70	64	60	57	56	54	52	50
Concrete-mixer	71	69	63	59	57	55	53	51	49
<b>Grade II of GB12523 – 2011</b>	70 (daytime)								
	55 (nighttime)								
<b>World Bank EHS Guideline</b>	55 (daytime for residential and institutional area);								
	70 (daytime for industrial and commercial area)								
	45 (nighttime for residential and institutional area);								
	70 (nighttime for industrial and commercial area)								

Source: DEIA Institute, TrTA Consultant.

257. These values were compared with the locations of the sensitive receptors (Section V.A) to see which villages would be within 40 m of construction works which exceed daytime noise levels of 70 dB(A), the threshold applied to this subproject under PRC standard GB12523-2011. To be conservative, no attempt was made to distinguish between noise emissions from different types of construction activity i.e. any works within 40 m of villages and residences were assumed to generate noise levels exceeding the threshold.

258. **Mitigation measures.** Good practice noise mitigation measures will be implemented to comply with PRC construction site noise limits and avoid or minimize any potential impacts. Based on effective implementation of these measures, the net impact of noise disturbance is expected to be low. However, noise management will still require close attention during subproject implementation.

259. The following noise mitigation measures will be implemented:

- i). Ensure that noise levels from equipment and machinery conform to PRC standard of GB12523-2011 (revised). Properly maintain construction vehicles and machineries to minimize noise.
- ii). Apply noise reduction devices and methods for high noise equipment operating within 200 m of the sensitive sites, e.g., schools, villages, residential areas (section V.A).
- iii). Locate high-noise activities (e.g., pilling) >500 m from sensitive areas. If the activities can't be more than 500 m from sensitive areas, installation of noise barriers to reduce as much of the emissions as possible, and/or installation of additional layers on the windows of the affected homes as necessary, the duration of daily construction activities will be agreed by the affected villagers through community consultation.
- iv). Prohibit operation of high-noise machinery, and movement of heavy vehicles along urban and village roads, between 20:00 and 06:00, in accordance with provincial regulations.
- v). Take special caution at construction sites that are close to such sensitive sites as schools and villages. When construction activities are unavoidable during the school seasons, the use of heavy equipment will be restricted to weekends and non-class hours.
- vi). Place temporary hoardings or noise barriers around noise sources during construction.
- vii). Monitor noises at regular intervals (EMP monitoring plan in Appendix 1). If noise standards are exceeded, equipment and construction conditions shall be checked, and mitigation measures shall be implemented to rectify the situation.
- viii). Conduct regular interviews with residents/villagers adjacent to construction sites to identify noise disturbance. Community feedback will be used to adjust the work hours of noisy machinery.
- ix). Concrete mixing is prohibited. Commercial concrete will be purchased.
- x). For households and sensitive receptors within 40 m of the works, particular attention will be provided. This will include: (a) follow-up consultations with these households prior to the start of any works, to specify the exact planned dates and schedule of works, nature

of works, equipment to be used, safety measures, and public access during construction; (b) installation of noise barriers to reduce as much of the emissions as possible, and/or installation of additional layers on the windows of the affected homes as necessary, based on the assessment of the most technically effective method and feedback from the community consultations; and (c) agreement on the duration of daily works.

260. Detailed mitigations are presented in the EMP (**Appendix I**).

#### **f) Vibration**

261. Mechanical vibration during the use of machinery may be sudden and discontinuous, and may cause stress among workers and communities. The Japanese Handbook of Environmental Impact Assessment provides measures of vibrations caused by construction machinery (**Table V-5**).

**Table V-5:** Vibration Levels of Construction Machinery (Unit: dB(A))

<b>Equipment</b>	<b>At 5 m</b>	<b>At 10 m</b>	<b>At 20 m</b>	<b>At 30 m</b>
Vibratory hammer	75	67	48	44
Roller	58	53	50	48
Diesel truck	62	58	54	51

Source: Japanese Handbook of Environmental Impact Assessment in DEIA, 2022.

262. The table shows that the requirements for residential and cultural areas (55 dB during daytime) specified in Environmental Vibration Standard for Urban Areas (GB10070-88) are met at a distance of >20 m from the vibration source. Overall, the impact of vibration is considered to be low.

263. To reduce this risk: (i) high noise activities, such as compaction operations, will be prohibited at night; (ii) communities will be consulted prior to large earthworks to ensure they are informed and to avoid sensitive timing, e.g., exams at nearby schools or festivals; and (iii) if there are buildings near to high impact areas, pre- construction crack surveys and post construction crack surveys will be conducted with proper records. Detailed vibration mitigations are presented in the EMP (**Appendix I**).

#### **g) Solid Waste**

264. Solid waste generated will comprise construction and domestic waste. Construction wastes will include packaging materials, excess wood and steel and other products, and construction debris. Domestic wastes will be produced by workers. The average workforce is estimated to be 200 (DEIA, 2022). Domestic refuse generated by construction workers is estimated to be 0.5 kg per worker per day, or 100 kg/d in total. Assuming there is on average 160 construction days in per year, the estimated domestic waste generated by the subproject will be 80 tons over about 5 years of construction.

265. Inappropriate waste disposal can cause soil and water pollution. To prevent environmental degradation, good solid waste management practices will be adopted in accordance with PRC requirements and *EHS Guidelines*, including reusing construction wastes to the extent possible (including concrete and brick debris), providing covered construction and domestic waste containers at all construction sites and workers camps, and ensuring all wastes that cannot be reused or recycled are disposal at the Yongchang County Municipal Landfill.

266. The following measures will be undertaken to manage construction and domestic wastes:

- i). Wastes will be managed in accordance with the *Law on the Prevention and Control of Environmental Pollution by Solid Waste* of the PRC and scrap material and demolition waste disposal standards promulgated by the PRC's Ministry of Housing and Urban-Rural Construction.
- ii). The lead construction contractor will be responsible for providing sufficient construction waste dumpsters at all work sites, and sufficient covered garbage and recycling collection bins at worker camps. Dumpsters and bins should be covered and protected from birds and vermin.
- iii). The lead construction contractor will be responsible for recycling and reusing construction wastes to the extent possible (including concrete and brick debris).
- iv). The lead construction contractor will be responsible for ensuring regular collection and transport of domestic recyclables to appropriate authorities and remaining wastes to the Yongchang County Municipal Landfill, using the local municipal solid waste collection system via contracts between the contractor and the local sanitation authority. The contractors' responsibility will be included in bidding documents and construction contracts.
- v). Littering by workers will be prohibited.
- vi). Excavated soil will be backfilled onsite to the extent possible. Excess spoil that cannot be used on-site will be transported to an approved spoil disposal site (see above).
- vii). There should be no final waste disposal on site. Waste incineration at or near the site is strictly prohibited.
- viii). Contractors will be held responsible for proper removal and disposal of any significant residual materials, wastes, spoil, and contaminated soils that remain on the site after construction.

267. Detailed solid waste mitigations are presented in the EMP (**Appendix I**).

#### **h) Ecology**

268. **Vegetation and flora.** The construction sites will be in a highly modified rural area. Vegetation clearance will include secondary growth of shrubs and weeds and other common species, and agricultural crops. None of these species are on the PRC local or provincial list of protected species, nor are these species of concern on the IUCN list.

269. **Impacts on fauna.** Risks to fauna during construction include: (i) pollution of aquatic habitats in Heihe River from construction wastewater (oils, fuels) and/or domestic wastewater from workers, which may impact fish as well as amphibians and aquatic invertebrates; and (ii) noise and visual disturbance to birds, mammals, reptiles, and/or amphibians. Mitigation measures have already been developed to avoid and reduce the risk of water pollution (see above).

270. **Protected areas.** Based on site visits there are no known rare or endangered flora or fauna, parks, nature reserves or areas with special ecological significance which will be impacted by the subproject except Jinchuanxia Reservoir. The mitigation measures on Jinchuanxia Reservoir protection are presented in above section.

271. **Key areas for soil erosion control.** The subproject is located at the Gansu Provincial key areas of soil erosion control. Based on Gansu Soil and Water Conservation regulations, soil erosion control and ecological environment improvement are the main governance targets in the key areas for soil erosion control. The subproject activities are compliance with the requirements.

272. The locations of subproject sites have been reviewed against provincial records provided by the Integrated Biodiversity Assessment Tool (IBAT) maps of Gansu protected



areas and Important Bird and Biodiversity Areas (IBBAs). No component encroaches on any legally protected natural area or other critical habitats.

273. Impacts on flora or fauna are thus expected to be minimal and short-term. Site vegetation plans will be developed at subproject sites using appropriate local native species. Any existing greening areas impacted by the subproject will be restored post-construction using appropriate native species.

274. **Assessment of Impacts.** Given the documented low ecological values and modified nature of the construction area, the risk of ecological impacts by the subproject is assessed to be low. Vegetation clearing is expected to have minimal negative impacts. Noise and visual disturbance will be temporary. Impacts on fauna are expected to be minimal and short-term.

275. To minimize potential impacts, clearance of vegetation will be restricted to specific construction sites, any adjacent areas of vegetation or habitats will be demarcated as no-go zones, and site revegetation plans will be developed using appropriate local native species, and cleared sites will be immediately re-vegetated afterward:

- (i) Clearance of vegetation will be restricted to construction sites.
- (ii) Prior to construction, any adjacent areas of vegetation or habitat will be clearly demarcated as no-go zones for workers and machinery.
- (iii) A site revegetation plan will be developed. Cleared sites will be immediately re-vegetated. All plantation activities under the revegetation plan will only use native plant species. In the event that non-native seedlings are required for rapid stabilization of exposed soils and sites, only sterile seedlings (i.e., which cannot propagate) will be used, to prevent the spread of weeds. The site revegetation plan will be approved by and registered with the local Gardens Bureau.
- (iv) To reduce the risk of spreading weeds, pest animals, and/or soil-based organisms, the project will: (a) prohibit the use of any plant species classified in the PRC as weeds – including native species – as defined by the Research Center for Biological Prevention and Control of Alien Invasion (Ministry of Agriculture and Rural Affairs) and Institute of Plant Protection (Chinese Academy of Agricultural Sciences), available at <http://www.chinaias.cn/wjPart/index.aspx>

276. Detailed ecology mitigations are presented in the EMP (**Appendix I**).

#### **i) Community Health and Safety**

277. Construction may cause unexpected interruptions in public services and utilities because of damage to pipelines for water supply and drainage, and power cables and communication cables. The risk of traffic accidents may also increase with construction traffic. To mitigate potential impacts on community health and safety contractors will implement good practice community health and safety measures, including traffic safety management, informing residents about construction activities and potential disruptions, and prohibiting the public from entering construction sites. Detailed community health and safety mitigations are presented in the EMP (**Appendix I**).

278. Most of the planned subproject facilities are located close to towns and villages. Construction works may cause unexpected interruption to municipal services, e.g., in case of unintended damage to pipelines or transmission lines for water, drainage, and/or electricity. Altered traffic flows and increased occurrence of slow-moving heavy vehicles may cause traffic jams and delays. These impacts will be localized and temporary. They will be managed through ongoing consultations with communities during construction (as well as operation), that will build on the consultations conducted during subproject preparation (Section VII), and measures for community health and safety. These measures are included in the EMP

**(Appendix I).**

- i) **Information disclosure and public consultation.** Villagers, residents, and businesses will be informed in advance through media, information boards, and public consultations (Section VII), including the dates, duration, and scope of planned works.
- ii) **Traffic management.** A traffic management plan will be prepared by the contractor, to be approved by the traffic management administration prior to the start of construction. The plan will include provisions for diverting or scheduling construction traffic, regulating traffic at road crossings, selecting transport routes to reduce disturbance to regular traffic, and opening roads to traffic as soon as the construction is completed.
- iii) **Construction site protection.** Clear signs will be placed at construction sites in view of the public, informing people about the project GRM, and warning people against potential dangers such as moving vehicles, hazardous materials and excavations, and raising awareness on safety issues. Heavy machinery will not be used at night. All sites will be secured, disabling access by the public through appropriate fencing wherever appropriate.
- iv) **Utilities.** Construction activities will be planned so as to minimize disturbances to utility services.
- v) **Excavated sites and protection.** Open trenches will be fenced and cordoned off to prevent access by the general public and reduce the risk of persons accidentally falling in.

**j) Occupational Health and Safety**

279. Construction may cause physical hazards to workers from noise and vibration, dust, handling heavy materials and equipment, falling objects, work on slippery surfaces, fire hazards, and chemical hazards such as toxic fumes and vapors.

280. To address these risks the Contractor's EHS Officer will develop and implement an Occupational Health and Safety Plan (OHSP), maintain records concerning health, safety and welfare and regularly report on accidents, incidents and near misses. The OHSP will provide adequate precautions to protect the health and safety of their workers, including but not necessarily limited to: construction site sanitation, including waste removal and provision of potable water and sanitation facilities; occupational safety, including provision of appropriate personal protective equipment (PPE) such as safety hats, shoes, goggles, ear plugs and respiratory masks; electrical safety; traffic safety; emergency response, including procedures for medical, fire and other emergencies; a COVID-19 health and safety plan; and training. The OHSP will be reviewed and approved by the LIEC and Sub-PMO.

281. To mitigate this risk, contractors will each prepare an **Occupational Health and Safety Plan** (OHSP), which will include the following.

- (i) Provide a clean and sufficient supply of freshwater for construction sites and camps. The worker camps will be constructed following IFC's Workers' accommodation: processes and standards<sup>23</sup>.
- (ii) Provide an adequate number of on-site latrines at construction sites and work camps and ensure that they are cleaned and maintained in a hygienic state.
- (iii) Garbage receptacles at construction sites and camps will be set up, which will be periodically cleared to prevent the outbreak of diseases.
- (iv) Provide PPE to comply with PRC regulations, e.g., safety boots, helmets, gloves, protective clothing, goggles, earplugs, life rings, and buoyancy aids. Trainings will be provided to workers working in proximity to water bodies.

<sup>23</sup> Available at: [www.ifc.org/wps/wcm/connect/topics\\_ext\\_content/ifc\\_external\\_corporate\\_site/sustainability-at-ifc/publications/publications\\_gpn\\_workersaccommodation](http://www.ifc.org/wps/wcm/connect/topics_ext_content/ifc_external_corporate_site/sustainability-at-ifc/publications/publications_gpn_workersaccommodation).

- (v) **Emergency Preparedness and Response Plan** for accidents and emergencies, including environmental and public health emergencies associated with hazardous material spills and similar events and working in proximity to water bodies. These plans will be submitted to the local EEBs for review and approval. Emergency phone link with hospitals in the project area will be established. A fully equipped first-aid base in each construction camp will be organized.
- (vi) A records management system that will store and maintain easily retrievable records against loss or damage will be established. It will include documenting and reporting of occupational accidents, diseases, and incidents. The records will be reviewed during compliance monitoring and audits.
- (vii) Occupational health and safety matters will be given a high degree of publicity to all work personnel and posters will be displayed prominently at construction sites.
- (viii) All workers will be given basic training in sanitation, general health and safety matters, and work hazards. An awareness program for HIV/AIDS and other communicable diseases will be implemented for workers and the local communities.
- (ix) Core labor standards will be implemented. Civil works contracts will stipulate priorities to: (i) employ local people for works; (ii) ensure equal opportunities for women and men; (iii) pay equal wages for work of equal value and pay women's wages directly to them; and (iv) not employ child or forced labor. Specific targets for employment have been included in the project gender action plan.
- (x) **COVID-19 health and safety plan.** The project EMP includes a coronavirus (COVID-19) health and safety plan to address COVID-19 health risks. The plan is prepared in line with government regulations and guidelines on COVID-19 prevention and control, and in consultation with public health agencies in the area. The plan will include (i) measures to record the locations that workers have visited/lived immediately before and during project work; (ii) schedules for disinfecting/cleaning offices, yards, stores and labor camps; (iii) measures to implement temperature checks and other health checks on-site; (iii) physical distancing measures, particularly in worker camps; (iv) requirements for mandatory use of personal protective equipment such as facemasks, and provision of handwashing stations, hand sanitizers, and other appropriate protective measures; (v) how workers and residents living near project sites will be provided with information to protect themselves from COVID-19; (vi) procedures to be adopted in the event a worker is suspected of having contracted COVID-19; and (vii) other COVID-19 prevention and control measures appropriate for the local context.

282. Detailed occupational health and safety mitigations are presented in the EMP (**Appendix I**).

#### **k) Physical Cultural Resources**

283. Construction activities have the potential to disturb as yet unknown subsurface physical cultural resources (PCRs). To address this issue, a Chance Find Procedure, developed in accordance with PRC's *Cultural Heritage Protection Law*, will be established and training will be provided by the LIEC on what constitutes a PCR and the Chance Find Procedure. The procedure will be activated if any chance finds of PCRs are encountered at any site (see EMP). A clause on the chance find procedure will be included in construction contracts.

284. The following PCR chance find procedure will be implemented:

- (i) Construction activities will be immediately suspended if any PCRs are encountered.
- (ii) Destroying, damaging, defacing, or concealing PCRs will be strictly prohibited.
- (iii) The local Cultural Heritage Bureau will be promptly informed and consulted.

- (iv) Construction activities will resume only after thorough investigation and with the permission of the local Cultural Heritage Bureau.

285. Detailed PCR mitigations are presented in the EMP (**Appendix I**).

#### **D. Operation Phase Impacts and Mitigation Measures**

286. Potential negative operation phase impacts include waste, wastewater, and increased loads to the municipal infrastructures from an increase in tourists.; domestic wastewater; emissions from vehicles; noise; and potential safety risks. These impacts will be effectively mitigated through good design, including, for example, solid waste and wastewater management; noise control measures; and good waste and health and safety management practices and plans.

287. Potential operation phase impacts and mitigation measures are discussed below. Detailed mitigation measures including responsibilities for implementation and oversight are presented in the EMP (**Appendix I**).

##### **a) Air Pollution**

288. For component 8, odor will be generated from the operation of sheep farms and organic fertilizer production plant. The main odorous pollutants of component 8 are NH<sub>3</sub> and H<sub>2</sub>S. To assess the dispersion of the odorous pollutants, an atmospheric dispersion of NH<sub>3</sub> and H<sub>2</sub>S gases was modelled using an atmospheric dispersion model, AERSCREEN, which was developed by the US EPA. The AERSCREEN model is an air dispersion screening model based on AERMOD. The odor emissions from the component are presented in **Table V-6**.

**Table V-6: Estimated Odor Emissions from Component 8**

Location	Pollution source	Surface source			Emission rate (kg/h)	
		Length (m)	Width (m)	Height(m)	NH <sub>3</sub>	H <sub>2</sub> S
Sheep farms	Sheep shades	200	120	4.3	0.001142	0.000114
	Manure storage area	50	20	3.0	0.000457	0.000023
Organic fertilizer production plant	Raw material storage area	40	15	3.0	0.000114	0.000011
	Fermentation workshop	40	15	3.0	0.000342	0.000046

Source: Domestic EIA, 2022.

289. The modelling results are summarized in **Table V-7**. Based on the air dispersion modelling results, the maximum concentration of NH<sub>3</sub> and H<sub>2</sub>S from the component are 0.0003105 mg/m<sup>3</sup> and 0.0001242 mg/m<sup>3</sup>, equivalent to 0.0207% and 0.207% respectively of the standard and the concentration of NH<sub>3</sub> and H<sub>2</sub>S at the nearest sensitive receptor (2.3 km from the cattle farm) are 1.35 E-06 mg/m<sup>3</sup> and 1.66 E-06 mg/m<sup>3</sup>, equivalent to 0.0001% and 0.0028% respectively of the standard. The odor impacts of the component 8 will be minor.

290. The following mitigation measures will be implemented during the operation stage:

- i) Manure in sheep shades will be cleaned regularly by dry clean method. Sheep shades will be designed with good ventilation condition;
- ii) Temporary manure storage places for healthy sheep will be installed with ceilings, windbreaks and intercepting drains. These storage places will have leakage and overflow prevention measures. The stored manure will be daily transported to organic fertilizer production plant for recycling;

- iii) Regular clean and disinfection of the sheep shades will be implemented;
- iv) Add deodorant to the fodder;
- v) Layout of the component be reasonable planned to reduce odor diffusion;
- vi) For component 8, regular odor monitoring will be conducted at the site boundaries.

**Table V-7: Summary of Air Dispersion Modeling Results for Component 8**

Distance (m)	Sheep shades			
	NH <sub>3</sub>		H <sub>2</sub> S	
	Concentration (mg/m <sup>3</sup> )	Ratio of limit (%)	Concentration (mg/m <sup>3</sup> )	Ratio of limit (%)
10	0.000121	0.0080	4.82E-05	0.0803
100	0.000217	0.0144	8.66E-05	0.1443
200	0.000295	0.0196	0.000118	0.1963
300	0.000301	0.0201	0.00012	0.2007
400	0.000265	0.0176	0.000106	0.1763
500	0.00023	0.0153	9.19E-05	0.1532
600	0.000201	0.0134	8.04E-05	0.1340
700	0.000178	0.0119	7.13E-05	0.1188
800	0.000161	0.0107	6.42E-05	0.1070
900	0.000146	0.0097	5.84E-05	0.0973
1000	0.000133	0.0089	5.34E-05	0.0890
1500	8.31E-06	0.0006	3.54E-05	0.0590
2000	2.24E-06	0.0001	2.50E-05	0.0417
Nearest sensitive receptor	1.35 E-06	0.0001	1.66 E-06	0.0028
Maximum concentration	0.0003105	0.0207	0.0001242	0.2070
Distance with the maximum concentration	248			

Distance (m)	Manure storage area			
	NH <sub>3</sub>		H <sub>2</sub> S	
	Concentration (mg/m <sup>3</sup> )	Ratio of limit (%)	Concentration (mg/m <sup>3</sup> )	Ratio of limit (%)
10	0.000102	0.00683	2.05E-05	0.0342
100	0.000226	0.01509	4.53E-05	0.0755
200	0.00019	0.01268	3.80E-05	0.0633
300	0.000123	0.00817	2.45E-05	0.0408
400	8.30E-05	0.00553	1.66E-05	0.0277
500	5.97E-05	0.00398	1.19E-05	0.0198
600	4.51E-05	0.00301	9.03E-06	0.0151
700	3.54E-05	0.00236	7.09E-06	0.0118
800	2.89E-05	0.00193	5.78E-06	0.0096
900	2.42E-05	0.00161	4.83E-06	0.0081
1000	2.06E-05	0.00137	4.11E-06	0.0069
1500	1.12E-05	0.00075	2.24E-06	0.0037
2000	7.23E-06	0.00048	1.45E-06	0.0024
Nearest sensitive receptor	3.55E-06	0.00024	7.34E-07	0.0012
Maximum concentration	0.000239	0.01595	4.79E-05	0.0798
Distance with the maximum concentration	124			

Distance (m)	Raw material storage area			
	NH <sub>3</sub>		H <sub>2</sub> S	
	Concentration (mg/m <sup>3</sup> )	Ratio of limit (%)	Concentration (mg/m <sup>3</sup> )	Ratio of limit (%)
10	0.000128	0.00853	1.28E-05	0.0213
100	0.000289	0.01925	2.89E-05	0.0482
200	0.000211	0.01405	2.11E-05	0.0352
300	0.000129	0.00861	1.29E-05	0.0215
400	8.57E-05	0.00571	8.57E-06	0.0143
500	6.11E-05	0.00407	6.11E-06	0.0102
600	4.58E-05	0.00305	4.58E-06	0.0076
700	3.58E-05	0.00239	3.58E-06	0.0060
800	2.92E-05	0.00195	2.92E-06	0.0049
900	2.43E-05	0.00162	2.43E-06	0.0041
1000	2.07E-05	0.00138	2.07E-06	0.0035
1500	1.12E-05	0.00075	1.12E-06	0.0019
2000	7.24E-06	0.00048	7.24E-07	0.0012
Nearest sensitive receptor	3.61E-06	0.00024	2.45E-07	0.0004
Maximum concentration	0.0002888	0.01925	2.89E-05	0.0482
Distance with the maximum concentration	113			

Distance (m)	Fermentation workshop			
	NH <sub>3</sub>		H <sub>2</sub> S	
	Concentration (mg/m <sup>3</sup> )	Ratio of limit (%)	Concentration (mg/m <sup>3</sup> )	Ratio of limit (%)
10	0.000384	0.02559	5.12E-05	0.0853
100	0.000866	0.05776	0.000116	0.1925
200	0.000632	0.04215	8.43E-05	0.1405
300	0.000387	0.02582	5.16E-05	0.0860
400	0.000257	0.01714	3.43E-05	0.0572
500	0.000183	0.01221	2.44E-05	0.0407
600	0.000137	0.00916	1.83E-05	0.0305
700	0.000108	0.00717	1.43E-05	0.0238
800	8.76E-05	0.00584	1.17E-05	0.0195
900	7.30E-05	0.00487	9.74E-06	0.0162
1000	6.21E-05	0.00414	8.28E-06	0.0138
1500	3.36E-05	0.00224	4.48E-06	0.0075
2000	2.17E-05	0.00145	2.89E-06	0.0048
Nearest sensitive receptor	1.23E-05	0.00082	1.41E-06	0.0024
Maximum concentration	0.0008664	0.05776	0.0001155	0.1925
Distance with the maximum concentration	113			

Source: Domestic EIA, 2022.

291. Detailed air pollution mitigations are presented in the EMP (**Appendix I**).

#### **b) Sustainable use of water resources and Wastewater**

292. The subproject will source domestic water and production water from municipal water supply system and the irrigation water from the existing irrigation water system. The municipal water and irrigation water of the two towns are mainly from Jinchuanxia Reservoir and Hongshanyao Reservoir. Available water resources in Jinchang are 0.77 billion m<sup>3</sup>. In recent years, Jinchang City has developed high-efficiency water-saving modern agriculture and the total water consumption of Jinchang City was reduced to 0.66 billion m<sup>3</sup> in 2021 from 0.76 billion m<sup>3</sup> in 2017. Besides, the subproject will result in water savings, thus water supply of the subproject can be guaranteed.

**Table V-8:** Water balance of the subproject. Unit: m<sup>3</sup>/a

Item	Fresh water consumption	Water loss	Wastewater
Domestic water	912.50	182.50	730
Water for tourists	8760	1752	7008
Water consumption of component 1	29716	29716	0
Water consumption of component 2	6950	6950	0
Water consumption of component 3	229820	229820	0
Water consumption of component 4	163050	163050	0
Water consumption of component 5	2702907	2702907	0
Water consumption of component 7	97752.06	97752.06	0
Water consumption of component 8	12775	12775	0
Total	3252642.56	3244904.56	7738

Source: Domestic EIA, 2022.

293. The subproject will result in conservation of water resources, through the avoided future use of about 2.66 million m<sup>3</sup> water per year compared with existing water use by the farmers in existing operations (for similar crops and conditions at nearby sites), due to utilization of water saving technology.

**Table V-9:** Water savings of the subproject. Unit: m<sup>3</sup>/a

Item	Baseline water consumption	Project Water consumption	Water savings
Component 1	87983	29716	58267
Component 2	17650	6950	10700
Component 3	636300	229820	406480
Component 4	456525	163050	293475
Component 5	4595267	2702907	1892360
Total	5793725	3132443	2661282

Source: Domestic EIA and FSR, 2022.

294. During operation domestic wastewater and solar wash wastewater will be generated. Inappropriate wastewater disposal may cause soil and water pollution. These impacts will be managed through good design and wastewater management. The following mitigation measures will be implemented:

- (i) Domestic wastewater will be collected and treated in septic tank for recycling.
- (ii) Stormwater will be collected, stored at stormwater storage tank, then recycled as irrigation water.
- (iii) Storm water and sewage will be drained separately.
- (iv) Manure storage area and sheep shades will be installed with ceilings, windbreaks and intercepting drains. These basins will have leakage proofing treatment and overflow prevention measures.
- (v) A clay layer with a thickness of 25 cm will be applied to sheep shades and sick and dead sheep waste temporary storage area at the depth of 35cm beneath the sheepfold to prevent the infiltration of urine into groundwater. The soil cover on top of the clay layer will be regularly removed and replaced. Dry feces will be regularly cleaned with the dry-

cleaning method.

- (vi) Water proof measures will be implemented on medical waste storage rooms, and temporary feces storage basins. High density polyethylene with a thickness of 2-mm will be installed on the storage basins and facility for water proofing and leakage prevention.
- (vii) Wastewater from the sheep farm will be collected and treated in septic tank for recycling. The septic tank will be regularly cleaned and transported to organic fertilizer plant by fecal suction truck for fertilizer production.

295. Detailed wastewater mitigations during operation are presented in the EMP (**Appendix I**).

### **c) Groundwater**

296. To prevent ground water pollution, the following mitigation measures will be implemented.

- (i) Wastewater collection will be carried out with implementation of leak proofing materials and overflow prevention measures in waste collection ditches and basins;
- (ii) Manure storage area and sheep shades will be installed with ceilings, windbreaks and intercepting drains. These basins will have leakage proofing treatment and overflow prevention measures.
- (iii) A clay layer with a thickness of 25 cm will be applied to sheep shades and sick and dead sheep waste temporary storage area at the depth of 35cm beneath the sheepfold to prevent the infiltration of urine into groundwater. The soil cover on top of the clay layer will be regularly removed and replaced. Dry feces will be regularly cleaned with the dry-cleaning method.
- (iv) Water proof measures will be implemented on medical waste storage rooms, and temporary feces storage basins. High density polyethylene with a thickness of 2-mm will be installed on the storage basins and facility for water proofing and leakage prevention.

### **d) Reservoir protection**

297. To prevent reservoir pollution, the following mitigation measures will be implemented.

- (i) For component 4, usage of pesticides is prohibited during operation;
- (ii) For component 4, littering of domestic waste in is prohibited during operation;
- (iii) Train staff, nearby farmers, EMU, Sub-PMP and IA on reservoir protection including relevant regulations such as "Regulations on pollution Prevention and Control of Drinking Water Source Protection Areas" and "Guidelines for Environmental Protection of Centralized Drinking Water Sources".
- (iv) Establish emergency response on spill response procedures.

### **e) Noise**

298. Noise sources during operation will be mainly from the sheep farm and noise from the tourists. To mitigate noise impacts good design and operational practices will be implemented, including the site layout will be planned to reduce noise levels; use of low-noise equipment as much as possible; and, proper maintenance of equipment to minimize noise. In addition appropriate noise PPE will be provided to the workers who are likely to be exposed to high noise level environments to meet the requirements in Occupational Exposure Limits for Hazardous Agents in Workplace, Part 2: Physical Agents (GBZ 2.2-2007) and *EHS Guidelines* on occupational health and safety (OHS).

299. Estimated noise levels at the site boundaries of sheep farm during operation are presented below. Based on the results, the noise levels at the site boundaries of sheep farm



during operation can meet the national standard.

**Table V-10:** Estimated noise level of the sheep farms during operation Unit: dB(A)

Location	Noise from the component	Baseline noise level		Estimated noise level during operation		Compliance of standard
		Daytime	Nighttime	Daytime	Nighttime	
East boundary	42	45.8	39.2	47.3	43.8	Yes
South boundary	43	45.1	40.1	47.2	44.8	Yes
West boundary	42	44.3	41.0	46.3	44.5	Yes
North boundary	42	44.6	40.8	46.5	44.5	Yes

Note: The standard is 60 dB(A) (daytime) and 55 dB(A) (nighttime)

Source: Domestic EIA, 2022.

300. The following mitigation measures will be implemented:

- (i) Site layout for the project will be planned to reduce noise levels, especially with respect to sensitive receptors.
- (ii) Low-noise equipment will be used as far as possible, and noise reduction measures such as noise elimination, shock absorption, insulated enclosures and sound dampening materials on exterior walls will be implemented.
- (iii) All equipment will be properly maintained to minimize noise.
- (iv) Appropriate noise protective equipment will be provided to the workers who are likely to be exposed to high noise level environments to meet the requirements in occupational exposure limits for hazardous agents in workplace Part 2: physical agents (GBZ 2.2-2007) and EHS Guidelines on occupational health and safety (OHS).

301. Detailed noise mitigations are presented in the EMP (**Appendix I**).

#### **f) Solid Waste**

302. During operation, solid waste will be generated, including domestic waste from the villages. Inappropriate waste disposal can cause soil and water pollution. To prevent environmental degradation good solid waste management practices will be adopted in accordance with PRC requirements and *EHS Guidelines*, including provision of waste and recycling bins throughout the subproject sites; domestic waste will be collected, transported and disposed at the Yongchang County Municipal Landfill by the local sanitary department.

303. For waste package materials (package for fertilizers and pesticides excluded), the waste package material will be sold out for recycling.

304. For waste vegetable and fruit from the component 1, 2, 3 and 5, these waste will be recycled for organic fertilizer production in nearby organic fertilizer production plant.

305. For plastic film of the subprojects, mitigation measures are:

- (i) In accordance with PRC Regulation GB 13735-2017 for Polythethylene Blown Mulch Film for Agricultural Uses, the use of non-recyclable plastic film <0.1 mm thickness will be prohibited. Only non-recyclable plastic film of thickness >0.1 mm and/or recyclable film (regardless of thickness) will be used;
- (ii) During harvesting season, the film waste will be collected by farmers. The waste will be stockpiled and transported to “plastic film waste recycling centers” under the

management of the Gansu Agricultural Department for the production of recycled fine-particle plastic materials, for sale to manufacturers for various uses. These centers are established and operating throughout farming areas of Gansu Province; and,

- (iii) Film mulching practices which optimize the timing of mulching and timely removal of film to shorten the mulching period.
- (iv) Overall, the impact of plastic film use is considered low, as the total amount to be generated (about 3.0 tons in five years) is relatively small.

306. For waste packaging such as chemical fertilizer and pesticide, including for greenhouses, mitigation measures are:

- (i) The project will result in significant reduction in the use of chemical fertilizers and pesticides, which will reduce the amount of plastic packaging;
- (ii) Training will be conducted for farmers on reducing the use of fertilizers and pesticides, and, responsible disposal of packaging; and
- (iii) Plastic packaging will be collected by manufacturers for subsequent recycling.

307. For waste from the component 8, mitigation measures are:

- (i) Domestic waste containers will be provided at work sites. Domestic waste will be collected on a regular basis by local sanitation departments and transported for recycling, reuse, or disposal at a licensed waste incineration power plant in accordance with relevant PRC regulations and requirements;
- (ii) Manure in sheep sheds will be cleaned regularly with the dry clean method. Collected manure will be transported to nearby fertilizer production plants to produce organic fertilizer.
- (iii) Sick sheep will be quarantined if observed, then sheep sheds will be disinfected and the sheep in the same flock will be observed and treated to avoid infection. Medical care will be provided to the sick sheep by the veterinarians;
- (iv) Waste from dead sheep and sick sheep will be temporally stored at designated area with anti-seepage measures and waterproof measures, then transported and treated by 3rd party certificated dead livestock treatment center following PRC technical specifications for harmless treatment of sick and dead animals. Regular clean and disinfection will be conducted in and around the temporally storage area. Clear warning signs will be installed at the temporally storage area;
- (v) Medical wastes from veterinarian treatment will be temporally stored at a storage facility following PRC's GB18597-2001. Medical wastes will be transported and treated by an independent company certificated for medical waste treatment;

308. For other waste, the following mitigation measures will be implemented:

- (i) Waste dumpsters and recycling bins will be provided at all sites.
- (ii) Domestic waste will be collected on a regular basis and disposed at the Yongchang County Municipal Landfill by the local sanitary department.
- (iii) Waste battery and waste PV panels will be recycled by manufactures.
- (iv) Publicity and education on domestic waste classification and collection will be provided to the tourists.
- (v) The septic tanks will be regularly cleaned and transported to organic fertilizer plant by fecal suction truck for fertilizer production.

309. Detailed waste management mitigations during operation are presented in the EMP (Appendix I).

### g) Use of Agricultural Chemicals

310. Increases in agricultural production are usually accompanied by increases in agricultural chemical use (both fertilizer and pesticides).

311. **Fertilizer.** Chemical fertilizers include inorganic ions such as sulfate and chloride (which weaken soil structure) and cadmium and fluoride (which accumulate in soil and can ultimately affect plant growth). Organic fertilizers based on nitrogen and phosphorus are slow release compared with chemical fertilizer and tend not to be leached away by rainstorms after application. High organic matter levels in organic fertilizers also aerate soils and maintain soil structure and wetting capacity.

312. The project reductions in fertilizer use were estimated based on: (i) comparison with existing rates of fertilizer use for similar crop types within the existing facilities; and (ii) the installation of new measures to be introduced by the project. These include: (i) sensors installed in greenhouses for monitoring of soil nutrient and water levels; (ii) application of combined water and fertilizer application through drip irrigation systems. Based on FSR, the fertilizer consumption reduction by the subproject will be 0.4 ton/mu. Thus, annual fertilizer consumption reduction of the subproject will be 4,308.8 ton per year.

313. **Pesticides.** The project will reduce the use of pesticides through: (i) conversion of field-based farming to greenhouse farming (resulting in less exposure to pests); (ii) utilization of physical pest control methods (lamps with sticky pads) and biological pest control methods; (iii) the use of organic-based pesticides which break down in soil and water (these pesticides are already available in Gansu Province for commercial use). Based on FSR, the pesticides consumption reduction by the subproject will be 1 kg/mu (including 0.3 kg insecticides). Thus, annual pesticides and insecticides consumption reduction of the subproject will be 10.77 ton and 3.23 ton separately.

314. The application and management of pesticides under the project will comprise the following: (i) safe storage of pesticides in a specific room, with limited access; (ii) training of staff and farmers in integrated pest management; (iii) PPE will be provided to staff and farmers; and (iv) usage of pesticides which are classified as “hazardous” or for restricted-use by WHO and/or the government <sup>24</sup> will be prohibited.

### h) Chemicals and Hazardous Materials

315. In addition to agricultural chemicals, other chemicals to be used for project operations comprise fuel and oil (for machinery and vehicles). Toxic chemicals and their hazardous waste can have negative impacts on human health and the environment if not appropriately managed. These risks will be mitigated as follows.

- (i) A registry of all activities that involve the handling of potentially hazardous substances will be developed, including protocols for the storage, handling and spill response.
- (ii) All chemicals, toxic, hazardous, and harmful materials will be transported in spill-proof tanks with filling hoses and nozzles in working order.
- (iii) All chemicals, toxic, hazardous, and harmful materials will be stored in secure areas with impermeable surfaces and protective dikes such that spillage or leakage will be contained from affecting soil, surface water or groundwater systems. The area should be a 110% volume of storage capacity. Their usage will be strictly monitored and recorded.
- (iv) Good housekeeping procedures will be established to avoid the risk of spills.
- (v) Spills will be dealt with immediately, and personnel will be trained and tasked with this

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24 The Chinese Recommended Classification of Pesticides by Hazard and guidelines to classification is available at: [www.who.int/publications/i/item/9789240005662](http://www.who.int/publications/i/item/9789240005662). The PRC' list is available at: [www.moa.gov.cn/nybgb/2017/dsq/201802/t20180201\\_6136189.htm](http://www.moa.gov.cn/nybgb/2017/dsq/201802/t20180201_6136189.htm).

- responsibility.
- (vi) Workers will be properly trained before handling hazardous wastes and have the requisite protective equipment.
  - (vii) Hazardous waste will be temporarily stored in closed containers away from direct sunlight, wind, water and rain in secure designated areas with impermeable surfaces and protective dikes such that spillage or leakage will be contained.
  - (viii) Hazardous wastes including oily waste and waste chemicals will be collected and disposed of by licensed contractors.
  - (ix) The waste battery of the sightseeing vehicles will be recycled by manufactures during operation.
  - (x) Waste solar PV panel will be recycled by manufactures during operation.

### **i) Occupational and Community Health and Safety**

316. Project operation poses potential safety risks to workers and communities. To mitigate potential health and safety risks to workers and adjacent residents an operational phase EHS plan will be developed and implemented, including provision of PPE, traffic safety measures, outreach to the local community, site fencing, and training of staff and workers on EHS plan implementation. Then plan will include measures in the World Bank EHS Guidelines with respect to occupational and community health and safety.

317. The following mitigation measures will be implemented:

- (i) An operation phase EHS plan will be developed and implemented, and staff and workers will be trained regularly on its implementation. The plan will include measures in the World Bank *EHS Guidelines* with respect to occupational and community health and safety.
- (ii) The EHS plan will include the following:
  - a. PPE including goggles, gloves, safety shoes will be provided to workers. Noise protection equipment will be provided to workers in high-noise area.
  - b. Nearby communities will be informed of the potential risks of the subproject operation if applicable.
  - c. Training will be provided to staff and workers on occupational health and safety, and emergency response.
  - d. Vehicles transporting materials or cargo will slow down and not use their horn when passing through or nearby sensitive locations, such as residential communities, schools and hospitals.
  - e. Safe traffic control measures, including road signs and flag persons to warn of dangerous conditions will be implemented as needed. Vehicles and machinery will undergo regular maintenance of to minimize potential accidents caused by equipment malfunction.
  - f. COVID-19 prevention and control measures will be taken following the PRC government's regulations and guidelines or international good practice guidelines as updated in the future<sup>25</sup>, such as disinfection/cleaning of offices and work places, on-site temperature checks, social distancing measures,

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<sup>25</sup> See e.g.:

World Health Organization. 2020. Considerations for public health and social measures in the workplace in the context of COVID-19. Geneva. Available at: <https://www.who.int/publications-detail/considerations-for-public-health-and-social-measures-in-the-workplace-in-the-context-of-covid-19>.

HM Government. 2020. Working safely during COVID-19 in construction and other outdoor work. Guidance for employers, employees and the self-employed. Available at: <https://assets.publishing.service.gov.uk/media/5eb961bfe90e070834b6675f/working-safely-during-covid-19-construction-outdoors-110520.pdf>.

The Canadian Construction Association – COVID-19 Standard Protocols. Available here: <https://www.cca-acc.com/wp-content/uploads/2020/04/CCA-COVID-19-Standardized-Protocols-for-All-Canadian-Construction-Sites-04-16-20.pdf><https://www.cca-acc.com/wp-content/uploads/2020/04/CCA-COVID-19-Standardized-Protocols-for-All-Canadian-Construction-Sites-04-16-20.pdf>.

mandatory use of PPE such as facemasks, provision of handwashing stations and hand sanitizers etc., and procedures to be adopted in the event any worker is infected with COVID-19.

318. Detailed mitigations are presented in the EMP (**Appendix I**).

#### **j) Emergency Response Plan**

319. An operation emergency risk and response plan for all components will also be established in accordance with the PRC National Environmental Emergency Plan (24 January 2006) and other relevant PRC laws, regulations and standards. Major elements of the emergency response plan are presented in the EMP.

### **E. Indirect, Induced and Cumulative Impacts**

320. Indirect impacts are adverse and/or beneficial environmental impacts that cannot be immediately traced to a project activity but can be causally linked. Induced impacts are adverse and/or beneficial impacts on areas and communities from unintended but predictable developments caused by a project which may occur later or at a different location. Cumulative impacts are the combination of multiple impacts from existing projects, the proposed project, and anticipated future projects that may result in significant adverse and/or beneficial impacts that would not be expected in case of a stand-alone project.<sup>26</sup>

321. Indirect impacts. A potential indirect risk is that the hydrology of streams downstream of the subproject sites is negatively affected, due to water extraction and interception of runoff for the project. This risk is considered minimal because the subproject will result in water savings. Besides, operation of the component 7 may have a negative impact on the sustainability of the feed supplier, the beef price etc. The risk is considered minimal because the capacity of the subproject 6 is very limited compared to the capacity of Jinchang City.

322. **Induced impacts.** A likely induced impact is that the establishment of infrastructure and capacity achieved by the project will result in scaling up of agricultural activities after the project, including increases in workers, further land intensification, and/or subsequent pressures on public utilities (e.g. roads and water and electricity easements) and natural resources, especially water use. Increased water use is especially significant for Gansu Province, which is largely arid and has relatively limited fresh water resources.

323. These risks are limited by the following: (i) annual water allocation quotas for all transboundary rivers in Gansu Province are controlled and issued by the National Yellow River Management Committee. This includes the Yellow River (which drains across the eastern PRC) and Hei River (which drains to Inner Mongolia Province) and is to ensure that downstream provinces receive sufficient water for development and conservation; and (ii) application of the national Basic Farmland Redline and Ecological System Production Redline Policy. Newly defined national “redlines” demarcated in the past five years restrict the expansion of economic development. A beneficial induced impact may be the increase in demand for organic fertilizer, strengthening the viability of the industry and reducing demand for chemical-based fertilizers.

324. **Cumulative impacts.** The cumulative impacts of the subprojects in combination with existing and future agricultural projects will include increased use in water resources and agricultural chemicals and potential soil pollution from the sheep breeding. At national and provincial planning levels, these risks are already well recognized through key policies (e.g. see above), which provide targets to reduce water use, improve farming efficiency, and convert

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26 ADB. 2011. Sourcebook for Safeguard Requirement 1: Environment. Manila.

to green production systems. The project has been designed to minimize its contribution to cumulative impacts, through a range of design features, including highly controlled irrigation supply, increased use of greenhouse farming, wastewater recycling, regular replacement of the soil at the sheep farms and use of drip irrigation in controlled circumstances (acknowledging the limitation of drip irrigation such as risk of clogging).

## F. Greenhouse Gas Emissions

325. **Greenhouse gases emissions.** The GHG emissions from the subproject will mainly result from the use of electricity to run the facilities and equipment. Annual power consumption and respective GHG emissions are presented in **Table V-11**. The annual GHG emissions from the power consumption are estimated at 4,908.6 tons of CO<sub>2</sub>.

**Table V-11:** Annual energy consumption.

Component	Power consumption (thousand kwh)	CO <sub>2</sub> emissions (t/a)
1	125.1	72.2
2	352.3	203.3
3	452.4	261.0
4	0	0.0
5	657.1	379.1
6	78.5	45.3
7	112.5	64.9
8	766.0	442.0
9	0	0.0
Total	<b>2543.9</b>	<b>1467.8</b>

Source: TrTA consultant.

326. **GHG reduction by Solar PV, lighting and heating.** This will contribute to the reduction of GHG emissions compared with the coal based methods. The GHG reduction is estimated at **938.6 tons** CO<sub>2</sub>e per year.

327. **GHG reduction by green building.** This will contribute to the reduction of GHG emissions. The GHG reduction is estimated at **107.0 tons** CO<sub>2</sub>e per year.

328. **GHG reduction by manure treatment and fertilizer replacement.** This will contribute to the reduction of GHG emissions. The GHG reduction is estimated at **11,011.1 tons** CO<sub>2</sub>e per year.

329. **Carbon sequestration.** The carbon sequestration will be mainly contributed by the proposed afforestation and re-vegetation activities in the project. The carbon sequestration is estimated at about **5,390.0 tons** of CO<sub>2</sub>e/yr.

330. **Net Emissions.** The total CO<sub>2</sub>e emissions generated by the subproject, every year during the operation, will be about 1,467.8 tons/yr, while the total CO<sub>2</sub>e reduction from the subproject will be 17,446.8 tons of CO<sub>2</sub>e/yr. Hence, the net GHG emission reduction from the subproject will be 15,979.0 tons/yr.

## G. Climate Risk

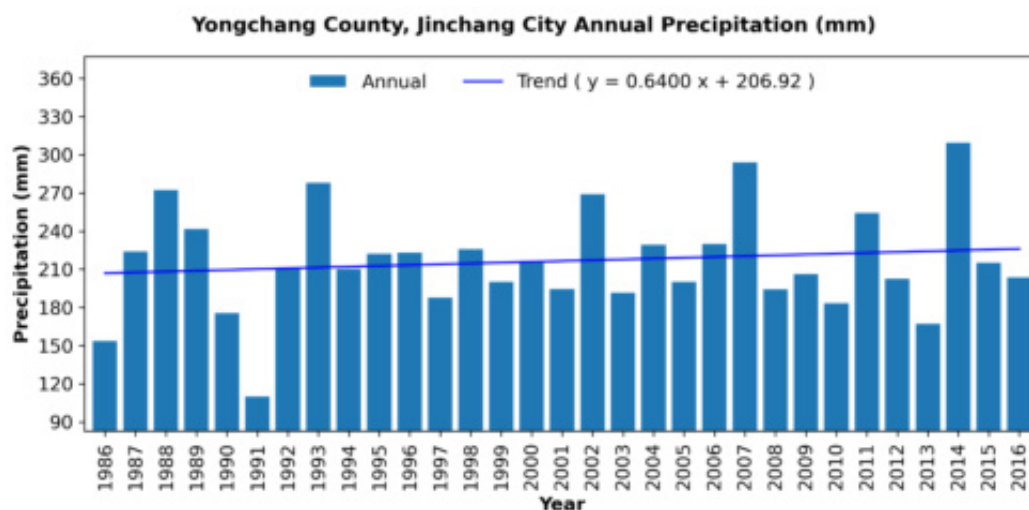
331. A climate risk assessment was conducted by the TrTA Consultant.

### a) Annual and Seasonal Mean Precipitation

332. The historical annual total precipitation in Yongchang is only 219.6mm, mainly falling from May to September with significant interannual variabilities; highest in August, it is about

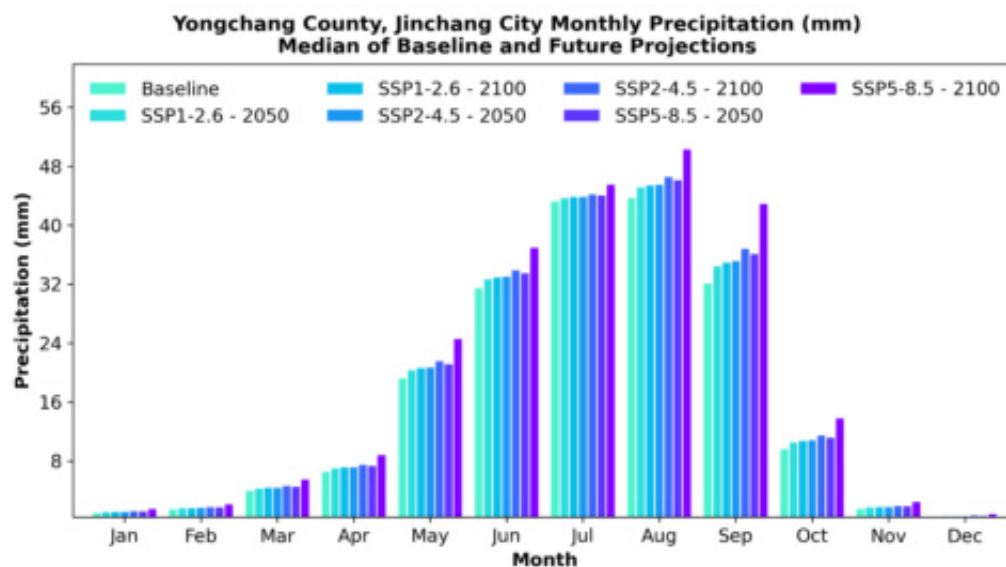
53.6 mm. The historical observational precipitation has no clear change trend. However, the precipitation is projected to increase, under the low emission scenario, SSP1-2.6, the annual precipitation will increase 4.6% in 2050 and 5.6% in 2100. Under the high emission scenario SSP5-8.5, precipitation will increase 7.4% in 2050 and 21.1% in 2100. However, the intermodel variabilities are significant; in the 5% lower bound of the ensemble, the precipitation is decreasing, while the 95% high bound is about 87.5% increase.

**Figure V-1:** Yongchang County, Jinchang City, Annual Precipitation Historical (mm).



Source: TrTA consultants

**Figure V-2:** Yongchang County, Jinchang City, Monthly Precipitation (mm) Median of Baseline and Future Projections.



Source: TrTA consultants

**Table V-12: Yongchang County, Jinchang City, Seasonal and Annual Precipitation Baseline (mm) and Future Changes (%) – 50<sup>th</sup> Percentile (Brackets 5<sup>th</sup> and 95<sup>th</sup> Percentile).**

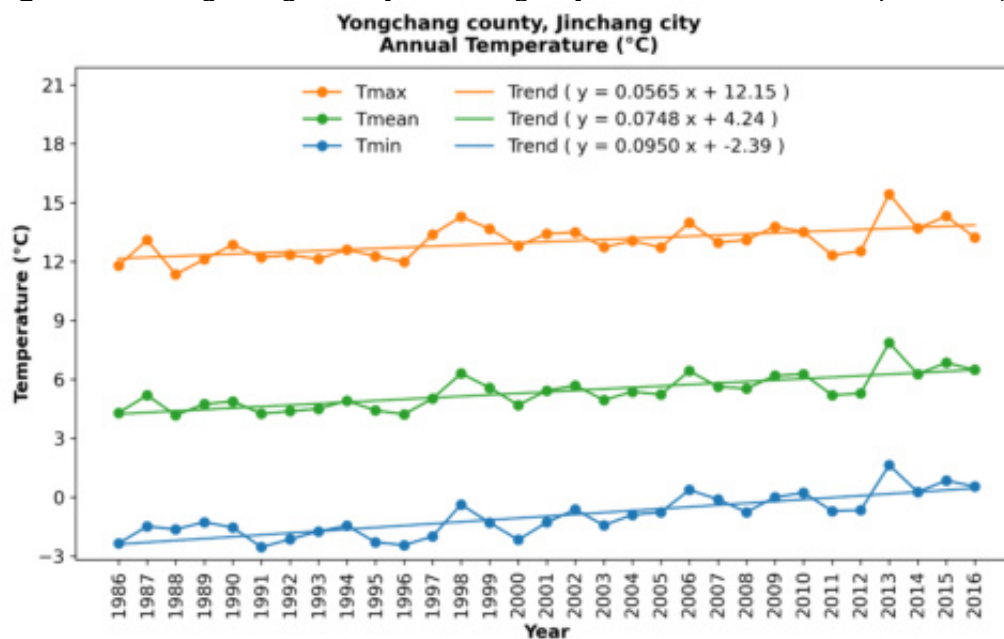
Season	Year	SSP1-2.6	SSP2-4.5	SSP5-8.5
DJF	Baseline	4.75	4.75	4.75
	2050	10.84 (-0.63, 31.90)	14.09 (-0.82, 41.47)	18.43 (-1.07, 54.23)
	2100	13.22 (-0.77, 38.92)	21.89 (-1.28, 64.44)	50.29 (-2.93, 148.02)
MAM	Baseline	34.71	34.71	34.71
	2050	6.68 (-3.83, 20.80)	8.69 (-4.98, 27.04)	11.36 (-6.52, 35.36)
	2100	8.15 (-4.68, 25.37)	13.50 (-7.74, 42.01)	31.00 (-17.79, 96.50)
JJA	Baseline	130.78	130.78	130.78
	2050	2.50 (-7.89, 13.14)	3.25 (-10.26, 17.08)	4.25 (-13.42, 22.34)
	2100	3.05 (-9.63, 16.03)	5.05 (-15.94, 26.54)	11.60 (-36.62, 60.97)
SON	Baseline	49.36	49.36	49.36
	2050	7.90 (-4.01, 31.34)	10.27 (-5.21, 40.74)	13.43 (-6.81, 53.27)
	2100	9.64 (-4.89, 38.23)	15.96 (-8.10, 63.30)	36.66 (-18.60, 145.40)
ANN	Baseline	219.61	219.61	219.61
	2050	4.55 (-6.22, 18.85)	5.92 (-8.09, 24.50)	7.74 (-10.57, 32.04)
	2100	5.56 (-7.59, 22.99)	9.20 (-12.56, 38.07)	21.13 (-28.86, 87.45)

Source: TrTA consultants

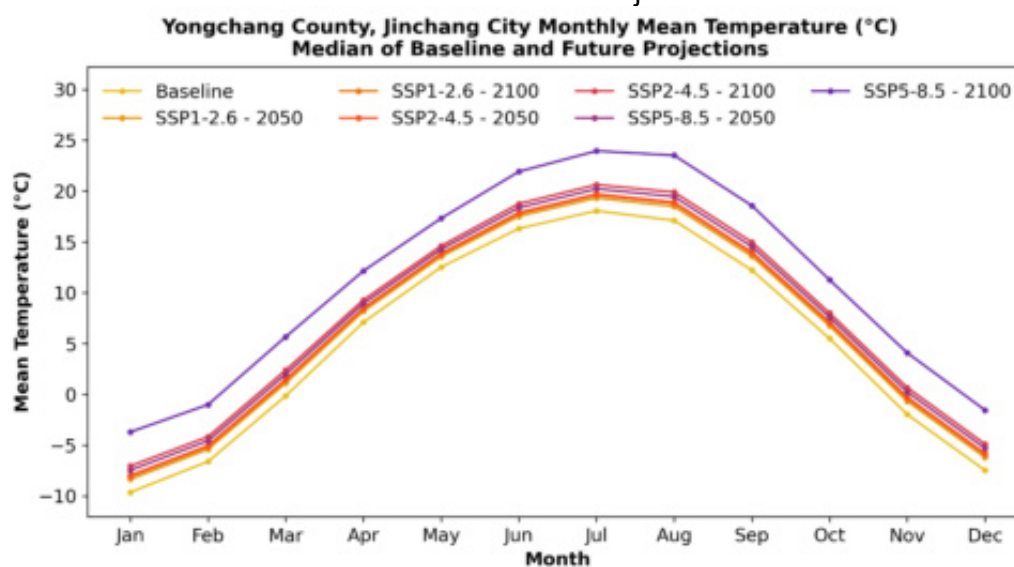
**b) Annual and Season Mean, Maximum and Minimum Temperature**

333. The project location is in a cold-arid climate zone, and the annual mean temperature is 5.9 °C, with -9.4 °C in January and 18.8 °C in July; the mean temperature in Yongchang has been getting warmer 0.75 °C per decades from 1986 to 2016. The annual mean maximum temperature is 13.4 °C, and the minimum temperature is -0.34°C. The maximum temperature has 0.57°C per decade, while the minimum temperature has a 0.95 °C per decade warming trend. Under the climate change scenarios, the temperature will continue the increase, SSP1-2.6 has the slower increase, SSP5-8.5 has the fastest increase, and SSP2-4.5 is in the middle. Under SSP5-8.5, in 2050, the mean temperature in Yongchang will increase by 2.1°C, and in 2100 it will be 5.8 °C. The warming signal is stronger than the global average. The minimum temperature in SSP5-8.5 will increase by 6.1 °C.



**Figure V-3: Yongchang County, Jinchang City Historical Annual Temperature (°C)****Trend.**

Source: TrTA consultants

**Figure V-4: Yongchang County, Jinchang City, Monthly Mean Temperature (°C) Median of Baseline and Future Projections.**

Source: TrTA consultants

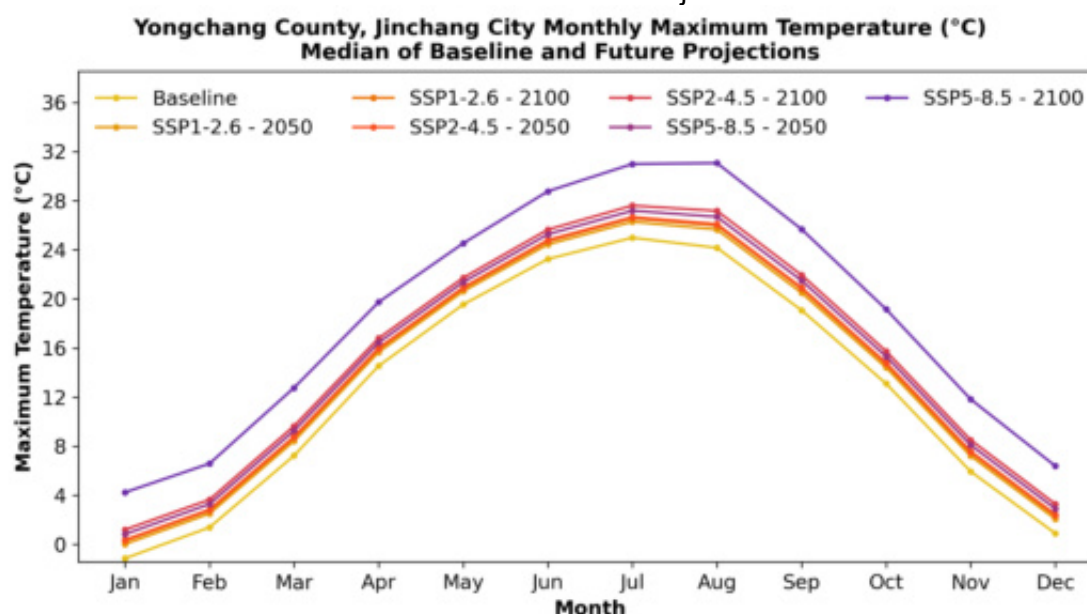
**Table V-13: Yongchang County, Jinchang City, Seasonal and Annual Mean Temperature Baseline (°C) and Future Changes (°C) – 50<sup>th</sup> Percentile (Brackets 5<sup>th</sup> and 95<sup>th</sup> Percentile).**

Season	Year	SSP1-2.6	SSP2-4.5	SSP5-8.5
DJF	Baseline	-7.35	-7.35	-7.35
	2050	1.25 (0.90, 1.67)	1.63 (1.17, 2.18)	2.13 (1.52, 2.85)
	2100	1.53 (1.09, 2.04)	2.53 (1.81, 3.38)	5.82 (4.16, 7.77)

	Baseline	7.15	7.15	7.15
<b>MAM</b>	2050	1.13 (0.79, 1.57)	1.46 (1.03, 2.04)	1.91 (1.35, 2.67)
	2100	1.37 (0.97, 1.91)	2.27 (1.60, 3.17)	5.22 (3.68, 7.28)
	Baseline	17.83	17.83	17.83
<b>JJA</b>	2050	1.29 (0.96, 1.69)	1.67 (1.25, 2.20)	2.19 (1.63, 2.88)
	2100	1.57 (1.17, 2.07)	2.60 (1.94, 3.42)	5.97 (4.46, 7.86)
	Baseline	5.86	5.86	5.86
<b>SON</b>	2050	1.31 (0.92, 1.74)	1.70 (1.20, 2.26)	2.22 (1.57, 2.95)
	2100	1.59 (1.13, 2.12)	2.64 (1.87, 3.51)	6.06 (4.29, 8.06)
	Baseline	5.87	5.87	5.87
<b>ANN</b>	2050	1.24 (0.89, 1.67)	1.62 (1.16, 2.17)	2.11 (1.52, 2.84)
	2100	1.52 (1.09, 2.04)	2.51 (1.81, 3.37)	5.77 (4.15, 7.74)

Source: TrTA consultants

**Figure V-5: Yongchang County, Jinchang City, Monthly Maximum Temperature (°C) Median of Baseline and Future Projections.**



Source: TrTA consultants

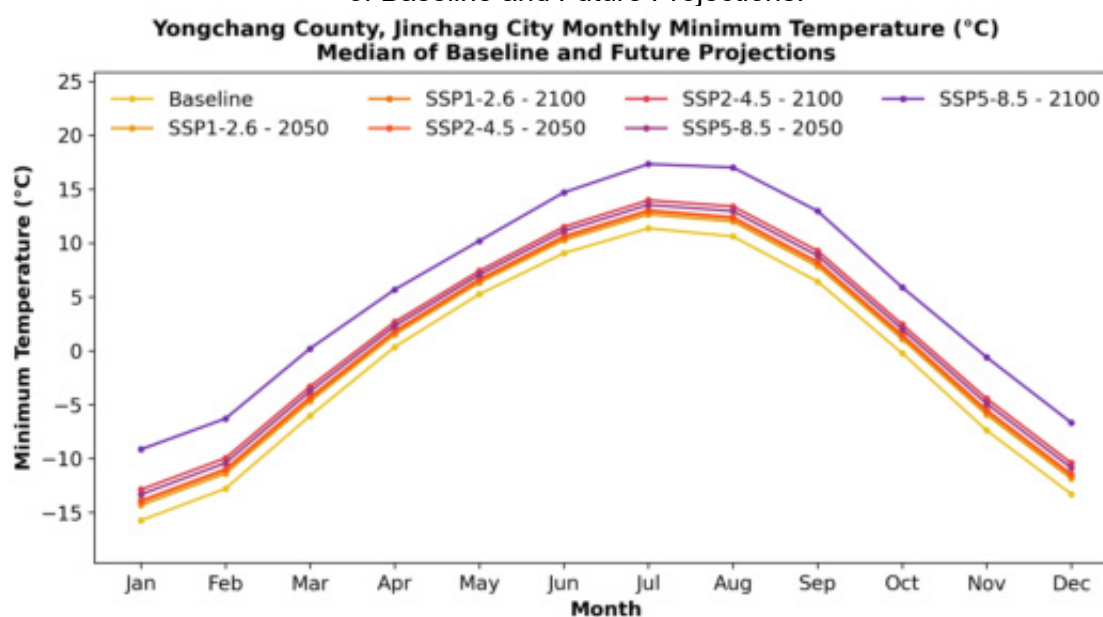
**Table V-14: Yongchang County, Jinchang City, Seasonal and Annual Maximum Temperature Baseline (°C) and Future Changes (°C) – 50<sup>th</sup> Percentile (Brackets 5<sup>th</sup> and 95<sup>th</sup> Percentile).**

Season	Year	SSP1-2.6	SSP2-4.5	SSP5-8.5
<b>DJF</b>	Baseline	0.92	0.92	0.92
	2050	1.15 (0.74, 1.61)	1.50 (0.97, 2.09)	1.96 (1.27, 2.73)
	2100	1.41 (0.91, 1.96)	2.33 (1.50, 3.24)	5.36 (3.45, 7.45)
<b>MAM</b>	Baseline	14.40	14.40	14.40
	2050	1.13 (0.80, 1.97)	1.47 (1.04, 2.56)	1.92 (1.36, 3.35)
	2100	1.38 (0.98, 2.41)	2.28 (1.61, 3.98)	5.24 (3.71, 9.15)
<b>JJA</b>	Baseline	24.76	24.76	24.76

	2050	1.33 (0.94, 1.90)	1.72 (1.22, 2.47)	2.25 (1.60, 3.23)
	2100	1.62 (1.15, 2.32)	2.68 (1.90, 3.84)	6.15 (4.36, 8.81)
	Baseline	13.39	13.39	13.39
	2050	1.33 (0.91, 1.85)	1.73 (1.18, 2.41)	2.27 (1.54, 3.15)
	2100	1.63 (1.11, 2.26)	2.69 (1.83, 3.75)	6.18 (4.21, 8.61)
	Baseline	13.37	13.37	13.37
	2050	1.24 (0.85, 1.83)	1.61 (1.10, 2.38)	2.10 (1.44, 3.12)
	2100	1.51 (1.03, 2.24)	2.49 (1.71, 3.70)	5.73 (3.93, 8.50)

Source: TrTA consultants

**Figure V-6: Yongchang County, Jinchang City, Monthly Minimum Temperature (°C) Median of Baseline and Future Projections.**



Source: TrTA consultants

**Table V-15: Yongchang County, Jinchang City, Seasonal and Annual Minimum Temperature Baseline (°C) and Future Changes (°C) – 50<sup>th</sup> Percentile (Brackets 5<sup>th</sup> and 95<sup>th</sup> Percentile).**

Season	Year	SSP1-2.6	SSP2-4.5	SSP5-8.5
	Baseline	-13.32	-13.32	-13.32
	2050	1.42 (1.00, 1.82)	1.84 (1.30, 2.36)	2.41 (1.70, 3.09)
	2100	1.73 (1.22, 2.22)	2.86 (2.02, 3.67)	6.57 (4.64, 8.43)
	Baseline	0.54	0.54	0.54
	2050	1.19 (0.88, 1.84)	1.54 (1.14, 2.39)	2.02 (1.50, 3.12)
	2100	1.45 (1.07, 2.24)	2.40 (1.78, 3.71)	5.51 (4.08, 8.52)
	Baseline	11.19	11.19	11.19
	2050	1.29 (0.95, 1.68)	1.68 (1.24, 2.19)	2.20 (1.62, 2.86)
	2100	1.58 (1.16, 2.05)	2.61 (1.92, 3.40)	6.00 (4.41, 7.80)
	Baseline	0.25	0.25	0.25
	2050	1.40 (0.97, 1.98)	1.82 (1.26, 2.57)	2.38 (1.65, 3.36)
	2100	1.70 (1.18, 2.41)	2.82 (1.96, 3.99)	6.48 (4.50, 9.18)
	Baseline	-0.34	-0.34	-0.34
	2050	1.32 (0.95, 1.83)	1.72 (1.24, 2.38)	2.25 (1.62, 3.11)
	2100	1.61 (1.16, 2.23)	2.67 (1.92, 3.69)	6.14 (4.41, 8.48)

Source: TrTA consultants

### c) Extreme Daily Precipitation

334. In the semi-arid area, the mean precipitation is relatively low. However, extreme precipitation can have a devastating impact with a 100-year return precipitation predicted to reach 54.1 mm. The extreme daily precipitation for different Average Recurrence Intervals (ARI) from 2 to 300 years is projected to increase in all scenarios. Rarer events have a more significant percentage of increase, is implicates the severe flash flood could happen. Under SSP1-2.6 2050, the 100 ARI extreme precipitation will increase by 13.9%, and under SSP5-8.5, it may rise by 64.5%. For other scenarios, the changes lies between these two values.

**Table V-16:** Yongchang County, Jinchang City, Extreme Precipitation Daily Baseline (mm) and Future Changes (%) – 50<sup>th</sup> Percentile (Brackets 5<sup>th</sup> and 95<sup>th</sup> Percentile).

ARI	Baseline	SSP1-2.6 – 2050	SSP1-2.6 – 2100	SSP2-4.5 – 2050	SSP2-4.5 – 2100	SSP5-8.5 – 2050	SSP5-8.5 – 2100
<b>2</b>	20.91	7.21	8.80	9.37	14.56	12.26	33.46
		(0.09, 13.92)	(0.12, 16.98)	(0.12, 18.10)	(0.19, 28.12)	(0.16, 23.67)	(0.44, 64.60)
<b>3</b>	24.26	7.92	9.66	10.29	15.99	13.46	36.74
		(0.15, 16.39)	(0.19, 20.00)	(0.20, 21.31)	(0.31, 33.12)	(0.26, 27.87)	(0.71, 76.07)
<b>5</b>	28.20	7.49	9.14	9.74	15.13	12.73	34.76
		(0.05, 19.39)	(0.06, 23.65)	(0.06, 25.21)	(0.10, 39.17)	(0.08, 32.96)	(0.22, 89.97)
<b>10</b>	33.69	7.37	9.00	9.59	14.89	12.53	34.21
		(0.23, 21.02)	(0.28, 25.65)	(0.30, 27.33)	(0.47, 42.46)	(0.39, 35.74)	(1.08, 97.54)
<b>15</b>	37.03	7.37	8.99	9.57	14.88	12.52	34.17
		(0.45, 22.09)	(0.55, 26.95)	(0.59, 28.72)	(0.91, 44.62)	(0.77, 37.55)	(2.10, 102.49)
<b>25</b>	41.35	7.91	9.65	10.28	15.98	13.44	36.70
		(0.71, 23.59)	(0.87, 28.78)	(0.92, 30.66)	(1.43, 47.65)	(1.21, 40.10)	(3.29, 109.44)
<b>50</b>	47.57	9.29	11.33	12.08	18.76	15.79	43.10
		(0.83, 25.83)	(1.01, 31.51)	(1.08, 33.58)	(1.67, 52.18)	(1.41, 43.91)	(3.85, 119.85)
<b>100</b>	54.13	11.23	13.70	14.60	22.69	19.10	52.12
		(0.07, 29.54)	(0.08, 36.03)	(0.09, 38.40)	(0.13, 59.66)	(0.11, 50.21)	(0.31, 137.04)
<b>200</b>	61.12	13.02	15.88	16.92	26.29	22.13	60.40
		(-1.73, 33.94)	(-2.11, 41.40)	(-2.25, 44.12)	(-3.50, 68.56)	(-2.94, 57.70)	(-8.03, 157.47)
<b>300</b>	65.46	13.91	16.97	18.08	28.09	23.64	64.53
		(-2.72, 36.92)	(-3.32, 45.04)	(-3.54, 48.00)	(-5.50, 74.58)	(-4.63, 62.77)	(-12.63, 171.32)

Source: TrTA consultants

### d) Extreme Daily Maximum Temperature

335. Extreme temperature occurs in the hot summer of Yongchang. For example, the 2-year return high temperature is 31.3°C, and the 100-year return extreme high temperature reaches 34.8°C. Therefore, the extreme temperature can be a risk for all the activities and constructions during the summer. The extreme temperature will increase under all the scenarios; for example, a 100-year event will increase 2.3°C under SSP1-2.6 and 6.3°C under SSP5-8.5.

**Table V-17:** Yongchang County, Jinchang City, Extreme Temperature Daily Baseline (°C) and Future Changes (°C) – 50<sup>th</sup> Percentile (Brackets 5<sup>th</sup> and 95<sup>th</sup> Percentile).

ARI	Baseline	SSP1-2.6 – 2050	SSP1-2.6 – 2100	SSP2-4.5 – 2050	SSP2-4.5 – 2100	SSP5-8.5 – 2050	SSP5-8.5 – 2100
<b>2</b>	31.26	1.84	2.02	2.10	3.01	2.66	5.73
		(0.95, 2.80)	(0.59, 3.20)	(1.17, 2.98)	(2.15, 4.85)	(1.61, 4.01)	(4.57, 8.25)
<b>3</b>	31.88	1.86	2.02	2.19	3.00	2.79	5.90
		(0.84, 2.80)	(0.52, 3.18)	(1.29, 3.06)	(2.22, 4.96)	(1.57, 4.13)	(4.49, 8.43)
<b>5</b>	32.50	1.92	2.14	2.22	3.13	2.90	6.00
		(0.62, 2.87)	(0.49, 3.08)	(1.23, 3.17)	(2.20, 5.10)	(1.58, 4.06)	(4.31, 8.77)
<b>10</b>	33.18	1.97	2.16	2.32	3.22	2.90	6.11
		(0.63, 3.04)	(0.46, 3.31)	(1.10, 3.42)	(2.04, 5.33)	(1.59, 4.02)	(3.96, 9.24)
<b>15</b>	33.53	2.04	2.17	2.41	3.29	2.93	6.16
		(0.63, 3.19)	(0.44, 3.46)	(1.03, 3.44)	(1.98, 5.53)	(1.56, 4.15)	(3.72, 9.48)
<b>25</b>	33.92	1.97	2.24	2.49	3.27	2.97	6.21
		(0.60, 3.47)	(0.41, 3.64)	(0.93, 3.46)	(1.92, 5.76)	(1.45, 4.45)	(3.57, 9.79)
<b>50</b>	34.39	2.07	2.21	2.61	3.31	3.11	6.19
		(0.55, 3.84)	(0.37, 3.88)	(0.72, 3.70)	(1.64, 6.08)	(1.31, 4.86)	(3.42, 10.19)
<b>100</b>	34.80	2.17	2.23	2.70	3.33	3.14	6.22
		(0.40, 4.20)	(0.33, 4.11)	(0.45, 3.95)	(1.26, 6.40)	(1.17, 5.27)	(3.32, 10.60)
<b>200</b>	35.16	2.27	2.29	2.76	3.28	3.21	6.25
		(0.23, 4.57)	(0.29, 4.29)	(0.36, 4.20)	(0.93, 6.71)	(1.03, 5.68)	(3.21, 11.00)
<b>300</b>	35.35	2.30	2.34	2.77	3.26	3.25	6.27
		(0.10, 4.78)	(0.26, 4.38)	(0.28, 4.34)	(0.78, 6.90)	(0.95, 5.91)	(3.08, 11.23)

Source: TrTA consultants

**e) Extreme Wind Speed**

336. Extreme wind speed in Yongchang can be damaging, the 50-year return event is 35.9m/s, and it is 28.1m/s for the 100-year event. Extreme wind speed is projected to increase 1-4% in the 75th percentile of the GCMs, with broader confidence bound, from decrease to increase, and not linearly correlated to temperature change scenarios. The uncertainties in extreme wind speed projection from GCMs should not hinder the adaptation action; the record-breaking historical extreme wind events in recent years have shown it is possible to have more extreme wind in this area.

**Table V-18:** Yongchang County, Jinchang City, Extreme Wind Speed Baseline (m/s) and Future Changes (%) – 75<sup>th</sup> Percentile (Brackets 5<sup>th</sup> and 95<sup>th</sup> Percentile).

ARI	Baseline	SSP1-2.6 – 2050	SSP1-2.6 – 2100	SSP2-4.5 – 2050	SSP2-4.5 – 2100	SSP5-8.5 – 2050	SSP5-8.5 – 2100
<b>2</b>	14.48	0.84	1.49	1.20	0.40	0.87	0.08
		(-5.56, 3.57)	(-8.93, 4.19)	(-8.06, 3.13)	(-11.26, 3.95)	(-7.03, 4.13)	(-12.83, 2.14)
<b>3</b>	16.20	0.73	1.68	1.44	0.54	0.73	0.13
		(-5.47, 3.68)	(-9.18, 5.11)	(-8.23, 3.83)	(-11.37, 4.35)	(-6.87, 5.16)	(-12.53, 3.06)
<b>5</b>	18.13	1.47	1.63	1.48	1.06	0.76	0.43
		(-5.38, 3.57)	(-9.49, 4.19)	(-8.66, 3.13)	(-11.37, 3.95)	(-6.93, 4.13)	(-12.66, 2.14)

		3.80)	6.07)	4.55)	4.78)	6.21)	4.22)
		2.09	1.59	1.89	1.70	0.89	0.79
<b>10</b>	20.54	(-5.40, 4.26)	(-9.34, 6.82)	(-9.78, 5.38)	(-11.54, 5.35)	(-7.45, 7.71)	(-13.29, 5.06)
		2.36	1.63	2.10	2.02	1.01	1.18
<b>15</b>	21.90	(-5.57, 4.61)	(-9.30, 7.15)	(-9.84, 5.85)	(-11.86, 5.77)	(-7.77, 8.59)	(-13.59, 5.39)
		2.70	1.57	2.31	2.36	1.20	1.83
<b>25</b>	23.59	(-5.91, 5.03)	(-9.26, 7.51)	(-9.89, 6.41)	(-12.24, 6.34)	(-8.17, 9.43)	(-14.13, 5.73)
		3.43	1.66	2.81	2.44	1.44	2.14
<b>50</b>	25.86	(-6.47, 5.57)	(-9.17, 8.02)	(-9.95, 7.22)	(-12.67, 6.78)	(-8.68, 10.47)	(-15.05, 6.21)
		4.06	1.87	3.22	2.95	1.77	2.34
<b>100</b>	28.10	(-7.07, 6.11)	(-9.33, 8.47)	(-10.26, 8.07)	(-13.06, 7.18)	(-9.35, 11.47)	(-15.86, 6.63)
		4.13	2.05	3.55	3.44	2.23	2.54
<b>200</b>	30.34	(-7.46, 6.68)	(-9.50, 8.90)	(-10.75, 8.81)	(-13.39, 7.57)	(-9.97, 12.41)	(-16.47, 7.02)
		4.19	2.15	3.70	3.71	2.51	2.66
<b>300</b>	31.65	(-7.57, 7.03)	(-9.59, 9.17)	(-11.03, 9.25)	(-13.56, 7.79)	(-10.32, 12.94)	(-16.56, 7.29)

Source: TrTA consultants

#### f) SPEI Drought Index

337. The SPEI drought index analysis showed that the drought condition increased with temperature, even the increase in precipitation could compensate for the water loss from evapotranspiration. However, the arid nature will not change with the increased potential evapotranspiration caused by warmer temperatures. The aridity index (AI) is an indicator to show the average climate condition. An AI of 0.26 suggests that Yongchang will remain an arid zone, dropping to 0.23 by 2100 under the SSP5-8.5 scenario.

**Table V-19:** Yongchang County, Jinchang City, SPEI categories (%) Median for the Baseline period and the future projections for the periods of 2050 and 2100 under SSP1-2.6, SSP2-4.5 and SSP5-8.5.

Scenario	Drought Category	1 mon	2 mons	3 mons	4 mons	5 mons	6 mons	7 mons	8 mons
Baseline	Moderate	100.0	78.1	52.1	39.1	31.3	26.0	22.3	19.5
SSP1-2.6_2050	Moderate	100.0	96.9	64.6	48.4	38.8	32.3	27.7	24.2
SSP1-2.6_2100	Moderate	100.0	100.0	71.9	53.9	43.1	35.9	30.8	27.0
SSP2-4.5_2050	Moderate	100.0	100.0	75.0	56.3	45.0	37.5	32.1	28.1
SSP2-4.5_2100	Moderate	100.0	100.0	100.0	84.4	67.5	56.3	48.2	42.2
SSP5-8.5_2050	Moderate	100.0	100.0	90.6	68.0	54.4	45.3	38.8	34.0
SSP5-8.5_2100	Moderate	100.0	100.0	100.0	100.0	100.0	94.3	80.8	70.7
Baseline	Severe	34.4	17.2	11.5	8.6	6.9	5.7	4.9	4.3
SSP1-2.6_2050	Severe	65.6	32.8	21.9	16.4	13.1	10.9	9.4	8.2
SSP1-2.6_2100	Severe	87.5	43.8	29.2	21.9	17.5	14.6	12.5	10.9

SSP2-4.5_2050	Severe	96.9	48.4	32.3	24.2	19.4	16.2	13.8	12.1
SSP2-4.5_2100	Severe	100.0	75.0	50.0	37.5	30.0	25.0	21.4	18.8
SSP5-8.5_2050	Severe	100.0	68.8	45.8	34.4	27.5	22.9	19.6	17.2
SSP5-8.5_2100	Severe	100.0	100.0	100.0	100.0	93.8	78.1	67.0	58.6
Baseline	Extreme	9.4	4.7	3.1	2.3	1.9	1.6	1.3	1.2
SSP1-2.6_2050	Extreme	15.6	7.8	5.2	3.9	3.1	2.6	2.2	2.0
SSP1-2.6_2100	Extreme	21.9	10.9	7.3	5.5	4.4	3.7	3.1	2.7
SSP2-4.5_2050	Extreme	25.0	12.5	8.3	6.3	5.0	4.2	3.6	3.1
SSP2-4.5_2100	Extreme	71.9	35.9	24.0	18.0	14.4	12.0	10.3	9.0
SSP5-8.5_2050	Extreme	50.0	25.0	16.7	12.5	10.0	8.3	7.1	6.3
SSP5-8.5_2100	Extreme	100.0	100.0	100.0	82.8	66.3	55.2	47.3	41.4

Source: TrTA consultants

**Table V-20: Yongchang County, Jinchang City, Aridity Index Baseline (n/a) and Future Projections (n/a) – 50<sup>th</sup> Percentile (Brackets 5<sup>th</sup> and 95<sup>th</sup> Percentile).**

Year	SSP1-2.6	SSP2-4.5	SSP5-8.5
Baseline	0.26	0.26	0.26
	0.24	0.24	0.24
2050	(0.22, 0.27)	(0.22, 0.27)	(0.21, 0.28)
	0.24	0.24	0.23
2100	(0.22, 0.27)	(0.20, 0.29)	(0.15, 0.32)

Source: TrTA consultants

### g) Temperature-Related Bio-climate Variables

338. Heating degree days (HDD) will decrease, which indicates that energy consumption for heating could be reduced. The historical average HDD is 4504.5; under SSP5-8.5, 14.0% in 2050 and 34.6% in 2100 will be reduced. Lower reductions in HDD are shown in the lower emission scenarios.

339. The cooling degree days (CDD) in Yongchang is 92.8, the energy need for cooling buildings is relatively low. However, climate change will increase CDD by up to 110% under SSP2-4.5 by 2050. Under SSP5-8.5 it could rise by 589.8% by 2100.

340. The frost-free season will be extended from 147 days of the historical period. Under SSP1-2.6, the frost-free season only increases 6.3%, about nine days by 2050. Under SSP5-8.5, it is expected to rise by 13.1% or 23 days. Under SSP5-8.5, the frost-free season could increase 30.1% by 2100, which means the growing season will be 281 days. The extension of growing season length could provide new cropping practices.

341. The growing degree days (GDD) in Yongchang is 2046.4 for the historical period; it is projected to increase with time. In 2050 it is projected to increase by between 12.9% and 22.3% under the different scenarios. Furthermore, it is expected to increase by between 15.8% and 65.5% by 2100. GDD increase will increase crop yield and opportunities for new plant species or varieties in Yongchang.

342. The minimum temperature in the coldest month in Yongchang is January, with -15.4 °C. It will increase by 1.4°C under SSP1-2.6 by 2050, and by 6.6 °C under SSP5-8.5 by 2100. The coldest month temperature could be a limiting factor for cropping and afforestation; more varieties could be introduced into the Yongchang area with the warming trend.

343. July is the warmest month in Yongchang; the average daily maximum temperature is 25.7 °C. In 2050, the maximum temperature is predicted to increase by 1.3 °C, 1.6 °C and 2.2 °C under the three scenarios. The maximum temperature could increase by 6.0°C by 2100 under SSP5-8.5. The change in the biological climate condition should guide plant selection and management regimes.

**Table V-21:** Yongchang County, Jinchang City, Heating Degree Days Baseline (C\*day/year) and Future Changes (%) – 50<sup>th</sup> Percentile (Brackets 5<sup>th</sup> and 95<sup>th</sup> Percentile).

Year	SSP1-2.6	SSP2-4.5	SSP5-8.5
<b>Baseline</b>	4504.49	4504.49	4504.49
	-8.43	-10.84	-13.97
<b>2050</b>	(-6.07, -11.20)	(-7.83, -14.35)	(-10.13, -18.43)
	-10.20	-16.42	-34.63
<b>2100</b>	(-7.36, -13.52)	(-11.93, -21.58)	(-25.57, -44.50)

Source: TrTA consultants

**Table V-22:** Yongchang County, Jinchang City, Cooling Degree Days Baseline (C\*day/year) and Future Changes (%) – 50<sup>th</sup> Percentile (Brackets 5<sup>th</sup> and 95<sup>th</sup> Percentile).

Year	SSP1-2.6	SSP2-4.5	SSP5-8.5
<b>Baseline</b>	92.77	92.77	92.77
	80.30	110.00	153.64
<b>2050</b>	(57.35, 113.29)	(77.68, 157.25)	(106.96, 222.27)
	101.82	191.53	589.83
<b>2100</b>	(72.11, 145.08)	(132.24, 279.44)	(392.02, 888.37)

Source: TrTA consultants

**Table V-23:** Yongchang County, Jinchang City, Frost-Free Season Length Baseline (days/year) and Future Changes (%) – 50<sup>th</sup> Percentile (Brackets 5<sup>th</sup> and 95<sup>th</sup> Percentile).

Year	SSP1-2.6	SSP2-4.5	SSP5-8.5
<b>Baseline</b>	146.87	146.87	146.87
	6.26	8.79	13.09
<b>2050</b>	(4.36, 11.40)	(5.93, 16.07)	(8.80, 20.65)
	8.39	14.88	36.03
<b>2100</b>	(5.34, 14.92)	(12.37, 25.28)	(28.11, 54.69)

Source: TrTA consultants

**Table V-24:** Yongchang County, Jinchang City, Growing Degree Days Baseline (C\*day/year) and Future Changes (%) – 50<sup>th</sup> Percentile (Brackets 5<sup>th</sup> and 95<sup>th</sup> Percentile).

Year	SSP1-2.6	SSP2-4.5	SSP5-8.5
<b>Baseline</b>	2046.41	2046.41	2046.41
	12.87	16.86	22.28
<b>2050</b>	(9.31, 17.47)	(12.16, 22.94)	(16.01, 30.42)
	15.79	26.70	65.53
<b>2100</b>	(11.40, 21.47)	(19.13, 36.55)	(45.96, 91.88)

Source: TrTA consultants

**Table V-25:** Yongchang County, Jinchang City, Tmin Coldest Month Baseline (°C) and Future Changes (°C) – 50<sup>th</sup> Percentile (Brackets 5<sup>th</sup> and 95<sup>th</sup> Percentile).

Month	Year	SSP1-2.6	SSP2-4.5	SSP5-8.5
<b>Jan</b>	Baseline	-15.36	-15.36	-15.36



<b>Jan</b>	2050	1.42 (0.97, 1.76)	1.85 (1.26, 2.29)	2.42 (1.65, 3.00)
<b>Jan</b>	2100	1.74 (1.18, 2.15)	2.87 (1.96, 3.56)	6.60 (4.50, 8.19)

Source: TrTA consultants

**Table V-26:** Yongchang County, Jinchang City, Tmax Warmest Month Baseline (°C) and Future Changes (°C) – 50<sup>th</sup> Percentile (Brackets 5<sup>th</sup> and 95<sup>th</sup> Percentile).

Month	Year	SSP1-2.6	SSP2-4.5	SSP5-8.5
<b>Jul</b>	Baseline	25.72	25.72	25.72
<b>Jul</b>	2050	1.30 (0.91, 2.06)	1.68 (1.18, 2.68)	2.20 (1.54, 3.51)
<b>Jul</b>	2100	1.58 (1.11, 2.52)	2.62 (1.83, 4.17)	6.01 (4.20, 9.57)

Source: TrTA consultants

## H. Climate change adaption Options

344. Yongchang is in the Shiyanghe river basin, a critical basin in Northwest China; Water-saving technology plays an essential role in water management. Therefore, all the project activities and designs need to be embedded.

345. Yongchang subproject has the soil modification (replacement treatment) activities, which need to consider and need more careful investigations on actual soil characteristics, in physical and biochemical parameters, to avoid the degradation of existing soils, these are included in the EMP (**Appendix 1**).

**Table V-27:** Initial climate risk assessment for Yongchang subproject activities

Project activities	Drought	Strong wind	Extreme Precipitation Flood	Heating and Cooling	Extreme temperature
<b>Water related:</b> Water supply facilities Sewage pipelines Water tank Water diversion canals and pipes	High	Med high	to Med to high	Med high	to Med to high
<b>Land related:</b> Park space Landscape greening Greenbelt	High	Med high	to Med to high	Med high	to Med to high
<b>Civil engineering and installation related:</b> Road construction or renovation Greenhouse HVAC system installation	Med high	to Med high	to Med to high	Med high	to Med to high

Source: TrTA consultants

346. The cost-benefit analysis indicated that, for different adaptation options, the lower cost options showed positive NPVs, while higher-cost adaption options would generate negative NPVs, even under the SSP5-8.5 scenario. The NPV is also highly sensitive to project lifespan, with longer project lifespans generating higher NPVs. However, the same results are consistent with the SSP1-2.6 scenario yielding negative NPV while SSP5-8.5 produces more substantial/positive NPVs. Given the current climate change trend and mitigation practice, the higher climate change scenario (such as SSP5-8.5) with higher benefit levels (15% or 25%) needs to be considered in the decision-making process. The selection of adaptation options

would depend on the financial arrangement of the investment.

**Table V-28:** Assumptions for adaption options and cost-benefit analysis for Yongchang subproject.

<b>Adaptation Options</b>	<b>Potential Climate Change</b>	<b>Physical Impacts of Climate change</b>	<b>Potential Adaptation Options</b>	<b>Potential Adaptation Measure Cost (% of the total project budget)</b>	<b>Potential Benefit Avoided Damage Assumption (% of the total project budget)</b>
<b>Option A</b>	Extreme cold and heat; Chronic risks of temp.& precip changes	Material damage and access issues extreme conditions flower health and production	Uplift design and building standard, energy supply to facilities; livestock management Factory health and safety	3-5% one-off with 0.2% maintenance fee per year	5% increase per degree warming extreme temperature
<b>Option B</b>	Extreme precipitation events; Flash or riverine flood	(Structure) Flood inundation damage to facilities and infrastructures; Horticulture loss; Woodland loss or damages Productivity loss	Climate proofed design and building materials, including localized drainage system, horticultural livestock management technics	5-7% one-off with 0.2% maintenance fee per year	5% increase per degree warming extreme precipitation
<b>Option C</b>	Flood Heatwaves Drought and Wind Cold spell Snow Fire	Disruption and damage to buildings, and infrastructure, water resources shortage, loss of productivity	Warning systems and public interface communicating effective service restoration and level of service before, during and after climatic events; Soil and water conservation technics	7-15% one-off with 0.2% maintenance fee per year	Increased efficiency, disruption avoided 5% Efficiency loss 1% Avoided maintenance cost 1%
<b>Option D</b>	All potential climate risks	The whole system, including all above and more minor potential impacts	Integrated adaptation measures	15-30% one-off with 0.2% maintenance fee per year	25% and increase with time

Source: TrTA consultants

**Table V-29:** An example of cost-benefit analysis under the SSP5-8.5 scenario for the Yongchang subproject (42 million total investment).

Project Year	Year	SSP5-8.5mid Temp. Change	Cost 10% Level (million USD)	Benefit Level 15% (million USD)	DB-DC (million USD)
0	2025	0.00	2.0000	0.0000	-2.0000
1	2026	0.03	0.0400	0.0900	-1.9554
2	2027	0.05	0.0400	0.1500	-1.8677
3	2028	0.08	0.0400	0.2400	-1.7253
4	2029	0.11	0.0400	0.3300	-1.5410
5	2030	0.14	0.0400	0.4200	-1.3254
6	2031	0.17	0.0400	0.5100	-1.0873
7	2032	0.20	0.0400	0.6000	-0.8340
8	2033	0.23	0.0400	0.6900	-0.5714
9	2034	0.27	0.0400	0.8100	-0.2938
10	2035	0.30	0.0400	0.9000	-0.0169
11	2036	0.33	0.0400	0.9900	0.2562
12	2037	0.36	0.0400	1.0800	0.5232
13	2038	0.40	0.0400	1.2000	0.7890
14	2039	0.43	0.0400	1.2900	1.0448
15	2040	0.47	0.0400	1.4100	1.2951
16	2041	0.50	0.0400	1.5000	1.5332
17	2042	0.54	0.0400	1.6200	1.7634
18	2043	0.58	0.0400	1.7400	1.9844
19	2044	0.61	0.0400	1.8300	2.1923
20	2045	0.65	0.0400	1.9500	2.3903
21	2046	0.69	0.0400	2.0700	2.5782
22	2047	0.73	0.0400	2.1900	2.7558
23	2048	0.76	0.0400	2.2800	2.9211
24	2049	0.80	0.0400	2.4000	3.0766
25	2050	0.84	0.0400	2.5200	3.2225
26	2051	0.88	0.0400	2.6400	3.3590
27	2052	0.92	0.0400	2.7600	3.4866
28	2053	0.96	0.0400	2.8800	3.6055
29	2054	1.00	0.0400	3.0000	3.7162
30	2055	1.04	0.0400	3.1200	3.8190
31	2056	1.07	0.0400	3.2100	3.9134
32	2057	1.11	0.0400	3.3300	4.0010
33	2058	1.15	0.0400	3.4500	4.0820
34	2059	1.19	0.0400	3.5700	4.1569
35	2060	1.23	0.0400	3.6900	4.2260
36	2061	1.27	0.0400	3.8100	4.2898
37	2062	1.31	0.0400	3.9300	4.3485
38	2063	1.35	0.0400	4.0500	4.4025
39	2064	1.39	0.0400	4.1700	4.4523
40	2065	1.43	0.0400	4.2900	4.4979
NPV20					2.3903
NPV40					4.4979

Source: TrTA consultants

**Table V-30:** NPVs for three climate change scenarios, three project lifetimes, four adaptation options, and three benefit levels (million USD) for the Yongchang subproject.

Scenario		SSP1-2.6	SSP1-2.6	SSP1-2.6	SSP2-4.5	SSP2-4.5	SSP2-4.5	SSP5-8.5	SSP5-8.5	SSP5-8.5
Benefit Sensitivity Level (% of USD 42.0 million total project investment, per degree of warming)										
		10%	15%	30%	10%	15%	20%	10%	15%	30%
Lifetime 20 years										
Adapt. Cost										
Option 5%	A	0.07	0.75	2.8	0.65	1.62	4.55	1.83	3.39	8.08
Option 10%	B	-0.93	-0.25	1.8	-0.35	0.62	3.55	0.83	2.39	7.08
Option 15%	C	-1.93	-1.25	0.8	-1.35	-0.38	2.55	-0.17	1.39	6.08
Option 25%	D	-3.93	-3.25	-1.2	-3.35	-2.38	0.55	-2.17	-0.61	4.08
Lifetime 40 years										
Option 5%	A	0.47	1.37	4.07	1.44	2.82	6.97	3.22	5.5	12.33
Option 10%	B	-0.53	0.37	3.07	0.44	1.82	5.97	2.22	4.5	11.33
Option 15%	C	-1.53	-0.63	2.07	-0.56	0.82	4.97	1.22	3.5	10.33
Option 25%	D	-3.53	-2.63	0.07	-2.56	-1.18	2.97	-0.78	1.5	8.33
Lifetime 60 years										
Option 5%	A	0.52	1.45	4.23	1.58	3.03	7.39	3.49	5.9	13.14
Option 10%	B	-0.48	0.45	3.23	0.58	2.03	6.39	2.49	4.9	12.14
Option 15%	C	-1.48	-0.55	2.23	-0.42	1.03	5.39	1.49	3.9	11.14
Option 25%	D	-3.48	-2.55	0.23	-2.42	-0.97	3.39	-0.51	1.9	9.14

Source: TrTA consultants

347. Findings from the economic analysis are presented below:

- (i) The potential benefit or damage avoided will be directly linked with the climate change scenarios; a higher emission scenario is linked to greater risk and more severe damage. Thus the benefit could be higher in terms of CBA.
- (ii) Under the SSP1-2.6 scenario, which shows a lower risk of climate change-related extreme events (temperature and precipitation), the NPV for adaptation is negative, implying that it is not economically worthwhile to climate-proof the subproject as the cost is higher than the benefit.
- (iii) Under the SSP5-8.5 scenario, i.e. a higher benefit sensitivity level, all NPV were positive, implying that it is more economical to climate-proof the project.
- (iv) For different adaptation options, the lower cost options showed positive NPVs, while higher-cost adaption options would generate negative NPVs, even under the SSP5-8.5

scenario.

- (v) The NPV is also highly sensitive to project lifespan, with longer project lifespans generating higher NPVs. However, the same results are consistent with SSP1-2.6 yielding negative NPV while SSP5-8.5 produces more substantial/positive NPVs.

348. Recommendations are presented below:

- (i) Given the current climate change trend and mitigation practice, the higher climate change scenario (such as SSP5-8.5) with higher benefit levels (15% or 25%) needs to be considered in the decision-making process.
- (ii) The selection of adaptation options would depend on the financial arrangement of the investment.

349. Caveats are presented below:

- (i) The economic analysis can only provide a possible range of NPV within which the true (and unknown) NPV may fall with a reasonable degree of confidence. Absolute certainty is beyond the realm of any economic analysis.
- (ii) The economic analysis aims to provide information on the economic efficiency of an investment project. However, it does not provide information about the project's political feasibility, legality, or social and cultural acceptability.
- (iii) This economic analysis was undertaken to identify the distribution of costs and benefits across stakeholders to inform decision-makers as to the distributional impacts of the project. ADB requires the conduct of such distributional analysis.
- (iv) The outcome of the economic analysis should not be and is typically not the only criterion used in assessing the social desirability of an investment project.

**Table V-31: Yongchang Subproject Adaptation Activities Costs**

<b>Adaptation Activity</b>	<b>Target Climate Risk</b>	<b>Target Climate Risk</b>	<b>Adaptation measure</b>	<b>Adaptation Finance Justification</b>
Smart Agriculture Demonstration Area Green energy-saving renovation of residential buildings (Yongchang)	20%	Wind, heat, drought, flood	Energy saving material and design	Incremental cost 5-30% and/or standalone components
Smart Agriculture Demonstration Area Town environment improvement(Yongchang)	20%	Wind, heat, drought, flood	Climat proofing standards, design and materials	Incremental costs of 5 - 30% of higher design standards and climate resilient materials
Smart Agriculture Demonstration Area Permeable brick paving (Yongchang)	50%	Flood and drought	Water conservation and flood protection	Incremental costs of 5 - 30% of higher design standards and climate resilient materials
Flower Farm and Wellness Area Farming Culture Experience Center(Yongchang)	10%	Strong wind, heat and flood	Higher building and material standards	Incremental costs of 5 - 30% of higher design standards and climate resilient materials
Flower Farm and Wellness Area Ecological toilet (Yongchang)	25%	Drought, flood, strong wind, heat	Higher building and material standards	Incremental costs of 5 - 30% of higher design standards and climate resilient materials
Reservoir ecological	50%	Wind, heat,	Higher building	Natural based

Adaptation Activity	Target Climate Risk	Target Climate Risk	Adaptation measure	Adaptation Finance Justification
management Improvement of the ecological environment on the west bank of Jinchuanxia Reservoir (Yongchang)		drought, flood	and material standards	adaptation solutions
Village infrastructure Ecological toilet (Yongchang)	75%	Drought, flood, strong wind, heat	Higher building and material standards	Incremental costs of 5 - 30% of higher design standards and climate resilient materials
Institution building and capacity strengthening Private sector participation(Yongchang)	25%			
Institution building and capacity strengthening Rural tourism	10%			
Institution building and capacity strengthening Interinstitutional cooperation mechanism (Yongchang)	5%			
Carrot Characteristic Town Smart Agriculture Demonstration Area Ecological Landscape Road - Pervious Concrete	100%	Wind and flood	new material and design	Standalone natural based solutions
Carrot Characteristic Town Smart Agriculture Demonstration Area Green protection belt	100%	Flood and strong wind	wind and flood resilience design and material	Standalone natural based solutions
Carrot Characteristic Town Smart Agriculture Demonstration Area Anti-corrosion wood plank road	100%	drought and corrosion	corrosion resistant material and design	Standalone natural based solutions
Carrot Characteristic Town Flower Farm and Wellness Area Anti-corrosion wood platform	100%	drought and corrosion	corrosion resistant material and design	Standalone natural based solutions
Carrot Characteristic Town Flower Farm and Wellness Area Anti-corrosion wood plank road	100%	drought and corrosion	corrosion resistant material and design	Standalone natural based solutions
Carrot Characteristic Town	100%	Flood and strong wind	wind and flood resilience design	Standalone natural based solutions

Adaptation Activity	Target Climate Risk	Target Climate Risk	Adaptation measure	Adaptation Finance Justification
Flower Farm and Wellness Area Permeable Brick Garden Road			and material	
Carrot Characteristic Town Flower Farm and Wellness Area Carrot Characteristic Town Color permeable floor Pingyuan Road	100%	Flood and strong wind	wind and flood resilience design and material	Standalone natural based solutions
Carrot Characteristic Town Farm high-standard farmland improvement and supporting facilities	100%	Wind, heat, drought, flood	New energy saving material and design technology	Standalone natural based solutions
Maobra folk culture exhibition area and planting and breeding base Folk customs and intangible cultural heritage exhibition area Green energy-saving renovation of Maobra dwellings	100%	Wind, heat, drought, flood	Energy saving material and design	Standalone natural based solutions
Carrot Characteristic Town Overhead anti-corrosion wooden plank road	100%	drought and corrosion	corrosion resistant material and design	Standalone natural based solutions
Carrot Characteristic Town forest plank road	100%	Wind, heat, drought, flood	Higher building and material standards	Standalone natural based solutions
Maobra folk culture exhibition area and planting and breeding base Efficient agricultural planting base High-standard farmland finishing and supporting facilities in the lower reaches of Zhongguan	100%	Flood and drought	New energy saving material and design technology	Standalone natural based solutions
Maobra folk culture exhibition area and planting and breeding base Efficient agricultural planting base Agricultural irrigation diversion channel (Xiaoerba) (D120)	100%	Flood and drought	New water technology	Standalone natural based solutions
Maobra folk culture exhibition area and planting and breeding base	100%	Flood and drought	New water technology	Standalone natural based solutions

Adaptation Activity	Target Climate Risk	Target Climate Risk	Adaptation measure	Adaptation Finance Justification
Efficient agricultural planting base Zhongquan Farmland Irrigation Adjustment Tank (50,000 m <sup>2</sup> )				
Maobra folk culture exhibition area and planting and breeding base Efficient agricultural planting base Zhongquan water-saving irrigation branch pipe	100%	Flood and drought	New water technology	Standalone natural based solutions
Carrot Characteristic Town U-shaped irrigation canal	100%	Flood and drought	New water technology	Standalone natural based solutions

Source: TrTA consultants

350. The potential adaptation options and recommendations are presented below.

**351. Overall climate risk governance and management.**

- (i) Institutional capacity building and awareness-raising activities need to be budgeted and carried out for the stakeholders.
- (ii) Compliance with relevant local, national and international risk management laws and regulations in consideration of climate change risk management
- (iii) Implementation and enforcement of building codes, zoning laws, and setbacks
- (iv) Incorporation of climate change concerns into environmental impact assessments of new infrastructure planning and investment
- (v) Climate-proof existing and new rural development projects against climate change risks

**352. Integration of disaster risk management.**

- (i) Integration of risk reduction principles into environmental permitting; integration of disaster risk management with climate change adaptation strategies to reduce exposure to floods and other climatic extreme events
- (ii) Drought, flood, extreme weather early warning systems; awareness and capacity building programs
- (iii) Improvement of disaster preparation and planning; training staff and volunteers; applying traditional knowledge to risk reduction strategies.

**353. Climate change adaptation.** Climate change could change environmental impacts; the positive effects could decrease, while negative impacts could be exacerbated by extreme weather and long-term climate change trends, especially in the Gansu province, where the natural environment is vulnerable to climate change. The following points could be considered:

- (i) Climate change caused extreme events that could exaggerate the environmental impacts during preconstruction, construction, and operational phases, where each is considered separately. The assessment's FSR results indicate that environmental issues are minimal during the preconstruction phase. However, these impacts need to be considered to ensure the appropriate incorporation of adaptation mitigation measures into the subproject design.
- (ii) Potential negative environmental impacts during the construction phase are short-term



and localized. They are associated with soil erosion, construction noise, fugitive dust, disruption of traffic and community services, and risks to worker health and safety. However, these can be effectively mitigated through good construction, health and safety practices, and climate change adaptation measures.

- (iii) In the construction, we should strengthen water and soil conservation, strengthen afforestation, control soil erosion, reduce sediment sources in rivers and create an excellent ecological environment for water conservation.
- (iv) To restore the biodiversity of biological communities, improving river water quality through a healthy river basin ecosystem. These ideas are mentioned in the FSR. However, implementation plans need to be clarified or developed. In addition, technical and natural-based solutions need to be clarified.
- (v) Extreme precipitation could cause floods, rare events are becoming more frequent, and related landslides, subsidence, deformation, and other potential geo-hazard need to be prevented.
- (vi) Soil and water conservation measures need to be considered in climate change carefully; climate change will induce unprecedented conditions, increasing the risks of building damage, plant damage, productivity loss, potential river floods, extreme wind and frost disasters. Therefore, the emergency management scheme needs to be prepared systemically with local authorities.
- (vii) Green or sustainable buildings or construction projects with a carbon emission reduction or carbon-neutral measures need to consider climate change risk at the same time.
- (viii) Climate change and ecosystem functions related to soil, water, and land management standards must be identified and clarified.
- (ix) Monitoring and evaluation processes need to be established and implemented.
- (x) Capacity building and awareness-raising activities educational materials need to be developed and prepared.

354. The climate change adaption measures have been provided to the Sub-PMO and will be incorporated into the design of the subproject in the detailed design stage.

## **VI. ALTERNATIVE ANALYSIS**

356. An analysis of alternatives was considered for (i) a no subproject scenario; and (ii) selection of agricultural technologies and coolants.

### **A. No Subproject Alternative**

357. If the Yongchang County Subproject is not implemented:

- the objective to demonstrate innovative, low-carbon, and environmentally sustainable rural development models in Gansu Province by supporting the use of renewable energy, sustainable agriculture practices, and high-level technology will not be achieved;
- the impacts of low-carbon transition in rural development, and carbon sequestration in rural areas promoted; and sustainable rural development promoted, and rural ecosystems protected and restored. will also not be achieved;
- the opportunity to use innovative and replicable green development solutions to achieve climate-resilient and sustainable rural economic diversification and mitigation of climate change will be missed;
- 65,368 residents in Chengguan Town and Hongshanyao Town, and particularly vulnerable groups including 34,425 women and 3,294 low-income people, will not directly benefit from improved agricultural production facilities and service system, upgraded public infrastructure, better living environment and employment opportunities; and,
- the 0.18 million residents of Yongchang County will not indirectly benefit from the subproject as secondary beneficiaries, including approximately 86,262 women, 1,524 EM people, and 8,960 low-income people.

358. For these reasons, the “no-subproject” alternative is considered unacceptable.

### **B. Agricultural technologies adopted**

359. Based on site visit and communication with farmers located at the proposed project sites, the common irrigation methods in the proposed project sites are flood irrigation. Flood irrigation is a waste of water and could result in non-point source pollution from loss of fertilizer and pesticides. Besides, excess use of water, fertilizer and pesticides high production costs, negative externalities on the environment and food safety and inefficient water usage.

360. The subproject will adopt drip irrigation methods, organic fertilizer and integrated water and fertilizer technology. The subproject will provide water savings and reductions in fertilizer and pesticide use.

361. The advantages of drip irrigation and integrated water and fertilizer technology are:
- (i) Fertilizer and nutrient loss are minimized due to a localized application and reduced leaching.
  - (ii) Water application efficiency is high if managed correctly.
  - (iii) Recycled non-potable water can be safely used.
  - (iv) Moisture within the root zone can be maintained at field capacity.
  - (v) Soil type plays a less important role in the frequency of irrigation.
  - (vi) Soil erosion is lessened.
  - (vii) Weed growth is lessened.
  - (viii) Labor cost is less than other irrigation methods.
  - (ix) Foliage remains dry, reducing the risk of disease.

**C. Overall Alternative Analysis**

362. Based on the analysis of alternatives, the “no subproject” option has been rejected, and the subproject has selected the most appropriate agricultural technologies.

## VII. PUBLIC CONSULTATION AND INFORMATION DISCLOSURE

### A. PRC and ADB Requirements for Disclosure and Public Consultation

#### a) PRC Requirements

363. Relevant provisions in the PRC *Environmental Impact Assessment Law* (revised in 2016) and the Regulations on the Administration of Construction Project Environmental Protection (No. 253 Order of the State Council, 1998, revised in 2017) require that an EIA study for a construction project shall solicit opinions from affected residents, as well as other organizations and concerned stakeholders. However, the requirements for public consultation are different for various sectors and projects. For an environmental Category A project a full EIA report is required including two rounds of public consultations, while for a Category B project only a simplified tabular EIA is required without the need for public consultation.

364. The “Provisional Regulations on Public Participation in Environmental Impact Assessment” (2006) provides detailed requirements for the public participation process, including information disclosure standards, consultation methods, and public enquiry process. It is significant since it was the first document clearly regulating public participation in EIA in China.<sup>27</sup>

365. In 2014, former MEE released “Guiding Opinions on Promoting Public Participation in Environmental Protection” (2014, No. 48) which defines public participation as ‘citizens, legal persons and other organizations’ voluntary participation in environmental legislation, enforcement, judicature and law obedience, and the development, utilization, protection and transformation activities related to environment.

366. The “Guideline on Public Participation” in EIA (2018) requires the contractors or the contracted EIA institute and the relevant EEB disclose EIA information in a manner accessible to the public. EITs are disclosed on the relevant EEB website for a period of 10 working days. However, there are no requirements for disclosure of monitoring reports during construction.

367. The public disclosure and consultation process undertaken during the preparation of the domestic EIA was undertaken in compliance with the relevant PRC requirements discussed above.

#### b) ADB Requirements

368. ADB’s SPS (2009) has specific requirements for information disclosure and public consultation.

369. Information disclosure involves delivering information about a proposed project to the general public and to affected communities and other stakeholders, beginning early in the project cycle and continuing throughout the life of the project. Information disclosure is intended to facilitate constructive engagement with affected communities and stakeholders over the life of the project. The SPS requires that borrowers take a proactive disclosure approach and provide relevant information from environmental assessment documentation directly to affected peoples and stakeholders. In addition, in order to make key documents widely available to the general public, the SPS requires submission to ADB for posting on the ADB website as follows:

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<sup>27</sup> Wang Ya Nan, 2012. Public Participation in EIA, SEA and Environmental Planning in China. Environmental Impact Assessment Research Centre.

- (i) a draft full EIA (including the draft EMP) at least 120 days prior to ADB Board consideration for Category A projects, and/or environmental assessment and review frameworks before project appraisal, where applicable;
- (ii) the final EIA/IEE;
- (iii) a new or updated EIA/IEE, EMP and corrective action plan prepared during project implementation, if any; and
- (iv) environmental monitoring reports.

370. The SPS also requires that the borrower carry out meaningful consultation with affected people and other concerned stakeholders, including civil society, and facilitate their informed participation. In addition, SPS requires when a project may affect physical cultural resources, the borrower will consult with affected communities who use, or have used them within living memory, for long-standing cultural purposes to identify physical cultural resources of importance and to incorporate the views of the affected communities on such resources into the borrower's decision-making process. Consultation will also involve relevant national or local regulatory agencies that are entrusted with protecting physical cultural resources. Consultations should include presentations on environmental impacts, benefits and mitigation measures, the project GRM, and ADB's Accountability Mechanism. During the subproject implementation, local Cultural Relics Bureau and/or relevant civil society organizations will be further consulted and their views if any will be incorporated in the updated IEE and disclosed on ADB website. For category A projects, such consultations should include consultations both at an early stage of EIA field work and when the draft EIA report is available.

## **B. Information Disclosure**

371. The Sub-PMO and the domestic EIA Institute undertook public consultation and information disclosure in accordance with the "Guidelines on Public Consultation for EIA" (2018) during the EIA preparation process.

372. The IA disclosed subproject information in two steps:

- (i) The first public information notice was posted on a famous website for information disclosure in May 2022 after the draft EIA was prepared (<https://www.eiacloud.com/gs/detail/1?id=20530RBy48>). The information provided was:
  - (a) Name and summary of the subproject.
  - (b) Name and contact information of the Sub-PMO.
  - (c) Name and contact information of the institute responsible for preparing the subproject EIA.
  - (d) EIA procedures and content.
  - (e) Mitigation measures.
  - (f) Request for questions, suggestions and feedback from the public.
- (ii) A second public information notice will be posted on the Jinchang EEB' website after submission of the final EIA report for approval. The notice will include Project name and information below:
  - (a) Name and summary of the subproject.
  - (b) Name and contact information of the institute responsible for preparing the EIA report.
  - (c) Name and contact information of the institute responsible for approval of the EIA report.
  - (d) Name and contact information of the construction company.
  - (e) Potential subproject environmental impacts and mitigation measures during construction phase and operation phase.
  - (f) Key conclusions of the EIA report.
  - (g) Contact information to get abridged versions of the EIA report.

Figure VII-1: Online information disclosure.

## 【甘肃】亚行贷款甘肃环境可持续乡村振兴与发展项目—金昌市永昌县子项目

189\*\*\*\*3657 发表于 2022-05-30 17:22

## 一、工程概况：

本项目为亚行贷款甘肃环境可持续乡村振兴与发展项目子项，位于甘肃省金昌市永昌县城关镇和红山堡镇。主要依托生态建设、生态农业、低效美丽乡村建设，实现乡村振兴，环境持续改善，乡村可持续发展。按照建设地点划分为胡萝卜特色小镇产业区、水库生态环境提升改造区及毛卜喇民俗文化展示区及种植养殖基地三大片区。其中：胡萝卜特色小镇产业区主要建设①智慧农业示范区、②花卉农庄康养区③胡萝卜特色小镇；毛卜喇民俗文化展示区及种植养殖基地主要建设①高效农业种植基地、②村庄基础设施、③民俗非遗展示区及④特色养殖基地。（单独评价，不在本次评价范围内）。工程占地30700.00亩，折合20467.00hm<sup>2</sup>。

## Project description

## 二、主要环境影响及治理措施

## 1. 生态环境

(1) 施工期：主要为水土流失及施工扰动对区域动植物影响，通过采取合理规划施工场地、施工道路，严格控制车辆、人员活动范围，严禁随意扩大；开挖土方严格按照环评中提出的措施实施，严禁随意堆放；对作业人员进行培训，提高环保意识；加强生态环境建设；合理安排施工时序，减少土方开挖量，禁止土方开挖造成水土流失；采取围挡防护措施，尽量避开雨季施工；料场及临时堆场应设置苫布等防护措施。

## Mitigation measures

(2) 运营期：表现在对土地利用、植被、区域生物多样性、景观的影响，及农药化肥等农业污染源影响。主要采取灌溉就近引水，使用滴灌等节水灌溉措施，节约水资源；尽量使用有机化肥、绿肥等，科学搭配，适量施肥；尽量使用生物防治预防病虫害，减少农药使用；化肥及农药使用避开雨季及大风天气，防治扩散及淋溶污染；运营期做好林地及绿地管护。

## 2. 大气环境

(1) 施工期：废气主要为施工扬尘及施工机械尾气；从源头防控和传播切断两方面进行：洒水降尘、临时堆存土方和建筑垃圾，应密闭堆放，运输车辆全覆盖；并及时清理，粉状材料堆放必须有防尘防雨棚或采用篷布覆盖；减少传播：设置围挡、限制车速及承载量。

(2) 运营期：废气主要为种植区种植活动产生的扬尘及农机具机械尾气，通过选用先进农机具，对农机具定期检修，避免带病作业，减少废气排放；避免大风天气进行农业生产作业，减少扬尘。

3. 声环境：项目建设及运营期噪声主要为机械设备噪声。通过选用低噪声机械设备、加强设备维护，保障施工机械正常运行等措施可降低噪声影响。

## 4. 水环境

(1) 施工期：施工废水收集沉淀后用于施工场地洒水，无外排；施工人员生活污水为盥洗废水，成分简单，用于泼洒降尘；施工期严禁废水及其他污染物排入水体。

(2) 运营期：运营期废水主要为职工及旅游人员生活污水，依托当地居民旱厕或化粪池处理。

## 5. 固体废物污染防治

(1) 施工期：建筑垃圾集中收集后运至城建部门指定地点；生活垃圾统一收集，定时拉运至就近生活垃圾填埋场。

## Mitigation measures

(2) 运营期：固体废物主要为职工及旅游人员生活垃圾，村镇配备设置垃圾桶及垃圾收集车，收集后运至区域生活垃圾厂填埋处置；种植过程中产生的农药包装袋、化肥包装袋等收集交由相关部门统一处置。

## 6. 金川水库直接水源地保护措施

(1) 施工期：开展施工人员的教育，做好进场前的施工培训和水源保护区保护宣传工作，告知施工人员本项目涉及的集中饮用水水源保护区的保护范围、保护内容及保护水源的重要性等；水源保护区内禁止布置施工营地，施工结束后及时清理现场，平整场地，恢复原状。

(2) 运营期：检查检修过程中严禁在水源地内随意堆放固体废物，检修期间要避免过多人员进入，并严格控制检修范围，加强检修人员环境保护知识培训，减少对水源地的影响。

## 三、征求意见方式

(1) 公众提供意见的方式和途径：

以信函或电子邮件的方式，与建设单位或报告编制单位联系。

Request for questions, suggestions and feedback from the public

(2) 公众意见表的网络链接：<https://www.wjx.cn/vm/>

(3) 建设单位：甘肃文鼎集团国际金融组织贷款项目管办办公室

Contact information of the EIA institute and Sub-PMO

联系人：曹磊 联系电话：18993033657

报告编制单位：甘肃恒鑫创新科技发展有限公司

联系人：杜均倩 联系电话：18189558615

E-mail: 1181252047@qq.com

Source: TrTA consultant, 2022.

373. No public feedback was received from the public information disclosure.

374. In addition to the above noted disclosure, hard copies of the DEIA executive summary and the full DEIA were also made available for public access at the village communities' offices to ensure that residents without access to the internet also had the opportunity to review and comment on the subproject. All information was provided in the Chinese language to ensure accessibility for residents.

### C. Public Consultations

375. Two rounds of public consultations were conducted in March to April 2022 in the subproject sites by the IA and Sub-PMO with the assistance from the TrTA environmental team. The first public consultation was conducted after the project scope and activities were confirmed. The second public consultation was conducted after the first information disclosure. The meetings were organized by the Sub-PMO and were held after the first information disclosure.

**Figure VII-2:** Photos from public consultation meetings



Meeting in Jinchuan East Village (first round)



Survey in Jinchuan West Village (first round)



Meeting in Maobula Village (first round)



Meeting in Jinchuan West Village (second round)





Meeting in Maobula Village (second round)



Survey in Jinchuan East Village (second round)



Meeting in Beihaizi Village (second round)



Survey in Ghenguan Town (second round)

Source: TrTA consultant.

376. During the second round of public consultation meetings, the domestic EIA institute introduced subproject information, adverse and beneficial impacts to the surrounding environment and residents during construction and operation, mitigation measures and the GRM, via a PowerPoint presentation and by the distribution of the draft DEIA report. The presentations were followed by a discussion and then distribution of a questionnaire which was completed by all participants. The breakdown of meeting participants and the results of questionnaire are presented in **Table VII-1** and **Table VII-2**.

**Table VII-1: Participants of the Public Consultation Meetings.**

Participants		226 Participants	%
Gender	Male	128	56.6%
	Female	98	43.4%
Age Group	<20	26	11.5%
	20-40	71	31.4%
	41-60	64	28.3%
	≥60	65	28.8%
Education	Illiterate	6	2.7%
	Primary school	21	9.3%
	Junior high school	71	31.4%
	Senior high school	55	24.3%
	Vocational school	43	19.0%
	College and above	30	13.3%
Ethnic	Han	221	97.8%
	Hui (minority)	5	2.2%
	Others (minority)	0	0



Occupation	Farmer	155	68.6%
	Civil servant	24	10.6%
	Employee	36	15.9%
	Others	11	4.9%

Table VII-2: Results of the Questionnaire.

Name	Sex	Age	
Education level	Occupation	Nationality	
Contact information			
Question	Choices	Yes	Comments
1. In your opinion, what are the major environment pollution issues in your areas?	Ambient air	54	23.9%
	Noise	40	17.7%
	Surface water	16	7.1%
	Groundwater	28	12.4%
	Soil	28	12.4%
	Solid waste	44	19.5%
	Odor	10	4.4%
	Other concern	6	2.7%
2. Distance between your working place and project site	<1 km	74	32.7%
	1-3 km	74	32.7%
	3-5 km	30	13.3%
	> 5km	48	21.2%
3. Distance between your house and project site	<1 km	56	24.8%
	1-3 km	76	33.6%
	3-5 km	26	11.5%
	> 5km	68	30.1%
4. Do you know this project before this public consultation?	Yes	204	90.3%
	No	22	9.7%
5. Do you understand the potential adverse impacts during the construction of the proposed project subprojects?	Clearly understand	146	64.6%
	Somewhat understand	41	18.1%
	Barely understand	31	13.7%
	Do not understand	8	3.5%
6. What would be the major impacts during project construction?	Noise	52	23.0%
	Dust	104	46.0%
	Solid waste	36	15.9%
	Traffic congestion	18	8.0%
	No major impacts	16	7.1%
7. After learning about mitigation measures during the construction, do you accept anticipated construction phase impacts?	Accept	157	69.5%
	Barely accept	28	12.4%
	Do not accept	4	1.8%
	Have no idea	6	2.7%
8. Do you understand all the anticipated environmental and health and safety adverse impacts of the project during operation?	Clearly understand	132	58.4%
	Somewhat understand	74	32.7%
	Barely understand	12	5.3%
	Do not understand	8	3.5%
9. What are the major impacts of this project during operation period?	Air pollution	14	6.2%
	Noise pollution	76	33.6%
	Waste water pollution	21	9.3%
	Soil pollution	19	8.4%
	Solid waste pollution	55	24.3%
	Odor gas	22	9.7%
	Impacts associated with increased tourists	11	4.9%
	No major impacts	8	3.5%

10. Do you accept the adverse impacts of the project after you understand the mitigation measures?	Accept	176	77.9%
	Barely accept	38	16.8%
	Do not accept	4	1.8%
	Have no idea	8	3.5%
Question	Choices		
11. Do you think construction of this project can improve local economic development or not?	Yes	226	100%
	No	0	0
	I do not know	0	0
12. Do you support the project?	Yes	226	100%
	No	0	0
	I do not know	0	0
Suggestions or requirements for environment protection of the project			

377. Of the respondents in the public consultation meeting, 90.3% knew about the subproject either from other people, newspapers, or information signs. The top three environmental issues respondents identified in their neighborhoods are ambient air (23.9%), solid waste (19.5%), noise (17.7%), and surface water (15.6%). Dust (46.0%), noise (23.0%), and solid waste (15.9%) were identified as the top three issues during the construction phase. Only 3.5 % of the respondents indicated that they didn't understand the adverse impacts of the subproject during the construction period. Noise (33.6 %), solid waste (24.3%) and odor (9.7%) were identified as the top three issues during the operation phase. These concerns are addressed through the subproject design features and safeguard mitigation measures in the subproject EMP (**Appendix I**).

378. Overall support for the subproject amongst the participants of the first consultation meeting was very strong; 100% of the respondents indicated that the subproject would improve local economic development; and 100% indicated that they support the proposed subproject.

#### **D. Future Information Disclosure and Public Consultation Program**

379. Public consultations will be maintained with subproject communities throughout subproject implementation, including: (i) before and after key works to ensure residents are informed of and have the opportunity to respond to, pending works and procedures; (ii) broader consultations about subproject progress. Especially, during the subproject implementation, local Cultural Relics Bureau and/or relevant civil society organizations will be further consulted after completion of design of key works and/or before construction of key works. In addition, future public consultations will be held beyond year one of operation with the villagers near the sheep farm to gauge the public's sensitivity to odors at different times of the year. Appropriate odor mitigation measures will be developed and implemented if necessary. Future consultation will be undertaken by the PPMO and Sub-PMO and implementation units' Environment and Social Officers, via questionnaire surveys, household visits, workshops, and public hearings (see EMP for further details).

## VIII. GRIEVANCE REDRESS MECHANISM

380. A project grievance is an actual or perceived project-related problem that gives ground for complaint by an affected person (AP). A project-wide environmental grievance redress mechanism (GRM) was developed in compliance with ADB's SPS (2009) requirement to address environmental, health, safety concerns associated with project construction and operation. The GRM was designed to achieve the following objectives: (i) provide channels of communication for residents to raise concerns about environmental and social-related grievances which might result from the subproject; (ii) prevent and mitigate adverse environmental and social impacts to villages and communities caused by project construction and operation, including those associated with resettlement; (iii) promote trust and productive relationships between the project agencies and residents; and (iv) build community acceptance of the project. The GRM is accessible to all residents, including women, youth, minorities, and poverty-stricken households. Multiple points of entry are available, including face-to-face meetings, written complaints, telephone conversations, e-mail, WeChat and social media.

381. Grievances to be addressed by the GRM will most likely be of disturbances e.g. dust emissions, construction noise, soil erosion, water quality deterioration and impact on fisheries, inappropriate disposal of construction wastes, and safety measures for the protection of the public and construction workers, and/or. A separate GRM has been designed for the project for issues related to land acquisition and resettlement, as these generally require different procedures and timelines to resolve compared with environmental-related grievances.

382. Currently in Gansu (and generally in the PRC), when residents or organizations are negatively affected by construction or development, they may complain, individually or through their village or community committee, to the contractors, developers, the local EEB, or by direct appeal to the local courts. The weaknesses of this system are: (i) the lack of dedicated personnel to address grievances; and (ii) the lack of a specific timeframe for the redress of grievances. The project GRM addresses these weaknesses.

383. The GRM also meets the regulatory standards of the PRC that protect the rights of citizens from construction-related environmental and/or social impacts. Decree No. 431 Regulation on Letters and Visits, issued by the State Council of PRC in 2005, codifies a complaint acceptance mechanism at all levels of government and protects the complainants from retaliation. Based on the regulation, the Ministry of Environmental Protection (MEE)<sup>28</sup> published updated Measures on Environmental Letters and Visits (Decree No. 15) in December 2010.

384. The details of the GRM, including a time-bound flow chart of procedures, are presented in the subproject EMP (**Appendix 1**).

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28 The new name for the MEP is Ministry of Ecology and Environment.

## IX. PROJECT ASSURANCES

385. All ADB-funded projects are required to comply with a standard set of loan assurances for environmental safeguards, which focus on compliance with national laws and the project EMP. In addition, the following project-specific assurances are included in the project agreement between ADB and the EA. Refer to the loan and project agreements for the final wording of the assurances.

- (i) **Institutional arrangements for implementation of the project EMP.** EA will ensure that the executing and implementing agencies establish the following positions that will be responsible for EMP coordination and delivery, and that these measures will be in place prior to the provision of ADB loan funds to the Sub-PMO and/or Environmental Management Units (EMUs): (i) one full-time PPMO environment officer, to lead overall coordination and implementation of the EMP, (ii) one Sub-PMO environment officers (one per implementing agency), to coordinate EMP implementation for the subproject. All officers assigned to these roles will be qualified environmental staff. All positions will be established within at least two months of loan effectiveness and prior to the start of any civil works.
- (ii) **Loan consulting services to support EMP implementation.** The PPMO will engage at least two qualified national environmental consultants to assist the executing and implementing agencies with EMP implementation: (i) a short-term start-up consultant, who will support the PPMO to establish the EMP, in the period between loan effectiveness and recruitment of loan implementation consultants, and (ii) a loan implementation environment consultant, who will provide intermittent support throughout the project duration.
- (iii) **External environmental monitoring.** The PPMO will engage a qualified environmental monitoring agency with appropriate national certification, to conduct the external environment monitoring specified in the EMP.
- (iv) **Training.** Before and during the implementation of works, EA shall cause the Sub-PMO and EMUs to organize and conduct training on implementation and supervision of the EMP for the Sub-PMO, implementing agencies and their EMUs, construction supervision companies, and contractors, and shall ensure that the appropriate staff and officers receive such training.
- (v) **Public Services.** EA through the PPMO will cause the implementing agencies and EMUs to ensure that (i) any existing public services, including drinking water supply, wastewater treatment, and solid waste collection, will continue to be provided to communities during the civil works for the project; (ii) any interruptions to such services are as limited as possible; and (iii) prior to any such interruptions, consultations are held with all affected communities.

## X. CONCLUSION

386. The Gansu Environmentally Sustainable Rural Vitalization and Development Project is aligned with the following impact: green and inclusive rural growth promoted in Gansu province. The project will use innovative and replicable green development solutions to achieve the following outcome: climate-resilient and sustainable rural economic diversification and mitigation of climate change demonstrated in Gansu Province. The Subproject will be implemented as part of the project.

387. The subproject is aligned with ADB's Strategy 2030. The proposed project activities in six rural towns in 5 project counties/districts for 5 subprojects will contribute to rural development, promote social and economic inclusion and sustainable livelihoods of the poor and vulnerable groups by providing diversified income generation channels and improved living environment. The main beneficiaries of the project will be rural residents in the six project towns, members of cooperatives and small and medium-sized agriculture enterprises in the five project counties/districts, including Lintao County of Dingxi City, Ganzhou District of Zhangye City, Yongchang County of Jinchang City, Pingchuan District of Baiyin City, and Qinzhou District of Tianshui City. In the six project towns and 18 villages, there are 266,104 residents, including 33,035 persons in 18 project villages, who are identified as the primary beneficiaries. In addition, the total 2.03 million population in the five project counties/districts will indirectly benefit from the project as secondary beneficiaries, including approximately 1.01 million women (49.48% of the beneficiaries), 31,738 EM people (1.56%), and 119,913 low-income people (5.67%).

388. The subproject will directly benefit 65,368 residents, particularly vulnerable groups, in the project areas, including 34,425 women, 3,294 low-income people (or 5.04%) through improved agricultural production facilities and service system, upgraded public infrastructure, better living environment and employment opportunities under the subproject. Expected project benefits for local residents, including women and vulnerable groups, include: (i) diverse job and income-generation opportunities in circular agriculture and agritourism sectors; (ii) improved/upgraded public infrastructure and services; (iii) improved living environment; (iv) improved institutional capacity of local agricultural organizations (farmers' cooperatives, leading enterprises, large family farms, etc.); (v) enhanced awareness and knowledge of public health, safety and environment protection; and (vi) increased consultation and participation opportunities in project design, implementation, and monitoring and evaluation.

389. Potential negative construction phase environmental impacts are short-term and localized, and are associated with fugitive dust, construction noise, wastewater, solid waste, vegetation clearance, and risks to worker and community health and safety. These will be effectively mitigated through good construction and health and safety practices, including construction soil and spoil management; dust controls including site watering and the use of ready-mix concrete; noise controls including limiting times and season when noisy activities can occur, selecting low noise equipment and scheduling materials delivery to avoid densely populated or sensitive areas; water quality protection measures including managing site runoff and provision of worker sanitary facilities; good solid and hazardous waste management practices; and worker and community good health, safety and emergency response procedures. Construction will not affect any parks, protected areas (except Jinchuanxia Reservoir), or rare or threatened flora or fauna species. The mitigation measures on Jinchuanxia Reservoir protection during construction phase have been developed and included in the EMP.

390. Potential negative operation phase impacts include water usage, wastewater discharge, solid waste management, odor emissions and manure from the sheep farm, waste vegetables from vegetable processing plant, noise, and potential safety risks. These impacts

will be effectively mitigated through good design, including, for example, solid waste and wastewater management, odor control measures, noise control measures, good waste and health and safety management practices and safety plans. Detailed mitigation measures are presented in the EMP (**Appendix 1**).

**391. Project benefits and added value for environmental management.** The subproject will have significant environmental benefits, as follows: (i) conservation of water resources, through the avoided future use of about 2.66 million m<sup>3</sup> water per year compared with existing water use by the farmers in existing operations (for similar crops and conditions at nearby sites), due to utilization of water saving technology; (ii) reduced pollution of water and soil resources, through the avoided future use of chemical fertilizer by about 4,308.8 tons per year, and reduced use of pesticides by about 10.77 tons and insecticides by 3.23 tons per year, compared to baseline conditions. Overall, reductions in the rate of application of agricultural chemicals per unit area, especially fertilizers, will decrease the non-point source pollution load entering waterways and contribute to improved water quality; (iii) reduction of greenhouse emission and pollution emission through intensive sheep raising compared to individual sheep raising by local farmers and solar Photovoltaic (PV) compared to coal based power generation; (iv) environmental improvement from ecology restoration; and (v) through these benefits, contribution to national and provincial policies for water conservation and protection.

**392.** A project-wide GRM has been developed, and will be implemented at the city, district, and site levels. Information disclosure and public consultation have been conducted with villagers and APs near the subproject site. Feedback from the consulted residents and APs villagers indicate a belief that the subproject will improve local economic development, and show strong local support for the proposed subproject.

**393. Overall conclusion.** The subproject IEE has: (i) identified potential negative environment impacts and established mitigation measures; (ii) assessed public support from the subproject beneficiaries and affected people; (iii) established a program GRM; and (iv) prepared an EMP, including environmental management and supervision structure, environmental mitigation and monitoring plans, and capacity building and training.

**394.** It is concluded that the subproject will not result in adverse environmental impacts that are irreversible, diverse, or unprecedented. Any minimal adverse environmental impacts associated with the program will be prevented, reduced, or minimized through the implementation of the subproject EMP.

**APPENDIX I. ENVIRONMENTAL MANAGEMENT PLAN****ENVIRONMENTAL MANAGEMENT PLAN FOR THE  
YONGCHANG COUNTY SUBPROJECT**

**Prepared by the Provincial Government of Gansu for the Asian  
Development Bank**

This Environmental Management Plan is a document of the borrower. The views expressed herein do not necessarily represent those of ADB's Board of Directors, Management, or staff, and may be preliminary in nature. Your attention is directed to the "terms of use" section of the ADB website in which the full Initial Environmental Examination is given.

In preparing any country program or strategy, financing any project, or by making any designation of or reference to a particular territory or geographic area in this document, the Asian Development Bank does not intend to make any judgments as to the legal or other status of any territory or area.

## **A. Objectives**

1. This environment management plan (EMP) is for the Yongchang County Subproject (the Subproject) of the Gansu Environmentally Sustainable Rural Vitalization and Development (the Project). The EMP has been developed as part of the initial environmental examination (IEE) of the subproject, in compliance with the requirements of PRC environmental laws and ADB's Safeguard Policy Statement (SPS 2009).

2. The EMP defines appropriate mitigation measures for the anticipated environmental impacts and defines the institutional responsibilities and mechanisms to monitor and ensure compliance with PRC's environmental laws, standards and regulations, and ADB's SPS. The EMP specifies (i) objectives; (ii) mitigation measures; (iii) implementing organizations and responsibilities; (iv) inspection, monitoring, and reporting arrangements; (v) training and institutional strengthening; (v) a feedback and adjustment mechanism; and (vi) the grievance redress mechanism (GRM).

3. This EMP will be reviewed and updated at the end of the detailed design, as needed, in order to be consistent with the final design. This EMP (or its updated version) will be included as a separate annex in all bidding and contract documents. The contractors will be made aware of their obligations to implement the EMP and to budget the EMP implementation costs in their proposals. The EMP supervision and monitoring results will be used to evaluate (i) the extent and severity of actual environmental impacts against the predicted impacts; (ii) the performance of the environmental protection measures and compliance with related rules and regulations; (iii) trends of impacts; and (iv) overall effectiveness of the mitigation measures.

## **B. Organizations and Their Responsibilities for EMP Implementation**

4. The Gansu Provincial Government will be the executing agency (EA) for the project and has established a provincial project management office (PPMO) under Gansu Culture Tourism Industry Co. Ltd. (GCT) to manage project preparation and implementation. The implementing agency (IA) of Yongchang County Subproject will be Yongchang County Government for project components in Ganzhou District and the IAs for other subprojects will be Yongchang County Government for project components in Yongchang County, Pingchuan District Government for project components in Pingchuan District, Lintao County Government for project components in Lintao County, and Tianshui City Economic Development Investment and Financing (Group) Co., Ltd. for project components in Qinzhou District. A Project Steering Committee (PSC) was established to provide high level guidance, supervision and coordination for the project. The PSC is led by the EA.

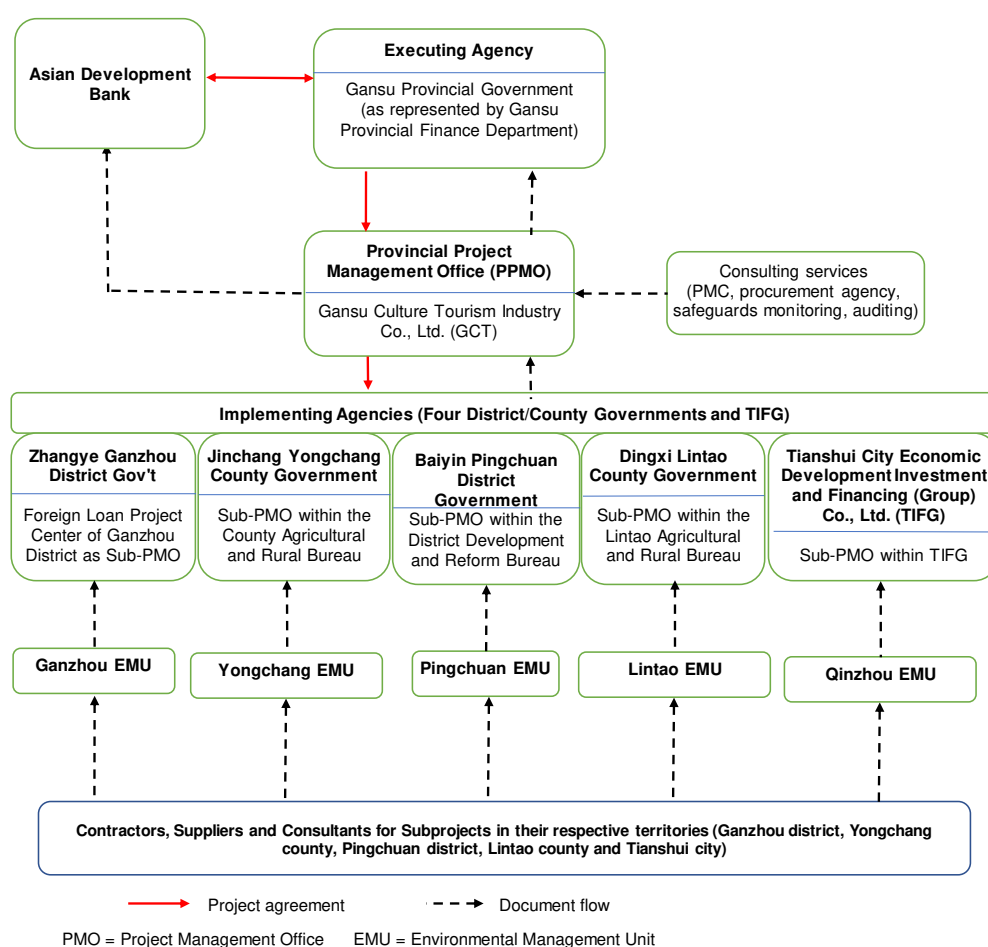
5. IA will establish a Sub-PMO to manage implementation of the project components for each county/district and will designate staff, including safeguard, procurement, and financial management staff, to its Sub-PMO to ensure appropriate and efficient project implementation. Each Sub-PMO will designate a qualified environment and safety officer separately, who will take overall responsibility for supervising the implementation of the EMP, including mitigation measures, coordinating the project level GRM, and preparing monitoring reports for submission by the PPMO to the ADB. The PPMO will recruit the Project Management and Capacity Development Consultants (PMC) to assist with project management, technical support, safeguards monitoring and implementation of the social development action plan, and the communication strategy. The PMC will also cater to the reporting needs of ADB. The PPMO will engage a loan implementation environment consultant (LIEC) prior to the engagement of construction contractors, who will support the PPMO and Sub-PMO in mitigation implementation, environmental monitoring, reporting, and addressing any environment-related issues that arise including grievances. The LIEC will also support contractors in developing construction site-specific environmental management plan (CEMP) prior to construction and operation.



6. The IAs will establish environmental management units (EMUs) under the Sub-PMO that will be directly responsible for individual components under the subproject and their associated safeguards. The EMUs will be led by the Sub-PMO environment and safety officer, and will have an appropriate number of designated environmental staff from the components (one staff for one component).

7. The EMP implementation arrangements and responsibilities of governmental organizations are summarized in Table EMP-1. An organogram of the project is presented in Figure EMP-1.

**Figure EMP-1: Organization chart of the project**



8. **Environmental staff within Sub-PMO and EMUs.** The Sub-PMO will designate a qualified environment officer, who will take overall responsibility for leading the EMU. The officer will work full-time for the subproject and will take charge of: (i) supervising the implementation of mitigation measures during subproject design, construction and operation; (ii) ensuring that environmental management, monitoring, and mitigation measures are incorporated into bidding documents, construction contracts and operation management manuals; (iii) submitting annual environmental monitoring and semi-annual progress reports to PPMO; (iv) coordinating the GRM; and (v) responding to any unforeseen adverse impacts. The Sub-PMO Environment Officer will be technically supported by the loan implementation

environment consultant. EMU will nominate one qualified environment and social focal officer to check the overall implementation of environmental management provisions of the EMP and to work in close coordination with the Sub-PMO Environment Officer.

9. **Project Management Consultant (PMC)** services will be provided to support the PPMO in project management, technical support, safeguards policy compliance and monitoring, social development and gender action plan and communication strategy implementation.

10. **Loan Implementation Consultants.** PPMO will engage (i) a loan implementation start-up consultant (environment) on a short-term basis, to assist the PPMO with early establishment of the EMP immediately after project effectiveness, and (ii) a loan implementation environmental consultant (LIEC) and loan implementation social consultant (LISC), as part of the loan consultancy implementation services for the whole duration of the project. These consultants will be recruited for intermittent (part-time) support.

11. The start-up environment consultant who will support the PPMO to establish the EMP, in the period between loan effectiveness and recruitment of loan implementation consultants required for efficient project implementation. After completion of this “start-up” phase, a LIEC will take over the work of the “start-up” consultant, to provide long-term support to the PPMO and EMUs. LIEC will support the PPMO for capacity building for, and coordination of, the EMP implementation. The LIEC will also support contractors in developing construction site-specific environmental management plans (CEMPs) prior to construction and operation.

12. A qualified **Construction Supervision Company (CSC)** will be recruited and be responsible for supervising and guiding construction contractors during project construction phase. The CSC will have a qualified Health, Safety and Environment Supervision Engineer who will be responsible for supervising construction contractors to ensure proper the implementation of EMP and CEMPs; and preparing and submitting consolidated quarterly environmental monitoring reports to the PPMO based on the CEMPs implementation.

13. One qualified 3rd party **Environmental Monitoring Agency (EMA)** will be engaged by the PPMO to undertake construction and operation phase environmental monitoring, as per the requirements of the Environmental Monitoring Plan (EMoP) presented in this EMP.

14. **Construction Contractors** will be responsible for implementing the mitigation measures during construction under supervision of the IA and the PPMO. In their bids the contractors will prepare CEMPs which detail the means by which the contractors will comply with the EMP. Each contractor will identify a lead focal point for environmental issues (e.g. Environment, Health and Safety Officer), who will oversee CEMP implementation, take all reasonable measures to minimize the impact of construction activities on the environment, develop and prepare monthly reports for submission to the IA. Contractors are also required to report any spills, near misses, accidents, and grievances received, and take appropriate action. The Environment, Health and Safety Officer will also be responsible for developing CEMPs and an Occupational Health and Safety Plan (OHSP).

15. **ADB** will conduct environmental compliance review of the subproject during review missions. ADB will also review and perform quality control on the environmental monitoring reports submitted by the PPMO and will disclose the reports on its website. If the PPMO fails to meet safeguards requirements described in the EMP, ADB will seek corrective measures and advise the EA/IA on items in need of follow-up actions.

16. Draft terms of reference for the PPMO and EMU environmental officer positions, start-up environmental consultant, and LIEC, are described in **Appendix 2** of the subproject IEE.

**Table EMP-1: Summary of Institutional Responsibilities for EMP Implementation.**

Agency	Role and Responsibility
Gansu Provincial Government (represented by Gansu Provincial Finance Department)	<ul style="list-style-type: none"> <li>• The project executing agency (EA) and contact point for ADB.</li> <li>• Responsible for overall implementation and compliance with loan assurances and the EMP.</li> <li>• Establishes provincial level project management office (PPMO)</li> <li>• Overall accountability and responsibility for project planning, management, and implementation</li> <li>• Ensure timely and effective execution of the loan agreements</li> <li>• Coordinate with ADB</li> </ul>
Project Steering Committee (PSC) led by the EA	Provide high level guidance, supervision and coordination for overall project management and environment safeguards.
Provincial Project Management Office (PPMO) –Located in Gansu Culture Tourism Industry Co. Ltd. (GCT)	<p><b>Overall project management and environment safeguards</b></p> <ul style="list-style-type: none"> <li>• Supervise and manage daily project implementation</li> <li>• Recruit and manage design institutes, procurement agents, consultants, in accordance with government and ADB regulations</li> <li>• Submit bidding documents, bid evaluation reports and other documents as needed to ADB for endorsement</li> <li>• Coordinate with ADB on all aspects of project implementation</li> <li>• Assign 1 PPMO Environment Officer and 1 PPMO Social Officer</li> <li>• Engage PMC and LIEC</li> </ul> <p><b>Role of the PPMO Environment Officer (full-time):</b></p> <ul style="list-style-type: none"> <li>• Update IEE and/or EMP as needed, especially during the stage of detailed engineering designs</li> <li>• Ensure that the EMP, especially all relevant mitigation measures, are included in the detailed engineering designs</li> <li>• Establish and coordinate implementation of the GRM</li> <li>• Supervise the implementation of mitigation measures during project design, construction, and operation</li> <li>• Ensure that environmental management, monitoring, and mitigation measures are incorporated into bidding documents, construction contracts and operation management manuals</li> <li>• Respond to any unforeseen adverse environmental impacts and take corrective actions as needed</li> <li>• Ensure project compliance with the environmental safeguard assurances in the loan and project agreements</li> <li>• Receive safeguard reports from the EMUs (see next row) and review and compile these</li> <li>• Prepare annual environment monitoring reports to ADB</li> </ul>
(i) Ganzhou District Government, (ii) Yongchang County Government, (iii) Pingchuan District Government, (iv) Lintao County Government, and (v) Tianshui City Economic Development Investment and Financing (Group) Co., Ltd.	<ul style="list-style-type: none"> <li>• The project implementing agencies (IAs).</li> <li>• Establish Sub-PMO.</li> <li>• Responsibilities at the project preparation stage include (i) coordination with central/provincial governments, and related government agencies; (ii) preparing required reports and obtaining approvals from upper level governments/authorities; (iii) organizing project preparation activities, like consultant recruitment and report preparation (project proposal, feasibility studies, land acquisition and resettlement plan, environment and social assessments, etc.); and, (iv) arranging project implementation.</li> <li>• Responsibilities at implementation include: (i) coordination among central/provincial governments, the EA, and related government agencies and entities; (ii) implementation planning, arrangement, and quality control; (iii) loan disbursement and financial management; (iv) compliance of environment and social safeguards; (v) Contracting and administering contractors and suppliers; (iv) supervising construction and monitoring quality control; and (v) engaging local environmental monitoring companies for environmental monitoring.</li> </ul>
Sub-PMO	<ul style="list-style-type: none"> <li>• Daily coordination, monitoring, and reporting of all aspects of administration for each subproject and their components</li> </ul>

Agency	Role and Responsibility
	<ul style="list-style-type: none"> <li>• Carry out procurement of contract packages to its related subproject, with the assistance with Procurement Agency and PICs;</li> <li>• Organize, participate and/or facilitate capacity building activities;</li> <li>• Submitting annual environmental monitoring and semi-progress reports to PPMO</li> <li>• Coordinating the GRM</li> <li>• Responding to any unforeseen adverse impacts.</li> </ul>
Environmental Management Units (EMUs)	<ul style="list-style-type: none"> <li>• Daily coordination, monitoring, and reporting of all aspects of safeguards for each subproject and their components</li> <li>• Supervising the implementation of mitigation measures during subproject design, construction and operation, including the implementation of contractors' site-EMPs</li> <li>• Ensuring that environmental management, monitoring, and mitigation measures are incorporated into bidding documents, construction contracts and operation management manuals</li> <li>• Act as local entry point for the project GRM</li> <li>• Assess contractors' compliance with EMP and PRC environmental quality standards for ambient air, water, and noise quality</li> <li>• Submit quarterly inspection results to the Sub-PMO environment officers, for review, verification, and confirmation</li> </ul>
Loan Implementation Start-Up Consultant (Environment) (national; continuous; short-term in the earliest stage of project effectiveness)	<ul style="list-style-type: none"> <li>• Provide short-term bridging support to the PPMO, Sub-PMO, and EMUs in the preparation for environment safeguards soon after project effectiveness, before the loan implementation environment consultant (see below) is recruited</li> <li>• Work with the PPMO and EMU safeguard officers</li> <li>• Especially, assist establishment of the grievance redress mechanism</li> <li>• As needed, review and update the TORs for the various PPMO and/or EMU safeguard positions and/or comment on the adequacy of assigned personnel in relation to qualifications needed for each role</li> <li>• Assist PPMO as needed to review and/or update the TOR for the external environment monitoring agency</li> <li>• Assess whether any changes have been made to the project design and/or whether the detailed engineering designs require any update to the EMP</li> </ul>
Loan Implementation Environmental Consultant (LIEC) (intermittent throughout project)	<ul style="list-style-type: none"> <li>• To be recruited under the loan implementation consulting services</li> <li>• Assist in updating the EMP and environmental monitoring program, as needed</li> <li>• Support the PPMO and EMUs social-and-environment safeguard officers to plan, coordinate, monitor, and report on implementation of the EMP</li> <li>• Assist the PPMO environment officer to prepare the annual environment monitoring reports to ADB</li> <li>• Provide training to the PPMO and EMU safeguard personnel, EMUs, contractors, and construction supervision companies, to ensure adequate capacity and understanding to implement the EMP (Table EMP-6)</li> <li>• Help identify any environment-related implementation issues and propose corrective actions</li> <li>• Undertake site visits for EMP inspection as required</li> </ul>
External environment monitoring agency (EMA, intermittent throughout project)	<ul style="list-style-type: none"> <li>• Several qualified independent environmental monitoring agencies will be recruited to implement the ambient monitoring portion of the environmental monitoring plan.</li> </ul>
Contractors (intermittent throughout construction)	<ul style="list-style-type: none"> <li>• Prepare CEMPs which detail the means by which the contractors will comply with the EMP.</li> <li>• Ensure sufficient funding and human resources for proper and timely implementation of required mitigation and monitoring measures in the EMP and CEMPs throughout the construction phase.</li> <li>• Identify a lead focal point for environmental issues ( Environment, Health and Safety Officer) who will oversee CEMP and Occupational Health and</li> </ul>

Agency	Role and Responsibility
	<p>Safety Plan (OHSP) development and implementation, take all reasonable measures to minimize the impact of construction activities on the environment, and develop and prepare monthly reports for submission to the IA.</p> <ul style="list-style-type: none"> <li>• Report any spills, near misses, accidents, and grievances received, and take appropriate action.</li> <li>• Responsible for implementation of resolutions identified during GRM operation during the construction phase.</li> </ul>
Construction supervision company (intermittent throughout construction)	<ul style="list-style-type: none"> <li>• Ensure sufficient funding and human resources for supervising and instructing contractors for proper and timely implementation of required mitigation and monitoring measures in the EMP</li> <li>• Supervise construction progress and quality</li> <li>• Appoint qualified EHS officer for regular onsite supervision of contractors</li> <li>• Supervise the contractor's EMP implementation performance</li> <li>• Undertake simple and cost-effective on-site quantitative measurements to regularly check that construction complies with the project environmental monitoring standards and targets, especially for noise and air quality (especially during works in urban areas and villages), using a basic hand-held meter</li> <li>• Submit monthly EMP monitoring reports to Sub-PMO and EMUs</li> </ul>
Asian Development Bank	<ul style="list-style-type: none"> <li>• Oversee project administration and timely execution of the loan agreements by the executing and implementing agencies</li> <li>• Disburse loan proceeds</li> <li>• Review procurement, consultant recruitment, progress reports, and audit reports</li> <li>• Review project compliance and targets against the design and monitoring framework, EMP, and project administration manual</li> <li>• Review and endorse updated IEE and EMP as needed</li> <li>• Monitors project progress and conducts review missions</li> <li>• Discloses monitoring reports on ADB public website</li> </ul>

CSC = construction supervision company, EHS = environment, health and safety, EMA = environment monitoring agency, EMP = environment management plan, GRM = grievance redress mechanism, LIEC = loan implementation environment consultant, EMU = Environmental Management Unit, PPMO = project management office.

### C. Potential Impacts and Mitigation Measures

17. Tables EMP-2 lists the potential impacts of the subproject components during preparation and design, construction and operation phases, and proposed mitigation measures. The mitigation measures will be incorporated into detailed design, bidding documents, construction contracts and operational management manuals, by the design institutes (during detailed design) and contractors (during construction), under the supervision of the PPMO and EMU Environment Officers and CSCs, with technical support from the LIECs. The effectiveness of these measures will be evaluated based on environmental inspections and monitoring to determine whether they should be continued, improved, or adjusted.

**Table EMP-2:** Potential Impacts and Mitigation Measures during Pre-construction, Construction and Operation Phases

Item	Potential impacts / issues	Mitigation measures	Who implements	Who supervises
<b>A. DESIGN AND PRE-CONSTRUCTION PHASE</b>				
<b>Detailed design stage</b>	Institutional strengthening for EMP implementation and supervision	<ul style="list-style-type: none"> <li>At least 2 months before any construction, PPMO engages LIEC.</li> <li>At least 2 months before any construction, provide training to all environmental staff for EMP implementation and supervision.</li> <li>At least 1 month before construction: (i) reconfirm the full-time status of the PPMO Environmental Officer; (ii) appoint required Environment Focal Staff in each EMU.</li> <li>Confirm that at least one certified EMA has been recruited for the subproject at least 2 months before any construction.</li> <li><b>Coronavirus (COVID-19) safety management – prescreening ahead of works.</b> Establish early screening measures and procedures to ensure that all new project personnel are tested negative before commencing on-site work. See also requirements under occupational health and safety (Construction Phase, and Appendix 3) for preparation of a COVID-19 health and safety plan.</li> </ul>	PPMO, Sub-PMO/EMU	PPMO
	Updating EMP	<p><b>Update the mitigation measures defined in this EMP</b></p> <ul style="list-style-type: none"> <li>Update the EMP as needed, based on the final detailed designs.</li> <li>Submit the updated EMP to ADB for review.</li> </ul> <p><b>Changes in project locations or scope</b></p> <ul style="list-style-type: none"> <li>In case of major changes of subproject location and/or additional physical components, engage a DEIA team to conduct additional DEIA and public consultation. The revised DEIA will be submitted to local EEBs and ADB for approval and disclosure. ADB will determine if the change is minor or major.</li> </ul>	Sub-PMO/EMU, LIEC, DEIA Team	EEBs, ADB
<b>Construction Preparation</b>	Environmental monitoring plan	<ul style="list-style-type: none"> <li>Prepare detailed monitoring plan in accordance with the monitoring plan in this EMP.</li> <li>Prior to construction, the Sub-PMO or EMUs will hire EMAs for environmental monitoring.</li> </ul>	Sub-PMO/EMU	PPMO
	Bidding and contract documents	<ul style="list-style-type: none"> <li>Mitigation measures in the EMP are incorporated in all bidding documents.</li> <li>Bidding documents are submitted to ADB for review.</li> <li>Prepare environmental contract clauses for contractors.</li> </ul>	Tendering Agency, Sub-PMO, PPMO	ADB
	EMP training	<ul style="list-style-type: none"> <li>LIEC, and/or invited environment specialists and/or officials from EEBs provide training on construction environmental management, implementation, supervision, for appropriate staff of the PPMO, IAs, EMUs, contractors, and CSCs, in accordance with the training plan in this EMP.</li> </ul>	LIEC	PPMO, EEB
	Establish GRM	<ul style="list-style-type: none"> <li>Responsibility for GRM implementation is assigned to the PPMO and Sub-PMO/EMU Environmental Officers and Social Officers and is included in their terms of reference.</li> <li>PPMO and EMU personnel will be aware of, and trained in, the GRM, and will help support the environmental and social officers when necessary.</li> <li>Key contact details for the GRM (phone number, WeChat, address, email) will be provided on the PPMO, IA and/or EEB public websites and information boards at construction sites.</li> </ul>	PPMO, Sub-PMO/EMU	ADB

Item	Potential impacts / issues	Mitigation measures	Who implements	Who supervises
	Site EMPs	<ul style="list-style-type: none"> <li>Prior to any works, prepare site-specific EMP for individual construction sites. The site EMP shall at minimum include: (a) surface water and ecosystem protection; (b) spill control and management; (c) site drainage and soil erosion protection; (d) temporary traffic management; (e) construction site access control; (f) health and safety and emergency response; (g) all other mitigation measures listed in the subproject EMP; (h) contractor performance targets; and (i) safety measures for coronavirus disease (COVID-19) in the EMP.</li> <li>Review and ensure site EMP complies with the measures in this EMP.</li> </ul>	Contractors	CSC, Sub-PMO, LIEC
<b>B. CONSTRUCTION PHASE</b>				
<b>Topography and Soils</b>	Earthwork, soil erosion, soil contamination	<ul style="list-style-type: none"> <li>The potential for construction site storm water runoff will be assessed, and appropriate storm water drainage systems to minimize soil erosion will be implemented, including perimeter bunds, temporary detention and settling ponds to control topsoil runoff, and intercept channels to prevent construction runoff from entering the nearby river.</li> <li>Land excavation and filling will be balanced so as to minimize the requirement for fill material sourcing and transportation.</li> <li>Spoil will be reused on-site to the maximum extent feasible as fill. During the land leveling much of the spoil will be used for back-fill and soil replacement. Excess spoil that cannot be used on-site will be transported for disposal at the approved spoil disposal sites. If any additional sites are needed, the new sites will be screened for compliance with selection criteria (see below).</li> <li>Temporary spoil storage sites (and storage containers at lane modification and stations construction sites) will be identified, designed, and operated to minimize impacts. Temporary spoil sites will be restored at the conclusion of storage activities.</li> <li>Construction and material handling, in particular for the excavation works, will be limited during rain (rainy season is May to September) and high winds.</li> <li>During earthworks, the area of soil exposed to potential erosion at any time will be minimized through good project and construction management practices.</li> <li>Spoil and aggregate (which will be purchased from the local suppliers) piles will be covered with landscape material and/or regularly watered.</li> <li>Waste construction material such as residual concrete, asphalt, etc., will be properly handled for reuse or disposal.</li> <li>Earthwork areas will be stabilized within 15 days after earthworks have ceased at the sites.</li> <li>Construction camps and storage areas will be situated to minimize land area required.</li> <li>Construction wastes will be removed from the site to approved disposal sites</li> </ul> <p><b>Disposal of spoil (surplus spoil), if required</b></p> <ul style="list-style-type: none"> <li>In the event that surplus spoil cannot be re-used and must be disposed of, the preference will be to use existing and EEB approved disposal sites in Jinchang. In the event no such suitable</li> </ul>	Contractors	CSC, Sub-PMO/EMU, EEB, WRB, LIEC

Item	Potential impacts / issues	Mitigation measures	Who implements	Who supervises
		<p>sites are available, disposal sites will be selected based on compliance with the following criteria: (i) situated as close as possible to the works sites, to minimize transport costs, vehicle emissions, and risks associated with more distant transport of spoil e.g. vehicle accidents, dislodging of spoil onto roads, and inadvertent transfer of invasive species or disease vectors, (ii) located at least 500 m from the rivers and other surface water bodies, to avoid impacts to river banks or siltation after rainfall, (iii) avoidance of any protected areas, wetlands, waterways, flood retention areas, or other sensitive receptors, (iv) compliance with land zoning for appropriate land use and compliance approvals issued by the EEB and Urban Administration Bureau, subject to their site inspections and endorsement prior to any disposal of project surplus spoil</p> <ul style="list-style-type: none"> <li>• Use the existing and EEB approved disposal sites in Jinchang.</li> </ul> <p><b>Borrow pits, if required</b></p> <ul style="list-style-type: none"> <li>• All borrow materials (earth) required will be sourced only from existing and certified borrow yards. Prior to using these sites, the PPMO, Sub-PMO/EMU and contractors will confirm again with relevant local agencies the sites contain sufficient capacity to provide the project needs.</li> <li>• No new borrow sites will be established for the subproject.</li> <li>• In the event that new disposal or borrow sites need to be established for the project, this will be subject to domestic environmental assessments and approvals. ADB will be notified in such case to ensure the new sites and procedures for use comply with the measures in this EMP. The new borrow sites should be rehabilitated/revegetated after the works have been undertaken</li> </ul>		
<b>Soil and water contamination</b>	Impact from wastewater, fuels, solid wastes	<ul style="list-style-type: none"> <li>• Labor camps, fuel storage, machinery maintenance workshop and vehicle cleaning areas must be stationed at least 500 m away from waterways.</li> <li>• Storage facilities for fuels, oil, and other hazardous materials will be within secured areas on impermeable surfaces and provided with bunds and cleanup installations.</li> <li>• Prior to any earthworks along rivers and channels, install sediment traps and curtains, to minimize sediment runoff.</li> <li>• Collect construction wastewater in retention ponds and filter tanks to remove silts, oil.</li> <li>• Equip machine wash-down sites with water collection basins and sediment traps.</li> <li>• Install oil-water separators before the sedimentation tank for oily wastewater treatment.</li> <li>• Equip all sites for washing of construction equipment with water collection basins and sediment traps.</li> <li>• Install portable toilets at worksites and on-site wastewater pre-treatment systems for worker camps along with maintenance protocols.</li> <li>• Domestic wastewater from worker camps will be disposed of in two ways: (i) for work sites accessible to municipal sewerage systems, the wastewater will be discharged into the nearest</li> </ul>	Contractors	CSC, Sub-PMO/EMU, PPMO, LIEC



Item	Potential impacts / issues	Mitigation measures	Who implements	Who supervises
		sewerage system; (ii) for work sites neither close to villages nor sewerage systems, temporary septic tanks will be constructed for the centralized treatment of domestic wastewater. <ul style="list-style-type: none"> <li>Contractors will develop actions for control of oil and other dangerous substances as part of their site EMPs.</li> <li>Contractors' fuel suppliers must be properly licensed. They shall follow proper protocol for transferring fuel and the PRC standard of JT3145-91 (Transportation, Loading and Unloading of Dangerous or Harmful Goods. revised).</li> </ul>		
<b>Reservoir contamination</b>	Impact from wastewater, fuels, solid wastes	<ul style="list-style-type: none"> <li>Requirements of "Regulations on pollution Prevention and Control of Drinking Water Source Protection Areas" and "Guidelines for Environmental Protection of Centralized Drinking Water Sources" will be fully considered and mitigation measures will be developed and incorporated in the design.</li> <li>Store petroleum products, hazardous materials and wastes on impermeable surfaces in secured and covered areas, &gt;500 m from the reservoir.</li> <li>Remove all construction wastes from the site to approved waste disposal sites. Construction waste will be regularly transported off-site by the contractor for disposal at the certified sites.</li> <li>Earthworks near the reservoir will be accompanied by measures on minimizing the sediment runoff into the water bodies, including silt fences and sediment traps</li> <li>Temporary interception and drainage ditch and waste water collection tank will be installed at the sites near the reservoir.</li> <li>Construction activities will be stopped before and in the rainy days.</li> <li>Construction equipment will be washed, maintenance and repaired at another site.</li> <li>Construction camp will not be built in the class II protection zone of the reservoir.</li> <li>Train contractors, CSCs, construction workers, Sub-PMO/EMU and IA on reservoir protection including relevant regulations such as "Regulations on pollution Prevention and Control of Drinking Water Source Protection Areas" and "Guidelines for Environmental Protection of Centralized Drinking Water Sources".</li> <li>Establish emergency response on spill response procedures.</li> </ul>	Contractors	CSC, Sub-PMO/EMU, PPMO, LIEC
<b>Ambient Air</b>	Dust generated by construction activities, gaseous air pollution (SO <sub>2</sub> , CO, NO <sub>x</sub> ) from construction machinery and asphalt pavement	<ul style="list-style-type: none"> <li>Spraying of water daily at construction sites where fugitive dust is being generated. Particular attention will be paid to dust suppression near sensitive receptors identified</li> <li>Storing petroleum or other harmful materials in the appropriate places and covering to minimize fugitive dust and emission.</li> <li>Transport vehicles will be limited to low speeds at construction sites.</li> <li>Loads will be covered during truck transportation to avoid spillage or fugitive dust generation. Fine materials will be transported in fully contained trucks to avoid spillage or dust generation.</li> <li>Construction site roads will be well maintained and watered and swept on an as-needed basis. Construction site road entry points will be equipped with truck drive through wash ponds.</li> </ul>	Contractors	CSC, Sub-PMO/EMU, PPMO, LIEC

Item	Potential impacts / issues	Mitigation measures	Who implements	Who supervises
		<ul style="list-style-type: none"> <li>• Transport routes and delivery schedules will be planned to avoid densely populated and sensitive areas, and high traffic times.</li> <li>• Provide regular maintenance to vehicles in order to limit gaseous emissions (to be done off-site). All vehicles and construction machinery must comply with the PRC Grade V or higher emission standard.</li> <li>• Temporary fencing will be erected around dusty activities.</li> <li>• Construction spoil, aggregate other construction materials will be temporary stored using containers, but they may the potential to generate dust. Thus, containers will be covered and/or watered if necessary. Powdered materials such as cement and lime will be stored in sealed bags or containers.</li> <li>• Muddy or dusty materials on public roads outside the exits of works areas will be cleaned immediately.</li> <li>• Disturbed site will be revegetated as soon as possible after the completion of works</li> <li>• Ensure emissions from vehicle and machinery comply with PRC standards of GB18352-2005, GB17691-2005, GB11340-2005, GB2847-2005, and GB18285-2005.</li> <li>• Commercial concrete will be purchased. Purchase pre-mixed asphalt for road surface paving. On-site asphaltting and concrete batching are prohibited.</li> </ul>		
<b>Noise and vibration</b>	Noise and vibration generated from construction activities	<b>Noise</b> <ul style="list-style-type: none"> <li>• Ensure construction machinery conform to PRC standard of GB12523-2011. Properly maintain vehicles and machineries to minimize noise.</li> <li>• Apply noise reduction devices or methods where noisy machinery is operating, within 200 m of sensitive sites.</li> <li>• Locate high-noise activities (e.g., pilling) &gt;500 m from sensitive areas. If the activities can't be more than 500 m from sensitive areas, installation of noise barriers to reduce as much of the emissions as possible, and/or installation of additional layers on the windows of the affected homes as necessary, the duration of daily construction activities will be agreed by the affected villagers through community consultation.</li> <li>• Prohibit operation of machinery generating high levels of noise, and movement of heavy vehicles along urban and village roads between 20:00 and 06:00.</li> <li>• Take special caution at construction sites that are close to such sensitive sites as schools and villages. When construction activities are unavoidable during the school seasons, the use of heavy equipment will be restricted to weekends and non-class hours</li> <li>• Place temporary hoardings or noise barriers around noise sources during construction.</li> <li>• Monitor noise at sensitive areas and consult villagers/residents at regular intervals (see Table EMP-4). If noise standards are exceeded, equipment and construction conditions shall be checked, and mitigation measures shall be implemented to rectify the situation.</li> <li>• Conduct interviews with residents adjacent to construction sites to identify and resolve issues,</li> </ul>	Contractors	CSC, Sub-PMO/EMU, PPMO, LIEC

Item	Potential impacts / issues	Mitigation measures	Who implements	Who supervises
		<p>including adjustment of work hours of noise-generating machinery.</p> <ul style="list-style-type: none"> <li>• Concrete mixing is prohibited. Commercial concrete will be purchased.</li> <li>• For households within 40 m of the works, particular attention will be provided. This will include: (a) follow-up consultations with these households prior to the start of any works, to specify the exact planned dates and schedule of works, nature of works, equipment to be used, safety measures, and public access during construction; (b) installation of noise barriers to reduce as much of the emissions as possible, and/or installation of additional layers on the windows of the affected homes as necessary, based on the assessment of the most technically effective method and feedback from the community consultations; and (c) agreement on the duration of daily works.</li> </ul> <p><b>Vibration</b></p> <ul style="list-style-type: none"> <li>• High noise activities, such as compaction operations, will be prohibited at night;</li> <li>• Communities will be consulted prior to large earthworks to ensure they are informed and to avoid sensitive timing, e.g., exams at nearby schools or festivals</li> <li>• If there are buildings near to high impact areas, pre- construction crack surveys and post construction crack surveys will be conducted with proper records</li> </ul>		
<b>Solid Waste</b>	Solid waste generated by construction activities and from workers' camps	<ul style="list-style-type: none"> <li>• Wastes will be managed in accordance with the <i>Law on the Prevention and Control of Environmental Pollution by Solid Waste</i> of the PRC and scrap material and demolition waste disposal standards promulgated by the PRC's Ministry of Housing and Urban-Rural Construction.</li> <li>• The lead construction contractor will be responsible for providing sufficient construction waste dumpsters at all work sites, and sufficient covered garbage and recycling collection bins at worker camps. Dumpsters and bins should be covered and protected from birds and vermin, at locations away from surface water or sensitive spots</li> <li>• The lead construction contractor will be responsible for recycling and reusing construction wastes to the extent possible (including concrete and brick debris).</li> <li>• The lead construction contractor will be responsible for ensuring regular collection and transport of domestic recyclables to appropriate authorities and remaining wastes to Yongchang County Municipal Landfill, using the local municipal solid waste collection system via contracts between the contractor and the local sanitation authority. The contractors' responsibility will be included in bidding documents and construction contracts.</li> <li>• Littering by workers will be prohibited.</li> <li>• Excavated soil will be backfilled onsite to the extent possible. Excess spoil that cannot be used on-site will be transported to an approved spoil disposal site (see above).</li> <li>• There should be no final waste disposal on site. Waste incineration at or near the site is strictly prohibited.</li> </ul>	Contractors	CSC, Sub-PMO/EMU, PPMO, LIEC

Item	Potential impacts / issues	Mitigation measures	Who implements	Who supervises
		<ul style="list-style-type: none"> <li>Contractors will be held responsible for proper removal and disposal of any significant residual materials, wastes, spoil, waste and contaminated soils that remain on the site after construction.</li> </ul>		
<b>Ecology</b>	Impacts to vegetation and flora and fauna	<ul style="list-style-type: none"> <li>Clearance of vegetation will be restricted to construction sites.</li> <li>Prior to construction, any adjacent areas of vegetation or habitat will be clearly demarcated as no-go zones for workers and machinery.</li> <li>A site revegetation plan will be developed, approved by, and registered with the local Gardens Bureau. Cleared sites will be immediately re-vegetated. All plantation activities under the revegetation plan will only use native plant species. In the event that non-native seedlings are required for rapid stabilization of exposed soils and sites, only sterile seedlings (i.e., which cannot propagate) will be used, to prevent the spread of weeds.</li> <li>To reduce the risk of spreading weeds, pest animals, and/or soil-based organisms, the project will: (a) prohibit the use of any plant species classified in the PRC as weeds – including native species – as defined by the Research Center for Biological Prevention and Control of Alien Invasion (Ministry of Agriculture and Rural Affairs) and Institute of Plant Protection (Chinese Academy of Agricultural Sciences), available at <a href="http://www.chinaias.cn/wjPart/index.aspx">http://www.chinaias.cn/wjPart/index.aspx</a></li> </ul>	Contractors	CSC, Sub-PMO/EMU, PPMO, LIEC
<b>Physical cultural resources</b>	Damage to known or unknown above or below-ground cultural relics	<p><b>Implement the following chance-find procedure at all sites:</b></p> <ul style="list-style-type: none"> <li>Prior to works, conduct a cursory check of the site and ground cover to assess what physical human objects – if any – are present e.g., graves, artifacts, temples, etc.</li> <li>Contractor is to immediately report these to the CSC and EMU.</li> <li>If an artefact is found during this check or during works, stop works immediately. Notify the CSC and EMU.</li> <li>The EMU notify the PPMO and Cultural Relics Bureau.</li> <li>No further work at the site will be conducted under the Cultural Relics Bureau provides specific guidance on how to proceed with next steps, and gives permission to proceed.</li> </ul>	Contractors, CSC	Sub-PMO/EMU, LIEC, cultural relic bureau
<b>Community and occupational health and safety</b>	Community consultation, health, and safety	<p><b>Community consultations</b></p> <ul style="list-style-type: none"> <li>Prior to any works, inform residents and businesses in advance through media, information boards, and direct consultations, of the construction activities, dates and duration of expected disruption.</li> <li>Especially for the communities within 40 m of works and who will be subjected to higher noise/dust levels, conduct meetings with residents prior to any works.</li> <li>Record all community feedback and solutions discussed and agreed.</li> <li>Based on feedback from the community consultations: (i) update contractor site plans as needed to incorporate the solutions, including revisions in work schedules, working hours, and construction and/or mitigation methods; (ii) revise CSC monitoring schedules and monitoring criteria as needed to reflect the updated contractor site management plans.</li> </ul>	Contractors, CSC	CSC, Sub-PMO/EMU, PPMO, LIEC

Item	Potential impacts / issues	Mitigation measures	Who implements	Who supervises
		<p><b>Community health, safety, and minimizing disruption to daily life and utilities</b></p> <ul style="list-style-type: none"> <li>• Prepare and implement a traffic control plan, for approval by local traffic management administration before construction. This will include scheduling or diverting construction traffic to avoid peak hours, regulating traffic at road crossings, selecting routes to reduce disturbance, reinstating roads, and opening them to traffic when construction is completed;</li> <li>• For all excavation along roads and easements which already have existing subsurface utilities (power cables, sewage pipes, water pipes, telecommunication cables): (i) plan and coordinate the project pipeline construction with the utility managers, (ii) check whether there are other pending projects to upgrade these utilities. Coordinate works to avoid repeated excavation of the same sections of road or easement; and work with utility managers to minimize the risk of damage or disruption to the existing utilities. If any utilities are disturbed by the construction activities, they will be rectified immediately by the contractor in coordination with the utility provider.</li> </ul> <p><b>Construction Site Protection</b></p> <ul style="list-style-type: none"> <li>• Install signs at construction sites to inform people of the project GRM, potential dangers (e.g. moving vehicles, hazardous materials, excavations) and safety issues.</li> <li>• Install safety barricades around all excavations, including open trenches.</li> <li>• Assign personnel to direct pedestrians around dangerous work areas.</li> <li>• Ensure that all sites are secure, discouraging access through appropriate fencing.</li> <li>• Lock and secure all work sites to prevent unauthorized access.</li> <li>• Night-time (8:00pm – 6:00am) use of heavy machinery is strictly prohibited.</li> </ul>		
	Occupational health and safety	<p>Prepare <b>Environmental, Health and Safety (EHS) plan</b>, to include:</p> <ul style="list-style-type: none"> <li>• worker campers will be constructed following IFC's Workers' accommodation: processes and standards;</li> <li>• clean and sufficient supply of fresh water for construction sites, camps, offices;</li> <li>• sufficient latrines and other sanitary arrangements at construction sites and work camps;</li> <li>• garbage receptacles and regular emptying;</li> <li>• provision of PPE as needed, in accordance with health and safety regulations (e.g., safety boots, helmets, gloves, protective clothing, respirators, goggles, and earplugs).</li> </ul> <p>Prepare <b>Emergency Preparedness and Response Plan</b> for accidents and emergencies, including environmental and public health emergencies associated with hazardous material spills and similar events, and working in proximity to water bodies.</p> <ul style="list-style-type: none"> <li>• Emergency phone linked with hospitals in the project area will be established. A fully equipped first-aid base in each construction camp will be organized.</li> <li>• A records management system that will store and maintain easily retrievable records against</li> </ul>	Contractors EHS Officer	CSC, Sub-PMO/EMU, PPMO, LIEC

Item	Potential impacts / issues	Mitigation measures	Who implements	Who supervises
		<p>loss or damage will be established. It will include documenting and reporting of occupational accidents, diseases, and incidents. The records will be reviewed during compliance monitoring and audits.</p> <ul style="list-style-type: none"> <li>Occupational health and safety matters will be given a high degree of publicity to all work personnel and posters will be displayed prominently at construction sites.</li> <li>All workers will be given basic training in sanitation, general health and safety matters, and work hazards. An awareness program for HIV/AIDS and other communicable diseases will be implemented for workers and the local communities.</li> <li>Provide personal protection equipment to workers as needed, e.g. safety boots, helmets, gloves, protective clothing, goggles, ear protection, life rings and buoyancy aids.</li> <li>Core labor standards will be implemented. Civil works contracts will stipulate priorities to: (i) employ local people for works; (ii) ensure equal opportunities for women and men; (iii) pay equal wages for work of equal value and pay women's wages directly to them; and (iv) not employ child or forced labor. Specific targets for employment have been included in the project gender action plan</li> </ul> <p><b>COVID-19.</b> Prepare and implement a <b>COVID-19 Health and Safety Plan</b> to address COVID-19 health risks. The plan will be prepared in line with government regulations and guidelines on COVID-19 prevention and control, and in consultation with public health agencies in the area. The plan will include</p> <ul style="list-style-type: none"> <li>measures to record the locations that workers have visited/lived immediately before and during project work;</li> <li>schedules for disinfecting/cleaning offices, yards, stores and labor camps;</li> <li>measures to implement temperature checks and other health checks on site;</li> <li>physical distancing measures, particularly in worker camps;</li> <li>requirements for mandatory use of personal protective equipment such as facemasks, and provision of handwashing stations, hand sanitizers, and other appropriate protective measures;</li> <li>how workers and residents living near project sites will be provided with information to protect themselves from COVID-19;</li> <li>procedures to be adopted in the event a worker is suspected to have contracted COVID-19; and</li> <li>other COVID-19 prevention and control measures appropriate for the local context.</li> </ul>		
<b>C. OPERATION PHASE</b>				
<b>Air pollution</b>	Odor Generated during Operation	<ul style="list-style-type: none"> <li>Manure in sheep shades will be cleaned regularly by dry clean method. Sheep shades will be designed with good ventilation condition;</li> <li>Temporary manure storage places for healthy sheep will be installed with ceilings, windbreaks</li> </ul>	EMU	LIEC, PPMO

Item	Potential impacts / issues	Mitigation measures	Who implements	Who supervises
		<p>and intercepting drains. These storage places will have leakage and overflow prevention measures. The stored manure will be daily transported to organic fertilizer production plant for recycling;</p> <ul style="list-style-type: none"> <li>• Regular Derating and clean and disinfection of the sheep shades will be implemented;</li> <li>• Add deodorant to the fodder;</li> <li>• Layout of the component be reasonable planned to reduce odor diffusion.</li> <li>• For component 8, regular odor monitoring will be conducted at the site boundaries.</li> </ul>		
<b>Wastewater</b>	Discharge of Production and Domestic Wastewater	<ul style="list-style-type: none"> <li>• Domestic wastewater will be collected and treated in septic tank for recycling.</li> <li>• Stormwater will be collected, stored at stormwater storage tank, then recycled as irrigation water.</li> <li>• Storm water and sewage will be drained separately.</li> <li>• Manure storage area and sheep shades will be installed with ceilings, windbreaks and intercepting drains. These basins will have leakage proofing treatment and overflow prevention measures.</li> <li>• A clay layer with a thickness of 25 cm will be applied to sheep shades and sick and dead sheep waste temporary storage area at the depth of 35cm beneath the sheepfold to prevent the infiltration of urine into groundwater. The soil cover on top of the clay layer will be regularly removed and replaced. Dry feces will be regularly cleaned with the dry-cleaning method.</li> <li>• Water proof measures will be implemented on medical waste storage rooms, and temporary feces storage basins. High density polyethylene with a thickness of 2-mm will be installed on the storage basins and facility for water proofing and leakage prevention.</li> </ul> <p>Wastewater from the sheep farm will be collected and treated in in septic tank for recycling. The septic tank will be regularly cleaned and transported to organic fertilizer plant by fecal suction truck for fertilizer production.</p>	EMU	LIEC, PPMO
<b>Groundwater</b>	Potential groundwater pollution from the component	<ul style="list-style-type: none"> <li>• Wastewater collection will be carried out with implementation of leak proofing materials and overflow prevention measures in waste collection ditches and basins;</li> <li>• Manure storage area and sheep shades will be installed with ceilings, windbreaks and intercepting drains. These basins will have leakage proofing treatment and overflow prevention measures.</li> <li>• A clay layer with a thickness of 25 cm will be applied to sheep shades and sick and dead sheep waste temporary storage area at the depth of 35cm beneath the sheepfold to prevent the infiltration of urine into groundwater. The soil cover on top of the clay layer will be regularly removed and replaced. Dry feces will be regularly cleaned with the dry-cleaning method.</li> <li>• Water proof measures will be implemented on medical waste storage rooms, and temporary feces storage basins. High density polyethylene with a thickness of 2-mm will be installed on the storage basins and facility for water proofing and leakage prevention.</li> </ul>	EMU	LIEC, PPMO
<b>Reservoir</b>	Pollution of Jinchuanxia	<ul style="list-style-type: none"> <li>• For component 4, usage of pesticides is prohibited during operation;</li> </ul>	EMU	LIEC, PPMO

Item	Potential impacts / issues	Mitigation measures	Who implements	Who supervises
<b>protection</b>	Reservoir	<ul style="list-style-type: none"> <li>For component 4, littering of domestic waste in is prohibited during operation;</li> <li>Train staff, nearby farmers, EMU, Sub-PMP and IA on reservoir protection including relevant regulations such as "Regulations on pollution Prevention and Control of Drinking Water Source Protection Areas" and "Guidelines for Environmental Protection of Centralized Drinking Water Sources".</li> <li>Establish emergency response on spill response procedures.</li> </ul>		
<b>Noise</b>	Impact on Sensitive Receptors	<ul style="list-style-type: none"> <li>Site layout for the will be planned to reduce noise levels, especially with respect to sensitive receptors.</li> <li>Low-noise equipment will be used as far as possible, and noise reduction measures such as noise elimination, shock absorption, insulated enclosures and sound dampening materials on exterior walls will be implemented.</li> <li>All equipment will be properly maintained to minimize noise.</li> <li>Appropriate noise protective equipment will be provided to the workers who are likely to be exposed to high noise level environments to meet the requirements in occupational exposure limits for hazardous agents in workplace Part 2: physical agents (GBZ 2.2-2007) and EHS Guidelines on occupational health and safety (OHS).</li> </ul>	EMU	LIEC, PPMO
<b>Solid Waste</b>	Collection and Disposal	<ul style="list-style-type: none"> <li>For waste package materials (package for fertilizers and pesticides excluded), the waste package material will be sold out for recycling.</li> <li>For waste vegetable and fruit from the component 1, 2, 3 and 5, these waste will be recycled for organic fertilizer production in nearby organic fertilizer production plant.</li> </ul> <p>For plastic film of the subprojects, mitigation measures are:</p> <ul style="list-style-type: none"> <li>In accordance with PRC Regulation GB 13735-2017 for Polythethylene Blown Mulch Film for Agricultural Uses, the use of non-recyclable plastic film &lt;0.1 mm thickness will be prohibited. Only non-recyclable plastic film of thickness &gt;0.1 mm and/or recyclable film (regardless of thickness) will be used;</li> <li>During harvesting season, the film waste will be collected by farmers. The waste will be stockpiled and transported to "plastic film waste recycling centers" under the management of the Gansu Agricultural Department for the production of recycled fine-particle plastic materials, for sale to manufacturers for various uses. These centers are established and operating throughout farming areas of Gansu Province; and,</li> <li>Film mulching practices which optimize the timing of mulching and timely removal of film to shorten the mulching period.</li> <li>Overall, the impact of plastic film use is considered low, as the total amount to be generated (about 3.0 tons in five years) is relatively small.</li> </ul> <p>For waste packaging such as chemical fertilizer and pesticide, including for greenhouses,</p>	EMU	LIEC, PPMO



Item	Potential impacts / issues	Mitigation measures	Who implements	Who supervises
		<p>mitigation measures are:</p> <ul style="list-style-type: none"> <li>• The project will result in significant reduction in the use of chemical fertilizers and pesticides, which will reduce the amount of plastic packaging;</li> <li>• Training will be conducted for farmers on reducing the use of fertilizers and pesticides, and, responsible disposal of packaging; and</li> <li>• Plastic packaging will be collected by manufacturers for subsequent recycling.</li> </ul> <p>For waste from the component 8, mitigation measures are:</p> <ul style="list-style-type: none"> <li>• Domestic waste containers will be provided at work sites. Domestic waste will be collected on a regular basis by local sanitation departments and transported for recycling, reuse, or disposal at a licensed waste incineration power plant in accordance with relevant PRC regulations and requirements;</li> <li>• Manure in sheep sheds will be cleaned regularly with the dry clean method. Collected manure will be transported to nearby fertilizer production plants to produce organic fertilizer.</li> <li>• Sick sheep will be quarantined if observed, then sheep sheds will be disinfected and the sheep in the same flock will be observed and treated to avoid infection. Medical care will be provided to the sick sheep by the veterinarians;</li> <li>• Waste from dead sheep and sick sheep will be temporally stored at designated area with anti-seepage measures and waterproof measures, then transported and treated by 3rd party certificated dead livestock treatment center following Technical specifications for harmless treatment of sick and dead animals. Regular clean and disinfection will be conducted in and around the temporally storage area. Clear warning signs will be installed at the temporally storage area;</li> <li>• Medical wastes from veterinarian treatment will be temporally stored at a storage facility following PRC's GB18597-2001. Medical wastes will be transported and treated by an independent company certificated for medical waste treatment;</li> </ul> <p>For other waste, the following mitigation measures will be implemented:</p> <ul style="list-style-type: none"> <li>• Waste dumpsters and recycling bins will be provided at all sites.</li> <li>• Domestic waste will be collected on a regular basis and disposed at the Yongchang County Municipal Landfill by the local sanitary department</li> <li>• Waste battery and waste PV panels will be recycled by manufactures.</li> <li>• Publicity and education on domestic waste classification and collection will be provided to the tourists.</li> <li>• The septic tanks will be regularly cleaned and transported to organic fertilizer plant by fecal suction truck for fertilizer production.</li> </ul>		
<b>Agricultural Chemicals</b>	Environmental pollution	<ul style="list-style-type: none"> <li>• Application of combined water and fertilizer application through drip irrigation systems</li> <li>• Conversion of field-based farming to greenhouse farming (resulting in less exposure to pests)</li> </ul>	EMU	LIEC, PPMO

Item	Potential impacts / issues	Mitigation measures	Who implements	Who supervises
		<ul style="list-style-type: none"> <li>Utilization of physical pest control methods (lamps with sticky pads) and biological pest control methods</li> <li>Safe storage of pesticides in a specific room, with limited access</li> <li>Training of staff and farmers in integrated pest management</li> <li>PPE will be provided to staff and farmers.</li> <li>Usage of pesticides which are classified as “hazardous” or for restricted-use by WHO and/or the government will be prohibited</li> </ul>		
<b>Chemicals and Hazardous Materials</b>	Negative impacts on human health and the environment	<ul style="list-style-type: none"> <li>A registry of all activities that involve the handling of potentially hazardous substances will be developed, including protocols for the storage, handling and spill response.</li> <li>All chemicals, toxic, hazardous, and harmful materials will be transported in spill-proof tanks with filling hoses and nozzles in working order.</li> <li>All chemicals, toxic, hazardous, and harmful materials will be stored in secure areas with impermeable surfaces and protective dikes such that spillage or leakage will be contained from affecting soil, surface water or groundwater systems. The area should be a 110% volume of storage capacity. Their usage will be strictly monitored and recorded.</li> <li>Good housekeeping procedures will be established to avoid the risk of spills.</li> <li>Spills will be dealt with immediately, and personnel will be trained and tasked with this responsibility.</li> <li>Workers will be properly trained before handling hazardous wastes and have the requisite protective equipment.</li> <li>Hazardous waste will be temporarily stored in closed containers away from direct sunlight, wind, water and rain in secure designated areas with impermeable surfaces and protective dikes such that spillage or leakage will be contained.</li> <li>Hazardous wastes including oily waste and waste chemicals will be collected and disposed of by licensed contractors.</li> <li>The waste battery of the sightseeing vehicles will be recycled by manufactures during operation.</li> <li>Waste solar PV panel will be recycled by manufactures during operation.</li> </ul>	EMU	LIEC, PPMO
<b>Occupational and community health and safety</b>	Occupational and community health and safety	<p>An operation phase EHS plan will be developed and implemented, and staff and workers will be trained regularly on its implementation. The plan will include measures in the World Bank EHS Guidelines with respect to occupational and community health and safety. The plan will include:</p> <ul style="list-style-type: none"> <li>PPE including goggles, gloves, safety shoes will be provided to staff and workers. Noise protection equipment will be provided to workers in high-noise area.</li> <li>Nearby communities will be informed of the potential risks of the project operation.</li> <li>Training will be provided to workers on occupational health and safety, and emergency</li> </ul>	EMU	LIEC, PPMO

Item	Potential impacts / issues	Mitigation measures	Who implements	Who supervises
		<p>response.</p> <ul style="list-style-type: none"> <li>• Vehicles will slow down and not use their horn when passing through or nearby sensitive locations, such as residential communities, schools and hospitals.</li> <li>• Safe traffic control measures, including road signs and flag persons to warn of dangerous conditions will be implemented as needed. Vehicles and machinery will undergo regular maintenance of to minimize potential accidents caused by equipment malfunction.</li> <li>• COVID-19. Prepare and implement a coronavirus (COVID-19) health and safety plan to address COVID-19 health risks. The plan will be prepared in line with government regulations and guidelines on COVID-19 prevention and control, and in consultation with public health agencies in the area. The plan will include (i) measures to record the locations that workers have visited/lived immediately before and during project work; (ii) schedules for disinfecting/cleaning offices, yards, stores and labor camps; (iii) measures to implement temperature checks and other health checks on site; (iii) physical distancing measures, particularly in worker camps; (iv) requirements for mandatory use of personal protective equipment such as facemasks, and provision of handwashing stations, hand sanitizers, and other appropriate protective measures; (v) how workers and residents living near project sites will be provided with information to protect themselves from COVID-19; (vi) procedures to be adopted in the event a worker is suspected to have contracted COVID-19; and (vii) other COVID-19 prevention and control measures appropriate for the local context.</li> </ul>		
<b>Emergency Response</b>	Emergency Response	<p>An <b>Emergency Risk and Response Plan</b> will be established in accordance with the “National Environmental Emergency Plan” (24 January 2006), other relevant PRC laws, regulations and standards, as well as World Bank EHS Guidelines and ADB’s SPS 2009 and will include measures in the World Bank EHS guidelines with respect to occupational and community health and safety. The plan must be established and in place before the project is operational.</p> <p><b>Indicative plan requirements are as follows:</b></p> <ul style="list-style-type: none"> <li>– Procedures for responding to different types of emergency situations will be identified in the response plan.</li> <li>– Emergency exercises will be conducted and they should include different emergency scenarios.</li> </ul> <p><b>Training Requirements</b></p> <ul style="list-style-type: none"> <li>– Appropriate operating and maintenance employees will be trained to ensure that they are knowledgeable of the requirements of emergency response plan. Training will be provided as follows: <ul style="list-style-type: none"> <li>– Initial training to all employees.</li> <li>– When new equipment, materials, or processes are introduced.</li> </ul> </li> </ul>	EMU	LIEC, PPMO

Item	Potential impacts / issues	Mitigation measures	Who implements	Who supervises
		<ul style="list-style-type: none"> <li>When emergency response procedures have been updated or revised.</li> </ul>		
		<p><b>Annual Emergency Simulation</b></p> <ul style="list-style-type: none"> <li>Simulated emergency exercises will be conducted at least annually.</li> </ul>		
		<p><b>Receiving Notification of a Possible Emergency</b></p> <ul style="list-style-type: none"> <li>When a supervisor receives a report of a possible emergency situation, he/she should obtain at minimum the following information from the reporting person: <ul style="list-style-type: none"> <li>Name of person reporting emergency;</li> <li>Nature of emergency - leak, fire, interruption of service if leak, odor present, etc.</li> <li>Details of emergency: location, amount, how long has the odor been noticed, what actions have been taken, etc.</li> <li>Leaks or other emergencies require prompt investigation.</li> </ul> </li> </ul>		
		<p><b>Immediate On-site Action</b></p> <ul style="list-style-type: none"> <li>The first responder will assess the nature of the report. This assessment should include the status of the emergency, an estimation of how the incident might progress, and an evaluation of the manpower, equipment, and materials needed to adequately cope with the situation.</li> <li>The responding supervisor shall determine the extent of the emergency and inform the fire and/or police department officials, or other authority having jurisdiction, and will remain with them during the emergency. The responding supervisor will be coordinated with the local emergency responders. When local emergency responders are involved, they will be in charge of the incident.</li> </ul>		
		<p><b>Communication with Public Officials</b></p> <ul style="list-style-type: none"> <li>When an emergency resulting in a hazard to the public safety occurs, the local fire department, police, the city medical emergency center and other relevant public officials should be notified. An emergency call list will be prepared and make it available at the subproject sites.</li> </ul>		

COVID-19 = coronavirus disease, CSC = construction supervision company, EEB = ecology and environment bureau, EMA = environmental monitoring agency; LIEC = loan implementation environment consultant, EMU = Environmental Management Unit (under project implementing agency), PPMO = project management office.

## D. Performance Indicators

18. Performance indicators (**Table EMP-3**) have been developed to assess the implementation of the EMP. These indicators will be used to evaluate the effectiveness of environmental management.

**Table EMP-3: Performance Indicators**

No.	Description	Indicators
1	Staffing	(i) PPMO and Sub-PMO established with appropriately qualified staff including safeguard officers. (ii) EMUs staffed appropriately. (iii) Qualified LIEC recruited. (iv) Qualified 3rd party environmental monitoring agencies engaged.
2	Budgeting	(i) Environment mitigation cost during construction and operation is sufficiently and timely allocated. (ii) Environment monitoring cost is sufficiently and timely allocated. (iii) Budget for capacity building is sufficiently and timely allocated.
3	Monitoring	(i) Compliance monitoring is conducted by Sub-PMO safeguard officers and LIEC. (ii) Ambient air quality and noise monitoring is conducted by 3 <sup>rd</sup> party environmental monitoring company.
4	Supervision	(i) ADB mission to review EMP implementation at least once a year during the construction phase. (ii) Local environmental authorities to supervise monitoring at their discretion.
5	Reporting	(i) Annual environmental monitoring reports prepared by PPMO with the support of LIEC, and submitted to ADB.
6	Capacity Building	(i) Construction Environmental Management Plans are developed and in place before substantive construction activities begin. (ii) Training on Construction Environmental Management Plans, ADB safeguard policy, EMP implementation, and GRM is provided prior to start of construction. (iii) Training on implementation of operation phase EMP and health and safety is provided prior to project operation.
7	Grievance Redress Mechanism	(i) GRM contact persons are designated at PPMO, Sub-PMO and EMUs, and GRM contact information disclosed to the public before construction. (ii) All complains are recorded and processed within the set time framework in the GRM.
8	Compliance with PRC standards	(i) Project complies with PRC environmental laws and regulations and meets all required standards.

## E. Environmental Monitoring, Inspection and Reporting

19. Three types of project monitoring will be conducted under the EMP: (i) internal monitoring – to be conducted by the EMUs and the CSCs; (ii) external monitoring – of air, water, noise and wastewater standards – to be conducted by the EMA(s); and (iii) compliance monitoring – to be conducted by the LIEC, to ensure the EMP is being implemented.

20. The monitoring program (Table EMP-4) describes the scope of monitoring, parameters, time and frequency, implementing and supervising agencies, and estimated costs. The monitoring shall comply with the standards presented in Chapter II.

21. **Internal monitoring.** During the construction phase, the CSCs and the EMUs will be responsible for conducting the internal environmental monitoring in accordance with the monitoring plan. Results will be reported through the CSC monthly reports to the EMUs and PPMO.

22. **External monitoring.** The EMUs will contract and fund at least one EMA to conduct the external environmental monitoring described in Table EMP-4. A detailed cost breakdown will be provided by EMAs tendering for this work. The external monitoring will be conducted during the entire construction phase and first full year of operation of the relevant facility. The EMA will prepare semi-annual monitoring reports of the methods and results. The EMA will submit these to the PPMO, Sub-PMO/EMU, which will be included in the environmental monitoring reports to be submitted by PPMO to ADB.

23. **Compliance monitoring for EMP.** The LIEC will review project progress and compliance with the EMP based on field visits, consultations with the PPMO and Sub-PMO/EMU environment officers, contractors, and CSCs, and review of the monitoring reports by the CSCs and EMA(s). The site visits will include comparison of the works and conditions observed with the EMP mitigation and monitoring measures in Tables EMP-2 and EMP-4. The site visits will include, but not be limited to: visual inspection of worker and construction solid waste at worker camps and work sites; evidence of soil erosion, water pollution, and sewage; community and occupational health and safety (camp hygiene, availability of clean water); and, evidence that emergency response plans are in place and that workers are familiar with them. There is no set frequency for these inspections. The LIEC will make site visits as often as possible within the available budget, focused especially on periods of peak construction. The findings of the LIEC will be reported to ADB through the annual environment monitoring reports.

24. **Annual environment monitoring reports.** The PPMO will submit these reports to ADB (Table EMP-5). They will include: (i) progress made in EMP implementation, (ii) overall effectiveness of the EMP implementation (including public and occupational health and safety), (iii) environmental monitoring and compliance, (iv) institutional strengthening and training, (v) public consultation (including GRM), and (vi) any problems encountered during construction and operation, and the relevant corrective actions undertaken. The LIECs will help the PPMO prepare the reports and submit the English report to ADB for disclosure. A standard reporting template will be provided by ADB to PPMO to assist in report preparation.

**Table EMP-4:** Environmental Monitoring Program.

<b>Subject</b>	<b>Parameter/Methodology</b>	<b>Monitoring Location</b>	<b>Frequency</b>	<b>Implemented by</b>	<b>Supervised by</b>
<b>A. Construction Phase</b>					
<b>Air Pollution</b>	Ambient dust monitoring (TSP, PM <sub>10</sub> , PM <sub>2.5</sub> ) following PRC requirements	4 sensitive locations (rotating), as selected by Sub-PMO	Semi-annually during construction season	EMA	Sub-PMO, EEB
	Compliance inspection of implementation of air pollution control measures	Construction sites	Daily during construction season	Contractor EHS Officer, LIEC (periodically)	Sub-PMO, EEB
<b>Wastewater</b>	Water sampling - COD, SS, pH etc. following PRC requirements	4 wastewater discharge points (rotating) of construction site, as selected by Sub-PMO	Semi-annually during construction	EMA	Sub-PMO, EEB
	Compliance inspection of implementation of wastewater pollution control measures	Construction sites	Daily during construction season	Contractor EHS Officer, LIEC (periodically)	Sub-PMO, EEB
<b>Noise</b>	Ambient noise monitoring (day and night Leq dB(A)) using portable monitoring device following PRC requirement	4 sensitive locations (rotating), as selected by Sub-PMO	Quarterly during construction season	EMA	Sub-PMO, EEB
	Compliance inspection of implementation of noise control measures	Construction sites	Daily during construction season	Contractor EHS Officer, LIEC (periodically)	Sub-PMO, EEB
<b>Solid Waste</b>	Compliance inspection of implementation of solid waste management measures	Waste collection and disposal sites	Weekly during construction season	Contractor EHS Officer, LIEC (periodically)	Sub-PMO, EEB
<b>Reservoir water quality</b>	Water sampling - COD, SS, pH etc. following PRC requirements	1 sample	Monthly	Local EEB	PPMO, LIEC
<b>Hazardous and Polluting</b>	Compliance inspections of implementation of hazardous	Storage facilities for fuels, oil, chemicals and other	Monthly during construction	Contractor EHS Officer, LIEC (periodically)	Sub-PMO, EEB

Subject	Parameter/Methodology	Monitoring Location	Frequency	Implemented by	Supervised by
<b>Materials</b>	materials management measures	hazardous materials. Vehicle and equipment maintenance areas.			
<b>Flora and Fauna</b>	Compliance inspection of land clearing to ensure mitigation measures are being implemented	Construction sites	Monthly during construction	Contractor EHS Officer, LIEC (periodically)	Sub-PMO, EEB
<b>Health and Safety and Emergency Response</b>	Compliance inspection of implementation of Occupational and Community Health and Safety measures including records on near miss, minor, major, fatal accidents and an Emergency Response Plan	Construction site	Monthly during construction season	Contractor EHS Officer, LIEC (periodically)	Sub-PMO, EEB
<b>B. Operation Phase</b>					
<b>Wastewater</b>	Wastewater sampling - COD, SS, pH etc. following PRC requirements	2 sites (rotating), as selected by Sub-PMO Discharge outlet to municipal sewer	Semi-annually	EMA	EA, EEB
<b>Odor</b>	Odor sample at the sheep farm boundaries	1 site (rotating), as selected by Sub-PMO	Semi-annually	EMA	EA, EEB
<b>Solid Waste</b>	Compliance inspection of operation phase solid waste management measures including treatment of waste from the sheep farm. Sheep carcasses should be transported and treated by 3rd party certificated dead livestock treatment center following PRC tTechnical specifications for	2 sites (rotating) and the sheep farm, as selected by Sub-PMO	Semi-annually	EMUs	PPMO, LIEC, EEB



Subject	Parameter/Methodology	Monitoring Location	Frequency	Implemented by	Supervised by
	harmless treatment of sick and dead animals.				
<b>Ground water</b>	Groundwater sampling near the sheep farms	1 site near the sheep farm	Semi-annually	EMA	PPMO, LIEC, EEB
<b>Water Consumption</b>	Water consumption monitoring for the agricultural activities	All agricultural activities	Annually	EMUs	PPMO, LIEC, EEB
<b>Usage of Agricultural Chemicals</b>	Agricultural Chemicals consumption monitoring for the agricultural activities	All agricultural activities	Annually	EMUs	PPMO, LIEC, EEB
<b>Reservoir water quality</b>	Water sampling - COD, SS, pH etc. following PRC requirements*	1 sample	Monthly	Local EEB	PPMO, LIEC
<b>Soil</b>	Soil quality sampling	Three replaced soil samples	Semi-annually	Qualified soil test company	PPMO, LIEC, EEB
<b>Noise</b>	Noise monitoring (day and night Leq dB(A))	2 sites (rotating), as selected by Sub-PMO	Quarterly	EMA	PPMO, LIEC, EEB
<b>Health and Safety and Emergency Response</b>	Compliance inspection of operation phase occupational and community health and safety management measures including keeping records on near miss, minor, major, fatal accidents and an Emergency Response Plan implementation	Subproject sites	Semi-annually	EMUs	PPMO, LIEC, EEB
<b>Environmental acceptance</b>	Compliance testing for environment acceptance	Project sites	Once	EMUs	PPMO, EEB

Note: \* The water quality parameters for the reservoir water will include 24 basic parameters (presented in Table II-8) for regular surface water, and other 80 parameters specific for centralized drinking water sources. The 80 parameters will include trichloromethane, tetrachloromethane, methylene chloride, bromoform, 1,2-dichloroethane, epichlorohydrin, chloroethylene, 1,1-dichloroethylene, 1,2-dichloroethylene, trichloroethylene, perchloroethylene, chloroprene, hexachlorobutadiene, styrene, formaldehyde, acetaldehyde,

acrolein, trichloro aldehyde, benzene, methylbenzene, ethylbenzene, xylene, isopropyl benzene, chlorobenzene, 1,2-dichlorobenzene, 1,4-dichlorobenzene, trichlorobenzene, tetrachlorobenzene, hexachlorobenzene, nitrobenzene, dinitro benzene, 2,4-dinitrotoluene, 2,4,6-trinitrotoluene, nitrochlorobenzene, 2,4-dinitrochlorobenzene, 2,4-dichlorophenol, 2,4,6-trichlorophenol, pentachlorophenol, phenylamine, benzidine, acrylamide, acrylonitrile, dibutyl phthalate, bis(2-ethylhexyl) phthalate, hydrazine hydrate, lead tetraethyl, pyridine, turpentine, trinitrophenol, butyl xanthic acid, active chlorine, dichlorodiphenyltrichloroethan (DDT), lindane, heptachlor epoxide, parathion, parathion-methyl, malathion, dimethoate, dichlorvos, trichlorfon, demeton, chlorothalonil, carbaryl, deltamethrin, atrazine, benzo-a-pyrene, methylmercury, polychlorinated biphenyls (PCB), microcystin-LR, yellow phosphorus, molybdenum, cobalt, beryllium, boron, antimony, barium, vanadium, titanium and thallium.

BOD<sub>5</sub> = 5-day biochemical oxygen demand; COD<sub>cr</sub> = chemical oxygen demand; CSC = construction supervision company; EMA = environmental monitoring agency; EEB = ecology and environment bureau; IA = implementation agency; LAeq = equivalent continuous A-weighted sound pressure level; NA= not applicable; EMU = Environmental Management Unit; PPMO = project management office; TSP = total suspended particle.

**25. Quality assurance (QA) /quality control (QC) for compliance monitoring.** To ensure accuracy of the monitoring, QA/QC procedures will be conducted in accordance with the following regulations:

- i) Regulations of QA/QC Management for Environmental Monitoring issued by the State Environmental Protection Administration in July 2006;
- ii) QA/QC Manual for Environmental Water Monitoring (Second edition), published by the State Environmental Monitoring Centre in 2001; and
- iii) QA/QC Manual for Environmental Air Monitoring published by the State Environmental Monitoring Centre in 2001.

**Table EMP-5: Environmental Reporting Plan.**

Report	From	To	Frequency of Reporting
<b>A. Construction Phase</b>			
Internal progress reports	CSC	EMU	Monthly
External environment monitoring reports	EMA	Sub-PMO/ EMU, PPMO	Semi-annual
Environmental acceptance monitoring and audit reports	Licensed institute	EEB, Sub-PMO, EMUs	Within three months after component completion
Environmental monitoring report. To include the external environment monitoring reports	PPMO	ADB	Annual
<b>B. Operation Phase</b>			
Environmental monitoring report	PPMO	ADB	Annual

**26. Project completion environmental audits.** Within three months after each subproject completion, or no later than a half year with permission of the local EEBs, environmental acceptance monitoring and audit reports of each subproject completion shall be: (i) prepared by a licensed environmental monitoring institute (usually, the institute is the municipal, district, or county environmental monitoring station under the municipal, district, or county EEB) in accordance with the PRC Guideline on Project Completion Environmental Audit (2001); (ii) reviewed for approval of the official commencement of individual subproject operation by environmental authorities; and (iii) reported to ADB through the environment monitoring reports.

## **F. Training and Capacity Building**

27. The IA and Sub-PMO have no previous experience with ADB-funded projects or safeguard requirements. The experience of individual staff within the city and the district EEBs for environmental management varies considerably. Domestic EIAs and project approvals generally include limited mitigation measures, but there is not yet a regulatory requirement in the PRC for EMPs of the scope required by ADB. Implementation of the current EMP represents a significant new task for the local agencies. During the project preparation phase, preliminary training on EMP implementation was provided by the LIEC Consultant, including roles and responsibilities of contractors and CSCs for EMP implementation, project impacts, and mitigation measures.

28. During implementation, a capacity building program will be implemented, including: (i) implementation of the EMP including mitigation measures, monitoring, and reporting; and (ii) operation and maintenance of the constructed facilities. Training will be provided by the loan implementation consultants and local EEBs, facilitated by the Sub-PMO and EMUs. Trainees will include the PPMO, IAs, Sub-PMO, EMUs, contractors and CSCs. The interactive training methods will include classroom training, e-learning, case studies, video based training, and participatory on-site training at select subproject component sites.

**Table EMP-6: Project Environment Training Program.**

<b>Training program</b>	<b>Scope of Training</b>	<b>Trainer</b>	<b>Trainee</b>	<b>Time</b>	<b>Days</b>	<b>Persons</b>
Procurement and contract management (emphasizing EMP implementation)	<ul style="list-style-type: none"> <li>• ADB procurement guidelines</li> <li>• Bidding document and contract preparation, including EMP clauses</li> <li>• Risk of improper procurement and mitigation measures, and handling variation orders and contract management</li> </ul>	LIEC	PPMO, Sub-PMO EMUs, contractors and CSCs	2	2/ year	20
Implementation of EMP	<ul style="list-style-type: none"> <li>• ADB safeguard policy statement requirements for EMP implementation and progress reporting</li> <li>• Roles, responsibilities, monitoring, inspection, reporting in EMP – especially, at each level of responsibility (PPMO, Sub-PMOs/EMUs)</li> <li>• Environment monitoring program;</li> <li>• Public consultation and participation;</li> <li>• GRM implementation, coordination, reporting, working with the public;</li> <li>• Environment, health and safety during project construction and operation for workers and the community;</li> <li>• Jinchuanxia Reservoir Protection during construction and operation</li> <li>• Occupational health and safety, including (i) prevention and control of transmissible diseases and HIV/AIDS, (ii) implementation of COVID-19 health and safety plan (see Table EMP-2)</li> </ul>	LIEC, EEB	PPMO, Sub-PMO EMUs, contractors and CSCs and farmers in West Jinchuan Village for reservoir protection	2	2 / year	40
Climate change adaption	<ul style="list-style-type: none"> <li>• Energy saving and GHG emission reduction</li> <li>• Climate change adaption</li> </ul>	LIEC	PPMO, Sub-PMO EMUs, contractors, CSCs	1	1	20
Environmental monitoring report preparation	<ul style="list-style-type: none"> <li>• Outline and main contents of environmental monitoring report</li> <li>• Introduction of EMP and ADB safeguard policy statement requirements for EMP implementation and progress reporting</li> </ul>	LIEC	PPMO, Sub-PMO EMUs, contractors, CSCs	1	1/year	20
Integrated pest management training	<ul style="list-style-type: none"> <li>• Safe storage of pesticides</li> <li>• Prohibition of usage of pesticides which are classified as “hazardous” or for restricted-use by WHO and/or the government</li> </ul>	LIEC	PPMO, Sub-PMO EMUs, staff and farmers	2	1	500
Emergency preparedness and response planning	<ul style="list-style-type: none"> <li>• Response mechanism</li> <li>• Emergency response team, procedure and actions</li> </ul>	LIEC	PPMO, Sub-PMO EMUs, contractors, CSCs	1	1	20
<b>Total</b>				<b>9</b>	<b>8</b>	<b>620</b>

ADB = Asian Development Bank, EMP = environment management plan, EEB = environment protection bureau, GHG = greenhouse gas, GRM = grievance redress mechanism, LIC = loan implementation consultant, EMU = Environmental Management Unit, PPMO = project management office.

## **G. Grievance Redress Mechanism**

29. This subproject grievance redress mechanism (GRM) is a joint GRM for: (i) the initial identification, documentation, and preliminary management of both environmental and social safeguard-related grievances; (ii) the resolving of environmental safeguard-related grievances; and (iii) the resolving of, and/or timely referral of, social safeguard-related grievances. Environmental and social safeguard-related grievances may differ considerably in the nature of grievances and agencies, procedures, and timing required to address them: the GRM provides a simple, time-based mechanism to meet project needs as required. Social safeguard issues beyond the scope of the GRM procedures, including issues related to land acquisition or resettlement, will be referred to relevant agencies as needed.

30. The GRM is designed to achieve the following objectives: (i) provide channels of communication for communities to raise concerns about environmental and social-related grievances which might result from the project; (ii) prevent and mitigate adverse environmental and social impacts to villages and communities caused by project construction and operation, including those associated with resettlement through improved awareness; (iii) promote trust between the project agencies and communities; and (iv) build community acceptance of the project. The GRM is accessible to all members of the villages and communities, including women, youth, minorities and poverty-stricken villagers and residents. Multiple points of entry are available, including face-to-face meetings, written complaints, telephone conversations, e-mail, and social media.

31. Environmental and social safeguard-related grievances may differ considerably in the nature of grievances and agencies, procedures, and timing required to address them. The GRM provides a simple, time-based mechanism to meet project needs as required. Social safeguard issues beyond the scope of the GRM procedures, including issues related to land acquisition or resettlement, will be referred to relevant agencies as needed.

32. The PPMO Environment Officer and Social Officer and Sub-PMO Environment Officers and Social Officers will lead the coordination of the GRM. However, all project agencies and staff will be trained in the GRM and are expected to take an active role for implementing the GRM. At the PPMO level, the PPMO Environment Officer and PPMO Social Officer will establish a GRM tracking and documentation system, conduct daily coordination with the EMU officers, arrange meetings and conduct site visits as necessary, maintain the overall project GRM database, and prepare the reporting inputs for progress reports to ADB. At the Sub-PMO level, the environment and social officers will instruct contractors and CSCs on the GRM procedures, and coordinate with the local EEBs and other government divisions as necessary. Sub-PMO and EMU staff will be trained and supported by the LIEC and loan implementation social consultant.

33. The contact persons for different GRM entry points, such as the Sub-PMO environmental and social officers, EMUs, contractors, and EEBs, will be identified prior to construction. The contact details for the entry points (phone numbers, addresses, e-mail addresses) will be publicly disclosed on information boards at construction sites and on the websites of the local EEBs.

34. The GRM will be accessible to diverse members of the villages and community, including more vulnerable groups such as women, minority and poor. Multiple points of entry, including face-to-face meetings, written complaints, telephone conversations, or e-mail, will be available.

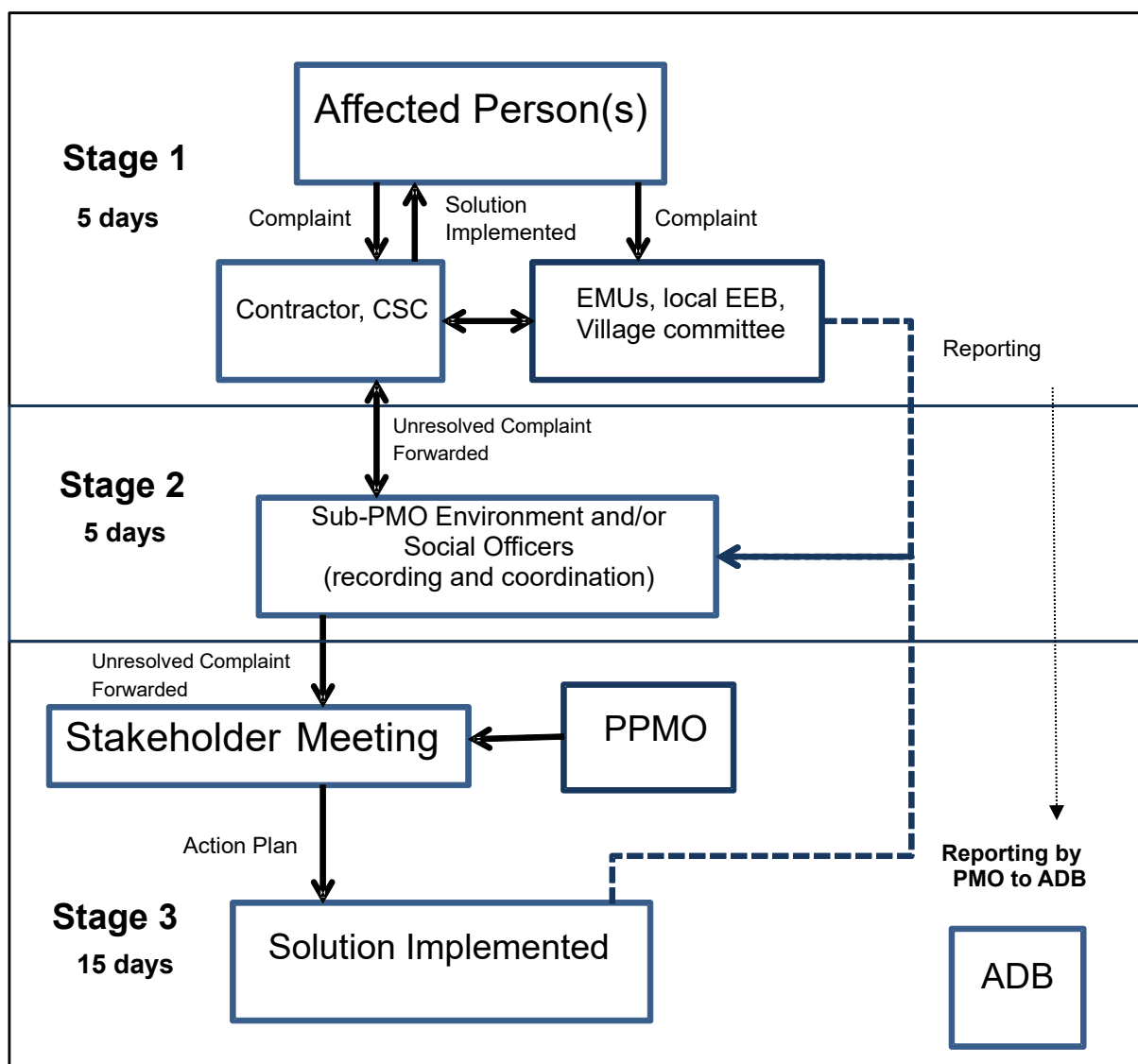
35. If a complaint is received and filed, the EMU will identify if the complaint is eligible for management under the GRM. Eligible complaints under the GRM include those where: (i) the complaint pertains to the subproject; and (ii) the issues arising in the complaint fall within the scope of environmental and/or social issues that the GRM is authorized to address. Ineligible

complaints include those where: (i) the complaint is not subproject-related; (ii) the nature of the issue is outside the mandate of the GRM (such as fraud or corruption); and/or (iii) other procedures would be more appropriate to address the issue. Ineligible complaints will be documented and provided to the relevant authorities and the complainant will be informed of these steps. The procedure and timeframe for the GRM is as follows and summarized in Figure EMP-2.

- **Stage 1 (5 calendar days):** If a concern arises during construction or operation, the affected person may submit a written or oral complaint to the contractor (construction phase) or EMUs (operation phase). The contractor or EMU will: (i) respectfully acknowledge the issue and immediately stop the causal activity (e.g. on-site construction causing high noise levels to a nearby household); (ii) not resume the activity until the complaint has been resolved; (iii) inform the EMU of the incident on the same day of the incident occurring and how the contractor has responded or will respond; (iv) give a clear reply to the affected person within two calendar days; and (v) as far as possible, resolve the problem within five calendar days from receiving the complaint. The EMU will: inform the Sub-PMO, local village committee, and Ecology and Environment Bureau of the incident within one working day of being informed by the contractor; and, subsequently keep these parties informed at all stages.
- **Stage 2 (5 calendar days):** If the issue cannot be resolved in Stage 1, after five calendar days, the Sub-PMO will take over responsibility. Eligibility of the complaint will be assessed and a recommended solution given to the complainant and contractors within two calendar days. If the solution is agreed by the complainant, the contractors and/or EMUs (in operation) will implement the solution within five calendar days from the Sub-PMO taking over responsibility of the complaint. Written records will be made of all stages and outcomes. At the expiration of Stage 2, PPMO will inform ADB of the outcome.
- **Stage 3 (15 calendar days):** If no solution can be identified by the Sub-PMO and/or EMU, and/or the complainant is not satisfied with the proposed solution, the PPMO will organize, within seven (7) calendar days, a stakeholder meeting (including the complainant, contractor, EEB, Sub-PMO/EMU and PPMO). A solution acceptable to all shall be identified including clear steps. The contractors (during construction) and EMU (during operation) will immediately implement the agreed solution. All attempts will be made to fully resolve the issue within 15 calendar days. Written records will be made of all stages and outcomes. At the expiration of Stage 3, PPMO will inform ADB of the outcome.

36. The contractor and/or EMU will ensure the affected person is updated at all times, in each stage, of the progress toward resolving the grievance. The GRM does not affect the right of an affected person to submit their complaints to any agency they wish to, for example the local village committee, community leaders, courts, PPMO, Sub-PMOs, EMUs, local governments and/or ADB.

37. The PPMO, Sub-PMO and EMUs shall bear any and all costs of implementing the GRM, including meeting, travel, and/or accommodation costs of the project staff or affected person. The GRM will be implemented throughout project lifetime.

**Figure EMP-2:** Operation Chart of the Grievance Redress Mechanism.

ADB = Asian Development Bank, CSC = construction supervision company, EEB = ecology and environmental bureau, GRM = grievance redress mechanism, IA = implementing agency, PPMO = project management office.

## H. Public Consultation and Awareness Raising

38. Information disclosure and public consultation were conducted during project preparation (IEE Section VII). During construction, the project will continue to seek public consultation and raise awareness of project activities, especially those that may impact the public such as noise, dust. The public consultation plan is in Table EMP-7 and includes public participation in evaluating environmental benefits and impacts. The PPMO Environment Officer and Social Officer will be responsible for public participation during project implementation, supported by the Sub-PMO/EMU and LIEC.

**Table EMP-7: Public Consultation and Participation Plan.**

Organizer	Approach	Times/Frequency	Subjects	Participants
<b>Construction</b>				
Sub-PMO /EMU, LIEC	Questionnaire survey, site visits, informal interviews	Once a year during peak construction	Construction impacts; adjusting mitigation measures if necessary; feedback	Workers, residents in construction areas
	Site-specific basis	At least one month before the start of construction at any new site	Anticipated risks – noise, odor, other; Procedures in the event of interruptions to water and wastewater services	Workers, residents in construction areas, local Cultural Relics Bureau and relevant civil society organizations
	Public workshops and hearing	At least once during peak construction period	EMP implementation progress; construction impacts; adjusting mitigation measures if necessary; feedback	Residents, affected persons, social sectors, local Cultural Relics Bureau
<b>Operation</b>				
Sub-PMO /EMU, IAs	Consultation and site visits	At least once in first year of operation	Effects of mitigation measures, impacts of operation, feedback	Affected persons and/or agencies
	Consultation with the villagers near the sheep farm	At least annually in first three years of operation	Effects of mitigation measures, impacts of odor, feedback	As above
	Public workshop	As needed based on consultations	Effects of mitigation measures, impacts of operation, feedback	As above
	Public survey	At least once after 1 year of operation	Comments and suggestions	Project beneficiaries

EIA = environmental impact assessment, EMU = Environmental Management Unit, PPMO = project management office, LIEC = loan implementation environmental consultant.

## **I. Cost Estimates**

39. This section provides an estimate of the cost of EMP implementation. The cost comprises expenses for three categories: the mitigation measures described in Tables EMP-2; monitoring (Table EMP-4); and training (Table EMP-6). Costs are presented for the construction phase of five years and the first year of operation i.e. a total of six years. The costs do not include: (i) detailed design revisions and adjustments; (ii) internal monitoring and inspection of solid wastes disposal, soil erosion and re-vegetation, occupational health and safety during construction, as this will be included in the design, construction and construction supervision contracts; and (iii) salaries of PPMO and Sub-PMO staff. Costs for mitigation measures and training are based on estimates in the DEIA and/or the experience of the TrTA consultants from other similar projects. All costs were discussed with the DEIA Institute, PPMO and IAs.

40. The total estimated cost for EMP implementation is presented in Table EMP-8. Construction-phase costs will be paid by the contractors (as part of their contracts). Operational-phase costs will be paid by each subproject IA.



**Table EMP-8:** Estimated Cost for EMP Implementation for Five Years Construction and First Year Operation (xCNY10,000).

Item	Unit	Unit cost	No. units	Total cost	Cost per year
<b>1 Pre-construction phase (Table EMP-2) – Paid by PPMO</b>					
1.1 Public consultation	Meeting, survey			2.0	
<b>Subtotal</b>				<b>2.0</b>	
<b>2 Construction phase (Table EMP-2) – Paid by Contractors</b>					
2.1 Soil erosion and contamination				500	
2.2 Dust and air pollution control				250	
2.3 Noise and vibration				120	
2.4 Surface water pollution				85	
2.5 Solid waste				150	
2.6 Protection of flora and fauna				100	
2.7 Community health & safety				50	
2.8 Occupational health & safety				50	
<b>Subtotal</b>				<b>1,305</b>	
<b>3 Operational phase (Table EMP-3) – paid by IA</b>					
3.1 Manure treatment				600	600
3.2 Waste collection				300	300
3.3 Noise control				100	100
3.4 Landscape				650	650
<b>Subtotal</b>				<b>1,650</b>	<b>1,300</b>
<b>4 Monitoring during construction (costs paid by Contractors)</b>					
4.1 Surface water quality	2 times/a	2.5	20	50	10
4.2 Construction wastewater	2 times/a	0.5	20	10	2
4.3 Ambient air	2 times/a	1.8	20	36	7.2
4.4 Noise	2 times/a	0.3	20	6	1.2
<b>Subtotal</b>				<b>102</b>	<b>20.4</b>
<b>5 Monitoring during operation (costs to be paid by IA)</b>					
5.1 Wastewater	2 times/a	0.5	10	25	5
5.2 Noise	2 times/a	0.3	10	15	3
5.3 Odor	2 times/a	0.3	10	15	3
<b>Subtotal</b>				<b>55</b>	<b>11</b>
<b>Grand total (xCNY10,000)</b>				<b>3,114</b>	

## J. Mechanisms for Feedback and Adjustment

41. Based on environmental inspection and monitoring reports, the PPMO and Sub-PMO shall decide, in consultation with the LIEC, whether (i) further mitigation measures are required as corrective actions, or (ii) some improvements are required for environmental management practices. The effectiveness of mitigation measures and monitoring plans will be evaluated by a feedback reporting system. Adjustment to the EMP will be made, if necessary. The PPMO Environmental Officer and the LIEC will play critical roles in the feedback and adjustment mechanism.

42. If during inspection and monitoring, substantial deviation from the EMP is observed or any changes are made to the project that may cause substantial adverse environmental impacts or increase the number of affected people, then the PPMO and Sub-PMO will immediately consult with ADB and form an environmental assessment team to conduct additional environmental assessment. If necessary, further public consultation will be undertaken. The revised DEIAs and project IEE, including this EMP, will be submitted to the ADB for review, appraisal, and public disclosure. The revised EMP will be passed to the contractors, CSCs and EMUs for implementation.

## APPENDIX II. DRAFT TERMS OF REFERENCE FOR ENVIRONMENTAL POSITIONS

### 1. PPMO ENVIRONMENT OFFICER (1 position)

1. **Background.** Development projects supported by the Asian Development Bank (ADB) routinely include a project management office (PPMO). For this project, the PPMO is responsible for project implementation and comprises the municipal agencies involved in the project. Compliance with the loan and project agreements include implementation of an environment management plan (EMP), which is prepared as part of the project initial environmental examination (IEE). The EMP is the critical guiding document to manage, monitor, and report upon potential project environmental impacts. Implementation of the EMP is a full-time task. The PPMO environment officer will oversee the implementation of the EMP. These terms of reference describe the position requirements.

2. **Scope and duration of work.** The officer will work on behalf of the PPMO to implement the project EMP. The officer will report directly to the PPMO. The position is for the entire project duration (5 years).

3. **Qualifications.** The officer will have: (i) a bachelor's degree or higher in environmental management or related field; (ii) at least 5 years of experience in environmental management, monitoring, and/or impact assessment, including specific experience on the management and monitoring of environmental projects; (iii) ability to communicate and work effectively with local communities, contractors, and government agencies; (iv) ability to analyze data and prepare technical reports; (v) willingness and health to regularly visit the project construction sites and in different seasons; and (vi) ideally (but not essential), proficiency in spoken and written English.

4. **Detailed tasks.** The PPMO Environment Officer will have a detailed understanding of the project EMP and supporting documents, including the domestic environmental reports, the project IEE, and project environmental assurances. The officer will have the following tasks.

- (i) Assess whether the EMP requires updating due to any changes in project design, which may have occurred after the EMP was prepared.
- (ii) Distribute the Chinese language version of the EMP to all relevant agencies, including the implementing agencies, and municipal agencies for environment protection. This should occur at least 3 months before construction begins.
- (iii) Conduct meetings with agencies as necessary to ensure they understand their specific responsibilities described in the EMP.
- (iv) Ensure that relevant mitigation, monitoring, and reporting measures in the EMP are included in the bidding documents, contracts, and relevant construction plans.
- (v) Confirm that the implementing agencies responsible for the internal environment monitoring described in the EMP understand their tasks and will implement the monitoring in a timely fashion.
- (vi) At least 2 months before construction begins, establish and implement the project grievance redress mechanism (GRM) described in the EMP. This will include: (a) preparation of a simple table and budget identifying the type, number, and cost of materials needed to inform local communities about the GRM and starting dates and scope of construction; (b) design, prepare, and distribute these materials, and plan and conduct the community meetings; (c) prepare a form to record any public complaints; (d) preparation of a summary table to record all complaints, including dates, issues, and how they were resolved; and (e) ensure that all relevant agencies, including contractors, understand their role in the GRM.
- (vii) Prior to construction, ensure that the implementation agencies and their contractors have informed their personnel, including all construction workers, of the EMP requirements. This will include all mitigation measures relating to impacts to air, water, noise, soil, sensitive sites, ecological values, cultural values, worker and community health and safety, respectful behavior when communicating with local communities, and responding to and reporting any complaints.

- (viii) During project construction, make regular site visits to assess progress, meet with contractors and/or local communities, and assess compliance with the EMP.
- (ix) Ensure that all relevant agencies submit required progress reports and information, including environmental monitoring and reports of any issues or grievances.
- (x) Compile, review, and store environmental progress reports from the implementation agencies, records of any grievances, and any other relevant issues. Maintain digital copies of all information. When necessary, enter data into summary tables in digital format (e.g., to transfer records of grievances from hard copy forms). Ensure that all information is stored in the PPMO filing system, backed up, and can be easily retrieved.
- (xi) Prepare annual environment monitoring reports on the status of project compliance with the EMP.
- (xii) Work closely with the PPMO, Sub-PMOs, EMUs, loan implementation consultants, and other agencies as necessary to conduct these tasks.

**5. Reporting requirements.** Annual environment monitoring reports during construction and annual reports during operation using the template provided by ADB or a domestic format reviewed and approved by ADB.

**6. Logistical support provided by PPMO to the officer:**

- (i) Provision of hard and soft copies of the project EMP, domestic and project environmental reports, feasibility study reports, loan and project agreements, maps, and other supporting materials as necessary to ensure the officer can implement the tasks.
- (ii) Vehicle transport, office materials, and other logistical support, as necessary for the officer to visit the project construction sites and local communities, arrange and conduct meetings, and prepare and distribute consultation materials.
- (iii) Overall coordination, including review of the draft annual monitoring reports, and final responsibility for submission of the monitoring reports to ADB.

## **2. Sub-PMO ENVIRONMENT AND SOCIAL OFFICER (Head of EMU)**

**1. Background.** At the project level, coordination of the social development action plan (SDAP), gender action plan (GAP), land use rights transfer framework (LURTF) and EMP is the responsibility of the PPMO social officer and environment officer. At the subproject level, daily coordination and implementation of the SDAP, GAP, LURTF and EMP will be undertaken by the Sub-PMO responsible for each subproject. For this purpose, each EMU requires a EMU environment and social officer. These officers will work on behalf of the EMUs to implement the project SDAP, GAP, LURTF and EMP. The officers will report directly to each of their managers and work closely with the local EEBs, environment and social monitoring agencies or experts and PPMO environment and social officers. The positions are for the entire project duration (5 to 6 years).

**2. Qualifications.** The officer will have: (i) a bachelor's degree or higher in social and/or environmental management or related field; (ii) at least 10 years of experience in social and/or environmental management, monitoring, and/or impact assessment, including specific experience on the management and monitoring of agriculture projects; (iii) ability to communicate and work effectively with local communities, contractors, and government agencies; (iv) ability to analyze data and prepare technical reports; (v) willingness and health to regularly visit the project construction sites and in different seasons; and (vi) ideally, proficiency in English.

**3. Detailed tasks.** The officer will have a detailed understanding of the project SDAP, GAP, LURTF and EMP and supporting documents, including the domestic environment and social reports, project IEE, and project environment and social assurances. The officer will have the following tasks.

- (i) Gain familiarity with the project sites and monitoring requirements through: (i) review of the items listed in the EMP, as well as the overall IEE and EMP; (ii) meetings with the project agencies; and (iii) site visits.
- (ii) Work closely with the PPMO environment and social officers, EEB, environment and social monitoring agencies, contractors, construction supervision companies, and all other relevant agencies to implement the SDAP, GAP, LURTF and EMP.
- (iii) Distribute the Chinese language version of the SDAP, GAP, LURTF and EMP to all relevant agencies, including the EMUs, CSCs, contractors. This should occur at least 3 months before construction begins.
- (iv) Conduct meetings with agencies as necessary to ensure they understand their specific responsibilities described in the SDAP, GAP, LURTF and EMP.
- (v) Ensure that contractors implement the SDAP, GAP, LURTF and EMP.
- (vi) Implement the monitoring and reporting requirements in the SDAP, GAP, LURTF and EMP, including timely submission of progress reports to the PPMO environment and social officers.
- (vii) Implement the project grievance redress mechanism.
- (viii) Make regular inspections of construction sites to assess progress, meet with contractors and/or local communities, and assess compliance with the SDAP, GAP, LURTF and EMP.
- (ix) Maintain digital records of all progress and information.
- (x) Support the PPMO environment and social officers in all of their tasks
- 4. **Reporting requirements.** Monthly reports to PPMO environment and social officers.

### 3. INITIAL (“START-UP”) PROJECT MANAGEMENT SUPPORT (ENVIRONMENT) (national consultant)

1. **Background.** In the early stages of project implementation, the PPMO and EMU will be assisted by “start-up consultants”, who will help establish the preparatory administrative and technical work required for efficient project implementation. This will include a national environment specialist. After completion of this “start-up” phase, a team of loan implementation consultants, including an environment specialist, will take over the work of the “start-up” consultants, to provide long-term support to the PPMO and EMUs.

2. **Scope and duration of work.** The consultant will help with early establishment of the project environmental management plan (EMP). This is a short-term position at the beginning of project implementation.

3. **Qualifications.** The consultant shall have (i) a master’s degree or higher in environmental management or related field; (ii) at least 12 years of experience in environmental management, monitoring and environmental impact assessment and/or initial environmental examination (IEE), including specific experience in management and monitoring of environmental projects; (iii) familiarity with ADB’s Safeguard Policy Statement (2009), ADB’s project management requirements, and national environmental management procedures; (iv) ability to communicate and work effectively with local communities, contractors, and government agencies; (v) ability to analyze data and prepare technical reports; (vi) willingness and health to regularly visit project sites; and (vii) proficiency in spoken and written English.

4. **Tasks.** The specialist will do the following. Refer to the project administration manual (PAM) for the number of specific person-months and costs for the consultancy.

- (i) Work closely with the PPMO, Sub-PMOs, EMUs and design institutes to ensure that preparation of the detailed engineering designs (DEDs) fully incorporates the designs and mitigation measures described in the project initial environmental examination (IEE) and environmental management plan (EMP).
- (ii) Assess whether any of the DEDs are sufficiently different from the preliminary designs

approved by the Government and ADB that updates to the IEE, EMP are required. This may include, but not be limited to: major changes in proposed alignments and/or locations of facilities; new subcomponents requiring infrastructure works and/or which may have environment; and/or cancellation of approved components.

- (iii) With the PPMO and ADB, discuss any changes required for the IEE, EMP. Assist the PPMO to prepare any new impact assessments and/or updates as required; and to submit these to ADB for review. No changes to any of the ADB-approved documents will be made without prior approval of the Government and ADB.
- (iv) Assist the PPMO and Sub-PMOs in establishing the project grievance redress mechanism (GRM), including procedures to ensure documentation and reporting of complaints, follow-up actions, and results.
- (v) Provide training to PPMO, Sub-PMOs and EMUs staff so that they will understand ADB's Safeguard Policy Statement (2009), policies, and compliance requirements for environmental management; national and local regulations and standards for environmental protection, health, labor, and occupational safety; and the subproject IEE and EMP.
- (vi) Provide hands-on guidance in preparing the first environmental monitoring report to ADB.
- (vii) Provide Chinese version EMP to the PPMO, Sub-PMOs and EMUs etc.

**5. Reporting requirements.** Upon completion of the consultancy, submit a written report describing the work accomplished, any key challenges encountered and/or technical concerns for further consideration, and lessons learned.

**6. Logistical support provided by PPMO to the specialist:**

- (i) Provision of hard and soft copies of the project EMP, domestic and project environmental reports, feasibility study reports, loan and project agreements, maps, and other supporting materials as necessary to ensure the officer can implement the tasks.
- (ii) Facilitation of site visits and meetings, as needed.

#### **4. LOAN IMPLEMENTATION ENVIRONMENTAL CONSULTANT (NATIONAL)**

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**1. Qualifications.** The specialist will have: (i) a master's degree or higher in environmental management or related field; (ii) at least 10 years of experience in environmental management, monitoring, and/or impact assessment; (iii) familiarity with ADB project management requirements and national environmental management procedures; (iv) ability to communicate and work effectively with local communities, contractors, and government agencies; (v) ability to analyze data and prepare technical reports; (vi) willingness and health to regularly visit the subproject sites; and (vii) proficiency in spoken and written English.

**2. Tasks.** Working closely with the PPMO, and Sub-PMO focal staff, and other staff and agencies as needed, the loan implementation environment consultant (LIEC) will do the following. Refer to the project administration manual (PAM) for the number of specific person-months and costs for the consultancy.

**3. Before construction:**

- (i) Ensure project environmental readiness, including: (i) all contractor contracts include, and will comply with, the EMP; (ii) relevant sections of the EMP are incorporated in construction plans and contracts; and (iii) prepare templates for contractor work plans.
- (ii) Assist the PPMO and Sub-PMOs to implement the grievance redress mechanism (GRM), including: (i) establish and publicize the GRM; and (ii) collate and evaluate grievances received.
- (iii) Develop procedures to: (i) monitor EMP implementation progress; (ii) collate and evaluate data collected in the EMP environmental monitoring program; and (iii) assist PPMO to prepare environmental monitoring reports (to continue until project completion report).
- (iv) Undertake training of project agencies as required by the EMP training plan.

- (v) Provide hands-on support and on-the-job training to the PPMO, Sub-PMOs, EMUs, and contractors on the specific requirements of the EMP as required.
- (vi) Update IEE/EMP as needed during detailed design and scope changes.

4. During project implementation:

- (i) Undertake site visits during subproject construction and operating phase.
- (ii) Assist in the ongoing public consultation process as described in the project IEE.
- (iii) Conduct and monitor project compliance with the EMP and all relevant assurances and covenants in the loan and project agreements for environmental safeguards; identify any environment-related implementation issues; and, propose necessary responses in corrective action plans.
- (iv) Assist the PPMO and Sub-PMOs in managing the accredited environmental external monitoring agencies for conducting periodic environmental impact monitoring in compliance with the approved monitoring plan defined in the EMP;
- (v) Undertake training of project agencies as required by the EMP training plan, and provide hands-on support and on-the-job training to the PPMO and/or Sub-PMOs and contractors on the specific requirements of the EMP, as required.
- (vi) Undertake simple and cost-effective on-site quantitative measurements to regularly check that the construction complies with the environmental monitoring standards and targets, especially for noise, using a basic hand-held meter.
- (vii) Assist PPMO to prepare annual environmental monitoring reports for submission to ADB. The reports will focus on progress with implementation of the EMP, compliance with environment-related project assurances, and results of the monitoring.

7. **Duration and logistical arrangements.** The proposed duration of the consultancy is at least 12 person-months (intermittent). Applicants who show initiative by bringing their own field monitoring equipment (e.g., to conduct on-site checks during field visits) will be well-regarded.

## 5. EXTERNAL ENVIRONMENTAL MONITORING AGENCY (NATIONAL)

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1. This document sets out the indicative terms of reference for external environmental monitoring to ensure that the Project will be implemented in conformity with the People's Republic of China (PRC) laws and regulations and the Asian Development Bank's (ADB) Safeguard Policy Statement (2009). The direct client is the project management office (PPMO). As a part of the loan conditions, an initial environmental examination (IEE) and an environmental management plan (EMP) have been prepared. The EMP requires that environmental monitoring of the construction and operation of the facilities are conducted by several external monitoring agencies (EMA). Refer to the project administration manual (PAM) for the number of specific person-months and costs for the consultancy.

2. **Implementation arrangements.** The external environmental monitoring will be carried out by a team of specialists through an EMA, twice a year during the construction of the facilities and in the first year of the operation of the facilities. The monitoring will be financed by ADB, and the EMA will be recruited by the PPMO according to ADB's Procurement Policy (2017, as amended from time to time) and ADB's Procurement Regulations for ADB Borrowers (2017, as amended from time to time) through consultants' qualifications selection. The EMA will work closely with the environment officers of the PPMO and Sub-PMOs; the local EEBs and implementing agencies; and contractors, consultants, communities, and/or other personnel; as required.

3. The PPMO, Sub-PMOs, and implementing agencies will provide assistance to the EMA, particularly in the aspects of field survey, staffing, and logistics. Specifically, they will (i) provide the EMA with hard and soft copies of the EMP, domestic environmental impact assessment, IEE, domestic feasibility study report, loan and project agreements, maps, and other supporting materials, as necessary; (ii) facilitate and arrange meetings with key project agencies, including contractors and construction supervision companies; (iii) conduct overall

coordination, including review of external environmental monitoring reports; and a consolidated external environmental monitoring report; and (iv) take final responsibility for submission of the external environmental monitoring reports and the consolidated external environmental monitoring report to ADB.

4. **Reporting requirements.** The EMA will submit to ADB, PPMO, and Sub-PMOs external environmental monitoring reports regularly twice a year during the construction of the facilities and in the first year of the operation of the facilities, and a consolidated external environmental monitoring report within 2 months after the completion of the project.

5. The external environmental monitoring reports will include, but not be limited to, (i) description of activities conducted in the reporting period and results; (ii) all cumulative data collected up to the current reporting period; (iii) any cases of noncompliance with the target standards; (iv) any additional observations (qualitative or quantitative); (iv) lessons learned; and (f) work schedule for the next annual monitoring period.

6. The consolidated external environmental monitoring report will summarize the results, conclusions, lessons learned, and recommendations for the overall monitoring program. All raw data will be handed over to the PPMO and Sub-PMOs in a clear and simple format.

7. The EMA will take full responsibility for the content and quality of the reports.

8. **Scope of services.** The EMA should (i) possess relevant domestic certifications required to conduct environmental monitoring; (ii) ensure the provision of all certified equipment and other resources needed for monitoring, analyses, and reporting, including field sampling and laboratory equipment and logistical resources (vehicles etc.); and (iii) assign qualified and experienced staff to be directly involved in site visits, monitoring, analyses, and reporting activities who has (a) a degree in environmental management or related field (preferable master's or higher degree); (b) an ability to communicate and work effectively with local communities, contractors, and government agencies; (c) experience in data collection and analyses and report preparation; and (d) good physical health and fitness to visit remote project construction sites and in different seasons.

9. The EMA will conduct the following tasks.

- (i) Gain familiarity with the project sites and monitoring requirements through (a) review of the items listed in the EMP, as well as the overall IEE and EMP; (b) meetings with the project agencies; and (c) site visits.
- (ii) If needed, recommend additional monitoring variables and/or changes in the monitoring methods (e.g., monitoring locations or frequency) for the items listed as "external monitoring" in Table EMP-5 of the EMP and provide a clear rationale for any proposed changes. Note: No changes to the monitoring plan in Table EMP-5 will be made without the prior review and endorsement by the PPMO and ADB.
- (iii) Design an environmental monitoring plan which (a) focuses on specific variables listed in EMP; (b) includes a clear methodology and work schedule; and (c) includes any additional variables recommended.
- (iv) Design and establish a simple database (e.g., in Excel) to store all collected data. Data should be entered and stored in a clear and simple format that enables comparison of values over time; and ensure that data is backed up on at least one external storage device.
- (v) Implement the monitoring program.
- (vi) While on site, provide demonstrations to the project agencies (including the PPMO, Sub-PMOs, contractors, and construction supervision companies) in the monitoring; and emphasize the links between good construction practices and reduction of environmental risks.
- (vii) Immediately report to the Sub-PMOs any cases of noncompliance with the EMP

monitoring standards and/or any other environmental management issues that may be observed while on site.

- (viii) Identify any cases of exceedance of values against the project standards, and the reasons for such exceedance.
- (ix) Prepare and submit external environmental monitoring reports.
- (xi) Work closely with the PPMO, Sub-PMOs, contractors, construction supervision companies, consultants, communities, and other stakeholders, as necessary, to conduct these tasks.

10. Three national specialist positions will provide consulting services to support extremal environmental monitoring. The key responsibilities are proposed but not limited to the following.

11. **Environmental Specialist/Team Leader** (national). The specialist will undertake the following tasks: (i) lead all the activities of the team; (ii) lead and set up the monitoring methodology, including design of baseline and tracer surveys; (iii) work and coordinate with relevant agencies and/or bodies within the project to implement the task of monitoring activities; (iv) lead and conduct the monitoring activities and required surveys to collect data and information at office and project sites, and then analyze the findings; (v) prepare external environmental monitoring reports which include conclusions and recommendations; and (vi) discuss findings with the PPMO and Sub-PMOs to reach agreement on follow-up actions. Specifically, the specialist will:

- (i) coordinate overall monitoring activities in compliance with contract requirements;
- (ii) develop detailed work plan and procedures;
- (iii) conduct regular site visits for guidance to local site workers;
- (iv) hold regular meetings to review work progress, and propose actions for improvement;
- (v) review monitoring work plan;
- (vi) review and finalize monitoring reports and consolidated monitoring report;
- (vii) propose suggestions based on progress, and participate in handling pollution accidents; and
- (viii) review environmental sections contained in construction management plans, and review compliance of environmental protection systems developed by contractors.

12. **Field Surveyors (national, two positions)**. The surveyors will (i) assist the environmental specialists in carrying out external environmental monitoring to ensure that environmental management is in compliance with the environmental management plan; (ii) under the guidance of the environmental specialists, carry out field surveys; (iii) analyze data collected from the field surveys; (iv) provide assistance to the environmental specialists for the preparation of external environmental monitoring reports; and (v) conduct any other duties assigned by the environmental specialist/team leader. Specifically, the surveyors will:

- (i) undertake field survey and inspection under the guidance of environmental specialist;
- (ii) participate in preparation of environmental monitoring procedures;
- (iii) conduct environmental monitoring at project sites, and evaluate control of pollutants for compliance with relevant environmental standards and regulations;
- (iv) identify issues, report them in a timely manner, and propose mitigation measures;
- (v) arrange site meetings for effective coordination with clients and contractors, and deliver training on a need basis;
- (vi) participate in handling pollution accidents under the guidance of the environment specialist;
- (vii) prepare external environmental monitoring report; and
- (viii) undertake other tasks assigned by the environmental specialist.



### APPENDIX III. COVID 19 – PROJECT HEALTH & SAFETY PLAN (DRAFT GUIDELINES)

Item	Good Practices	Who implements	Who supervises
Awareness materials	<ul style="list-style-type: none"> <li>Preparation of awareness materials on COVID-19 e.g., signs, posters</li> <li>Installation of awareness signs at work sites, for visibility to workers and the general public</li> </ul>	Contractor	CSC, Sub-PMO/EMU, LIEC
Detection Measures	<ul style="list-style-type: none"> <li>Control and document the entry/exit to the work site for both workers and other parties.</li> <li>Prevent sick workers from entering the site through checking temperatures of workers and other people entering the site. Require self-reporting prior to entering the site.</li> <li>All workers to self-monitor their health, possibly with the use of questionnaires, and take their body temperature regularly.</li> <li>Thermal screening at the workplace to be considered only in the context of a combination of measures for prevention and control of COVID-19 at the workplace and along with risk communication.</li> </ul>	Contractor	CSC, Sub-PMO/EMU, LIEC
Physical Distancing measures	<ul style="list-style-type: none"> <li>Keep a distance of at least 1 meter between workers and minimize physical contact, ensure strict control over external access, and queue management (marking on the floor, barriers).</li> <li>Reduce density of people in the building (no more than 1 person per every 10 m<sup>2</sup>), physical spacing at least 1 meter apart for work stations and common spaces, such as entrances/exits, lifts, pantries/canteens, stairs, where congregation or queuing of employees or visitors/clients might occur.</li> <li>Avoid crowding by staggering working hours to reduce the congregation of employees at common spaces such as entrances or exits.</li> <li>Implement or enhance shift or split-team arrangements, or teleworking.</li> <li>Minimize the movement of local workers in and out of the site (e.g., avoid workers returning home to affected areas, or returning to site from affected areas).</li> <li>Minimize the workers' contact with local community.</li> </ul>	Contractor	CSC, Sub-PMO/EMU, LIEC
Respiratory measures	<ul style="list-style-type: none"> <li>All workers should wear a face mask.</li> <li>If a worker is sick, they should not come to work if a member of staff or a worker feels unwell while at work, provide a medical mask so that they may get home safely.</li> <li>Where masks are used, whether in line with government policy or by personal choice, it is very important to ensure safe and proper use, care and disposal</li> </ul>	Contractor	CSC, Sub-PMO/EMU, LIEC

Item	Good Practices	Who implements	Who supervises
Hand Hygiene measures:	<ul style="list-style-type: none"> <li>Regular and thorough handwashing with soap and water or hand hygiene with alcohol-based hand-rub (a) before starting work, before eating, frequently during the work shift, especially after contact with co-workers or customers, (b) after going to the bathroom, after contact with secretions, excretions and body fluids, after contact with potentially contaminated objects (gloves, clothing, masks, used tissues, waste), and immediately after removing gloves and other protective equipment but before touching eyes, nose, or mouth.</li> <li>Hand hygiene stations, such as hand washing and hand rub dispensers, should be put in prominent places around the workplace and be made accessible to all staff, contractors, clients or customers, and visitors along with communication materials to promote hand hygiene</li> </ul>	Contractor	CSC, Sub-PMO/EMU, LIEC
Cleaning and Disinfection	<ul style="list-style-type: none"> <li>Cleaning and Disinfection off all site facilities, including offices, accommodation, canteens and common spaces:</li> <li>Cleaning (soap, water, and mechanical action) to remove dirt, debris, and other materials from surfaces. Disinfection of dirty surfaces and objects only after cleaning.</li> <li>Most common disinfectants – sodium hypochlorite (bleach) of surface at concentration 0.1% or alcohol at least 70% concentration for surfaces which can be damaged by sodium hypochlorite.</li> <li>Priority disinfection of high-touch surfaces - commonly used areas, door and window handles, light switches, kitchen and food preparation areas, bathroom surfaces, toilets and taps, touchscreen personal devices, personal computer keyboards, and work surfaces.</li> <li>Disinfectant solutions must always be prepared and used according to the manufacturer's instructions, including instructions to protect the safety and health of disinfection workers, use of personal protective equipment, and avoiding mixing different chemical disinfectants.</li> <li>Provide appropriate PPEs to the cleaners.</li> <li>Manage the waste as the medical waste, and dispose of it in accordance with local regulations.</li> </ul>	Contractor	CSC, Sub-PMO/EMU, LIEC
Response measures if workers found with COVID-19 symptoms	<ul style="list-style-type: none"> <li>Workers who are unwell or who develop symptoms consistent with COVID-19 to stay at home, self-isolate, and contact a medical professional or the local COVID-19 information line for advice on testing and referral (consider telemedicine and flexible sick leave policy).</li> <li>Standard operating procedures to be prepared to manage a person who becomes sick at the workplace and is suspected of having COVID-19, including isolation, contact tracing and disinfection.</li> <li>People who were in close contact at the workplace with persons with laboratory-confirmed COVID-19 should be quarantined for 14 days from the last time of the</li> </ul>	Contractor	CSC, Sub-PMO/EMU, LIEC

Item	Good Practices	Who implements	Who supervises
	<p>contact in accordance with WHO recommendations.</p> <ul style="list-style-type: none"> <li>• Set out differentiated procedures for the treatment of sick persons, based on the case severity. Pay workers throughout periods of illness, isolation or quarantine.</li> <li>• Set aside a part of worker accommodation for precautionary self-quarantine.</li> <li>• Establish communications with local medical services and refer sick workers to there.</li> </ul>		
Adjusting Work Practices and Manage Work Related Travels	<ul style="list-style-type: none"> <li>• Consider changes to work processes and timings to minimize contact between workers (e.g., decreasing the size of work team, changing to a 24-hour work rotation).</li> <li>• Cancel or postpone non-essential travel to areas with community transmission of COVID-19.</li> <li>• Provide hand sanitizer to workers who must travel, advise workers to comply with instructions from local authorities where they are travelling, as well as information on whom to contact if they feel ill while travelling.</li> <li>• Workers returning from an area where COVID-19 transmission is occurring should monitor themselves for symptoms for 14 days and take their temperature twice a day; if they are feeling unwell, they should stay at home, self-isolate, and contact a medical professional.</li> </ul>	Contractor	CSC, Sub-PMO/EMU, LIEC
Communication and Contact with the Community	<ul style="list-style-type: none"> <li>• Carefully manage the relations with the community with clear and regular communication.</li> <li>• Made aware of the procedures put in place at the site to address issues related to COVID-19.</li> <li>• Practice social distancing with the local community.</li> </ul>	Contractor	CSC, Sub-PMO/EMU, LIEC
Risk communication, training, and education	<ul style="list-style-type: none"> <li>• Provide posters, videos, and electronic message boards to increase awareness of COVID-19 among workers and promote safe individual practices at the workplace, engage workers in providing feedback on the preventive measures and their effectiveness.</li> <li>• Provide regular information about the risk of COVID-19 using official sources, such as government agencies and WHO, and emphasize the effectiveness of adopting protective measures and counteracting rumors and misinformation.</li> <li>• Special attention should be given to reaching out to and engaging vulnerable and marginalized groups of workers, such as those in the informal economy and migrant workers, domestic workers, subcontracted and self-employed workers, and those working under digital labor platforms.</li> <li>• Train the workers on procedures in place by the project, and their own responsibilities in implementing them.</li> </ul>	Contractor	CSC, Sub-PMO/EMU, LIEC