# Initial Environmental Examination (Draft)

Project Number: 53077-001
June 2022

# People's Republic of China: Gansu Environmentally Sustainable Rural Vitalization and Development Project: Qinzhou District Subproject

Prepared by the Provincial Government of Gansu for the Asian Development Bank

## 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 |
| €1.00 | = | CNY 7.1351 | or | $1.0705 |

## ABBREVIATIONS

| | | |
|---|---|---|
| ADB | – | Asian Development Bank |
| AQG | – | Air Quality Guideline |
| $BOD_5$ | – | 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 |
| $I_{Mn}$ | – | Permanganate Index |
| IPCC | – | International Panel on Climate Change |
| LIEC | – | Loan Implementation Environment Consultant |
| MEE | – | Ministry of Ecology and Environment |
| $NH_3$-N | – | Ammonia Nitrogen |
| $NO_2$ | – | Nitrogen Dioxide |
| $NO_X$ | – | Nitrogen Oxides |
| PAM | – | Project Administration Manual |
| PM | – | Particulate Matter |
| $PM_{10}$ | – | Particulate Matter with diameter ≤ 10 micrometers |
| $PM_{2.5}$ | – | 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 |
| $SO_2$ | – | 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

| | | |
|---|---|---|
| $^oC$ | – | degree centigrade |
| µ | – | micron |
| cm | – | centimeter |
| h | – | hour |
| ha | – | hectare |
| km | – | kilometer |
| km/h | – | kilometer per hour |
| $km^2$ | – | square kilometer |
| m | – | meter |
| $m^2$ | – | square meter |
| $m^3$ | – | cubic meter |
| m/s | – | meter per second |
| $m^3/d$ | – | cubic meter per day |
| $m^3/s$ | – | cubic meter per second |
| mg/l | – | milligram per liter |
| $mg/m^3$ | – | 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 Qinzhou District 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 Qinzhou District Subproject in Tianshui City. It does not include the project activities in Ganzhou District Subproject (Zhangye City), Yongchang County Subproject (Jinchang City), Pingchuan District Subproject (Baiyin City) and Lintao County Subproject (Dingxi 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 [1]; additional baseline data collection and analyses undertaken by the domestic EIA institute under the direction of an ADB TrTA team[2]; 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($km^2$) 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-

1 This IEE has been developed based on one domestic Environmental Impact Tabular (EIT) of the Qinzhou District 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).

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; [3] sustainable rural development promoted; and rural ecosystems protected and restored.[4] 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. [5] 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 $m^2$), 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 $m^2$ of

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;

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

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.

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 $m^2$), and an organic fruit and vegetable storage center (1,500 $m^2$). 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 $m^2$ of exhibition and processing facilities, and 40 green shared farms, and a cultural service center (14,200 $m^2$) 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 $m^2$) 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 $m^2$), and an urban and rural elderly caring demonstration base (30,000 $m^2$) 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 Qinzhou District Subproject will be undertaken as part of project outputs 1-4. The subproject will support Tianshui City to (i) promote green development in rural areas; (ii) develop smart agriculture and ecological agriculture in rural areas; (iii) promote sustainable tourism and low-carbon rural development including elderly caring demonstration; 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 (Qinzhou District of Tianshui City, Ganzhou District of Zhangye City, Yongchang County of Jinchang City, Pingchuan District of Baiyin City, and Lintao County of Dingxi 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 Qinzhou District Subproject will be 42,700 residents in Pingnan Town, including 2,640 persons in one subproject village. In addition, the 555,388 population in Qinzhou District will indirectly benefit from the subproject as secondary beneficiaries, including approximately 326,576 women (49.73% of the beneficiaries), 13,933 EM people (2.12%), and 49,355 low-income people (7.52%).

11. The subproject will directly benefit vulnerable groups including 20,300 women and 3,211 low-income people (or 7.52%) 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 2.12% 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 of 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 247 mu (164,667 $m^2$) of land. There will be no physical house relocation. In addition, temporary land occupation will occur during construction period, and the subproject will use 2,170 mu of trough 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, or rare or threatened flora or fauna species.

16. **Operation Phase**. Potential negative operation phase impacts include water usage, wastewater discharge, solid waste management, 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, 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 0.21 million $m^3$ 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 875.2 tons per year, and reduced use of pesticides by about 2.2 tons and insecticides by 0.7 tons per year, [6]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, 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) utilization of gas fired heating boiler ; (iv) utilization of organic fertilizer to reduce fertilizer consumption; and (v) carbon sequestration by ecological restoration and afforestation and re-vegetation activities. The total CO2e emissions generated by the subproject, every year during the operation, will be about 868.4 tons/yr, while the total CO2e reduction from the subproject will be 12,378.2 tons of CO2e/yr. Hence, the net GHG emission reduction from the subproject will be 11,509.8 tons/yr.

6 The savings were calculated based on the baseline consumption and subproject consumption. Detailed information is presented in section D of chapter V.

## 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 Qinzhou District are available on request at the PPMO, and will be disclosed on the Pingchuan Environment and Ecology Bureau (EEB) website later. The first public information notice was posted on the website https://www.eiacloud.com/gs/detail/1?id=20530k761W 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 draft EIA was prepared. Questionnaire survey was conducted after the public consultation. A total of 116 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 Qinzhou District Subproject will be Tianshui City Economic Development Investment and Financing (Group) Co., Ltd. for project components in Qinzhou District 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, Yongchang County Government for project components in Yongchang County, and Lintao County Government for project components in Lintao County. 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 Qinzhou District 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 Qinzhou District 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 Qinzhou District Subproject in Tianshui City (the subproject). It does not include the project activities in Ganzhou District Subproject (Zhangye City), Yongchang County Subproject (Jinchang City), Pingchuan District Subproject (Baiyin City) and Lintao County Subproject (Dingxi 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 team7; 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[8]; and sustainable rural development promoted, and rural ecosystems protected and restored[9]. 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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8 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;

9 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

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. [10] 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 $m^2$), 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 $m^2$ 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 $m^2$), and an organic fruit and vegetable storage center (1,500 $m^2$). 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 $m^2$ of exhibition and processing facilities, and 40 green shared farms, and a cultural service center (14,200 $m^2$) 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 $m^2$) 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 $m^2$), and an urban and rural elderly caring demonstration base (30,000 $m^2$) 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

10 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 Qinzhou District Subproject will be undertaken as part of project outputs 1 to 4. The subproject will support Tianshui 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 $CO_2$ emissions. The subproject activities are presented in detail in **Chapter III**.

8. The primary beneficiaries of the Qinzhou District Subproject will be 42,700 residents in Pingnan Town, including 2,640 persons in one subproject village. In addition, the 555,388 population in Qinzhou District will indirectly benefit from the subproject as secondary beneficiaries, including approximately 326,576 women (49.73% of the beneficiaries), 13,933 EM people (2.12%), and 49,355 low-income people (7.52%).

9. The subproject will directly benefit vulnerable groups including 20,300 women and 3,211 low-income people (or 7.52%) 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.

10. 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 2.12% 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 of land use and construction disturbance of civil works, have been addressed by the resettlement plan (RP) and the 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 Qinzhou District 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 Qinzhou District Subproject (this report). Four separate Category B IEEs have been prepared for the Ganzhou District Subproject (Zhangye City), Yongchang County Subproject (Jinchang City), Pingchuan Subproject (Baiyin City) and Lintao County Subproject (Dingxi 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).[11] 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, Pingchuan District Subproject, Yongchang County Subproject, Lintao District 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)[12] 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 *Environmental Protection Law* (EPL) (1989, amended 2014, effective 2015 and item 2 in **Table**

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

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

**II-1**), which sets out key principles for the nation's pollution control system, including the "Three Simultaneities policy, [13] 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 |
| | **Regulations** | |
| 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 |
| | **Decrees and Announcements** | |
| 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 |
| 31 | Interim Measures for the Environmental Protection Acceptance of Completed | 2017 |

13 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.

| | | |
|---|---|---|
| | Construction Projects (EIA department of MEP, 2007-04) | |
| 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.

| | **Guidelines** | **Date** |
|---|---|---|
| 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* (2018) (**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.[14]

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*

14 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[15] 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 I*nterim 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.

15 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 Qinzhou District Subproject was classified as category B, requiring the preparation of one EIT report covering the various activities. 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 Tianshui EEB. Draft EIT reports were prepared and disclosed in May 2022. The final EIT reports will be submitted to Tianshui EEB for formal review, revision (if required) and approval [16].

## 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 Vehicle Compression-Ignition and Gas Fueled Ignition Engines |
| 18 | GB18285-2005 Limits and Measurement Methods for Exhaust Pollutants from Vehicles |

16 The EIA shall be approved before commencement of construction and domestic EIA approval is not a pre-condition for domestic project approval.

| No. | Standards |
|---|---|
| | 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 Consultant 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.[17]

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 $PM_{10}$ 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 $PM_{2.5}$ 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 $SO_2$ WHO only has a 24-hour guidelines. The PRC Class 2 24 hour standard (150 $\mu g/m^3$) almost meets the WHO IT-1 target (125 $\mu g/m^3$).
(v) For $NO_2$ 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 $\mu g/m^3$) is more stringent than the WHO IT-1 target (120 $\mu g/m^3$)
(vi) For $O_3$, 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.

17 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 $PM_{2.5}$. 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* (μg/m$^3$) | | WHO/EHS Guidelines (μg/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 |
| $PM_{10}$ | 1-year | 40 | 70 | 20 - 70 | 15 |
| | 24-hour | 50 | 150 | 50 - 150 | 45 |
| $PM_{2.5}$ | 1-year | 15 | 35 | 10 - 35 | 5 |
| | 24-hr | 35 | 75 | 25 - 75 | 15 |
| $SO_2$ | 1-year | 20 | 60 | n/a | n/a |
| | 24-hour | 50 | 150 | 50 - 125 | 40 |
| | 1-hour | 150 | 500 | n/a | n/a |
| $NO_2$ | 1-year | 40 | 40 | 20-40 | 10 |
| | 24-hour | 80 | 80 | 50-120 | 25 |
| | 1-hour | 200 | 200 | n/a | 200 |
| $O_3$ | 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$^3$ as the maximum allowable emission concentration and ≤ 1.0 mg/m$^3$ 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).

| PRC Standards Leq dB(A) | | | International Standards One Hour Leq dB(A) | | Comparison |
|---|---|---|---|---|---|
| **Class** | **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: 55<br><br>WHO Class II: industrial, commercial: 70 | institutional, educational: 45<br><br>WHO Class II: Industrial, Commercial: 70 | 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 | | | |
| II: Mixed residential, commercial and industrial areas | 60 | 50 | | | |
| III: Industrial areas | 65 | 55 | | | |
| 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 Tao River 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 ≥7.5 | ≥6 | ≥5 | ≥3 | ≥2 |
| Permanganate index ($I_{Mn}$) [mg/L] | ≤2 | ≤4 | ≤6 | ≤10 | ≤15 |
| Chemical oxygen demand (COD) [mg/L] | ≤15 | ≤15 | ≤20 | ≤30 | ≤40 |
| 5-day Biochemical oxygen demand ($BOD_5$) [mg/L] | ≤3 | ≤3 | ≤4 | ≤6 | ≤10 |
| Ammonia nitrogen ($NH_3$-N) [mg/L] | ≤0.15 | ≤0.5 | ≤1.0 | ≤1.5 | ≤2.0 |
| Total phosphorus (as P) [mg/L] | ≤0.02 | ≤0.1 | ≤0.2 | ≤0.3 | ≤0.4 |
| Lakes & reservoirs | ≤0.01 | ≤0.025 | ≤0.05 | ≤0.1 | ≤0.2 |
| Total nitrogen (lakes, reservoirs, as N) [mg/L] | ≤0.2 | ≤0.5 | ≤1.0 | ≤1.5 | ≤2.0 |
| Copper (Cu) [mg/L] | ≤0.01 | ≤1.0 | ≤1.0 | ≤1.0 | ≤1.0 |
| Zinc (Zn) [mg/L] | ≤0.05 | ≤1.0 | ≤1.0 | ≤2.0 | ≤2.0 |
| Fluoride (as $F^-$) [mg/L] | ≤1.0 | ≤1.0 | ≤1.0 | ≤1.5 | ≤1.5 |
| Selenium (Se) [mg/L] | ≤0.01 | ≤0.01 | ≤0.01 | ≤0.02 | ≤0.02 |
| Arsenic (As) [mg/L] | ≤0.05 | ≤0.05 | ≤0.05 | ≤0.1 | ≤0.1 |
| Mercury (Hg) [mg/L] | ≤0.0005 | ≤0.0005 | ≤0.0001 | ≤0.001 | ≤0.001 |
| Cadmium (Cd) [mg/L] | ≤0.001 | ≤0.005 | ≤0.005 | ≤0.005 | ≤0.01 |
| Chromium (Cr, hexavalent) [mg/L] | ≤0.01 | ≤0.05 | ≤0.05 | ≤0.05 | ≤0.1 |
| Lead (Pb) [mg/L] | ≤0.01 | ≤0.01 | ≤0.05 | ≤0.05 | ≤0.1 |
| Cyanide (CN) [mg/L] | ≤0.005 | ≤0.05 | ≤0.2 | ≤0.2 | ≤0.2 |
| Volatile phenol [mg/L] | ≤0.002 | ≤0.002 | ≤0.005 | ≤0.01 | ≤0.1 |
| Total petroleum hydrocarbon (TPH) [mg/L] | ≤0.05 | ≤0.05 | ≤0.05 | ≤0.5 | ≤1.0 |
| Anionic surfactant (=LAS) [mg/L] | ≤0.2 | ≤0.2 | ≤0.2 | ≤0.3 | ≤0.3 |
| Sulfide [mg/L] | ≤0.05 | ≤0.1 | ≤0.2 | ≤0.5 | ≤1.0 |
| Fecal coliform bacteria [number/L] | ≤200 | ≤2000 | ≤10000 | ≤20000 | ≤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[18] 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.

18 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/

**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<br>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 |
| 1 | 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 Consultant 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 (Discharge into Class III water bodies) | Class 2 (Discharge into Class IV and V water bodies) | Class 3 (Discharge into municipal sewers) |
|---|---|---|---|---|
| pH | no unit | 6-9 | 6-9 | 6-9 |
| SS | mg/L | 70 | 150 | 400 |
| $BOD_5$ | 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 $NH_3$-N | mg/L | 15 | 25 | --- |
| $PO_4^{2-}$ (as P) | mg/L | 0.5 | 1.0 | --- |
| Anionic Surfactants | mg/L | 5.0 | 10 | 20 |

Source: PRC GB8978-1996.

55. The component will build wastewater treatment stations (WWTSs) which will treat domestic wastewater and medical wastewater from component 2. The domestic wastewater from component 1 will be treated by the existing WWTS of Sunji Village. The effluent of Sunji WWTS is regulated under PRC's Reuse of urban recycling water-Water Quality standard for green space irrigation (GB/T 25499-2010). The effluent of the WWTS of the subproject is regulated under PRC's Reuse of urban recycling water-Water Quality standard for green space irrigation (GB/T 25499-2010) and Discharge standard of water pollutants for medical organization (GB 18466-2005). The WWTSs will not involve treatment of industrial wastewater. The PRC has more stringent standards than World Bank Group EHS standards (see **Table II-11** and **Table II-12** for comparison) for treated wastewater discharges, and hence PRC standards are applicable to the project.

**Table II-11:** PRC Wastewater Quality Standards for Reuse of urban recycling water-Water Quality standard for green space irrigation and relevant international guidelines (Units: mg/L, except pH, chromaticity and fecal coliform)

| No. | Parameter | PRC GB/T 25499-2010 | World Bank Group EHS Guidelines |
|---|---|---|---|
| 1 | CODcr | ≤100 | 125 |
| 2 | BOD5 | ≤20 | 30 |
| 3 | SS | ≤10 | 50 |
| 4 | Oils | ≤1 | NA |
| 5 | Petroleum | ≤1 | 10 |
| 6 | LAS | ≤1.0 | NA |
| 7 | Total nitrogen | ≤10 | 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 | ≤200 | 400 |
| 13 | Residual chlorine | | |

Note: for Sunji Village WWTS
Source: PRC GB/T 25499-2010.

**Table II-12:** PRC Wastewater Quality Standards for Reuse of urban recycling water-Water Quality standard for green space irrigation, Discharge standard of water pollutants for medical organization (GB 18466-2005) and relevant international guidelines (Units: mg/L, except pH, chromaticity and fecal coliform).

| No. | Parameter | PRC GB/T 25499-2010 | PRC GB 18466-2005 | World Bank Group EHS Guidelines for Health Care Facilities |
|---|---|---|---|---|
| 1 | CODcr | ≤100 | ≤60 | 250 |
| 2 | BOD5 | ≤20 | ≤20 | 50 |
| 3 | SS | ≤10 | ≤40 | 50 |
| 4 | Oils | ≤1 | ≤1 | 10 |
| 5 | Petroleum | ≤1 | ≤5 | NA |
| 6 | LAS | ≤1.0 | ≤5.0 | NA |
| 7 | Total nitrogen | ≤10 | NA | NA |
| 8 | Ammonia nitrogen | ≤5 | NA | NA |
| 9 | Total phosphorus | ≤0.5 | NA | NA |
| 10 | Chromaticity | ≤30 | ≤30 | NA |
| 11 | pH | 6-9 | 6-9 | 6-9 |
| 12 | Fecal coliform | ≤200 | ≤500 | 400 |
| 13 | Volatile phenol | NA | 0.5 | 0.5 |
| 14 | Cyanide | 0.5 | 0.5 | NA |
| 15 | Mercury | 0.001 | 0.05 | 0.01 |
| 16 | Cadmium | 0.01 | 0.1 | 0.05 |
| 17 | Chromium | 0.5 | 1.5 | 0.5 |
| 18 | Chromium VI | 0.1 | 0.5 | NA |
| 19 | Arsenic | 0.05 | 0.5 | NA |
| 20 | Lead | 0.1 | 1.0 | 0.1 |
| 21 | Silver | NA | 0.5 | NA |
| 22 | Total alpha radioactivity (bq/L) | NA | 1 | NA |
| 23 | Total beta radioactivity (bq/L) | NA | 10 | NA |
| 24 | Residual chlorine | 0.2-0.5 | 0.5 | NA |

Note: for WWTS of the subproject, the more stringent standard of PRC GB/T 25499-2010 and GB 18466-2005 will be applied.

Source: PRC GB/T 25499-2010 and GB 18466-2005.

**Boiler Emissions**

56. presents the relevant PRC national boilers emission standard compared with relevant international standards (EHS Guidelines for thermal power plants). The national standards are more stringent than the EHS Guidelines, and the national standards are applicable to the subproject.

**Table II-13:** Relevant National Emission Standards for gas fired boilers and Relevant International Guidelines

| Parameter | ***Emission standard of air pollutants for coal-burning oil-burning gas-fired boiler*** (GB13271-2014) | **EHS Guidelines for Small Combustion Facilities Emissions Guidelines (3MWth-50MWth)** (Boiler) | Comparison |
|---|---|---|---|
| Stack Height | Stack height is determined according to the requirements in the approved EIA, and must be > 8 m. | Design stack height according to Good International Practice (GIP) to avoid excessive ground level concentrations and minimize | PRC standard meets GIP |

| | | | |
|---|---|---|---|
| | | impacts. | |
| PM | 20 mg/Nm$^3$ | NA | No EHS guideline. |
| $SO_2$ | 50 mg/Nm$^3$ | NA | No EHS guideline. |
| $NO_x$ | 200 mg/Nm$^3$ | 320 mg/Nm$^3$ | PRC standard is more stringent than the EHS guidelines |

**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[19] 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**).

**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** | **NA** |
| 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.

19 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

**Solid Waste**

57. 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.

58. 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**

59. **Table II-15** presents the environmental standards and guidelines applicable to the Project, which reflects the requirements set forth by the Tianshui 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 Qinzhou District Subproject.

| Parameter / Area of Concern | Applicable Standards and Guidelines | Remarks |
|---|---|---|
| Ambient air quality | *Ambient Air Quality Standard* (GB3095-2012), Class II | Yearly average:<br>$PM_{10}$: 0.070 mg/m$^3$<br>$PM_{2.5}$: 0.035 mg/m$^3$<br>$SO_2$: 0.06 mg/m$^3$<br>$NO_2$: 0.04 mg/m$^3$<br>CO: 4.0 mg/m$^3$<br>Daily average:<br>TSP: 0.30 mg/m$^3$<br>$PM_{10}$: 0.15 mg/m$^3$<br>$PM_{2.5}$: 0.075 mg/m$^3$<br>$SO_2$: 0.15 mg/m$^3$<br>$NO_2$: 0.08 mg/m$^3$<br>CO: 4.0 mg/m$^3$<br>Hourly average:<br>$SO_2$: 0.50 mg/m$^3$<br>$NO_2$: 0.20 mg/m$^3$<br>CO: 10.0 mg/m$^3$ |
| Construction air pollutant emission | *Air Pollutant Integrated Emission Standard* (GB16297-1996) | Maximum allowable emission concentration:<br>Particulate matter (PM): 120 mg/m$^3$<br>Fumes from asphalt plant: 40 mg/m$^3$ during production and 75 mg/m$^3$ during mixing<br>Limits for fugitive emission:<br>PM: ≤1.0 mg/m$^3$ at construction site boundary<br>Fumes from asphalt plant: no obvious emission at asphalt production plant |
| Environmental noise | *Environmental Quality Standard for Noise* (GB3096-2008):<br>• Class III for areas within the sites<br><br>*WHO Noise Quality Guidelines*<br>• Class I for sensitive receptors near the sites | Class III areas:<br>Day time: 65 dB(A)<br>Night time: 55 dB(A)<br>Class I areas:<br>Day time: 55 dB(A)<br>Night time: 45 dB(A) |

| Parameter / Area of Concern | Applicable Standards and Guidelines | Remarks |
|---|---|---|
| Construction noise | *Emission Standard of Environmental Noise for Boundary of Construction Site* (GB12523-2011) | Noise level at construction site boundary:<br>Day time: 70 dB(A)<br>Night time: 55 dB(A)<br>Noise level within construction site:<br>Day time: 60 dB(A)<br>Night time: 50 dB(A) |
| Surface water quality | *Environmental Quality Standards for Surface Water* (GB3838-2002), see **Table II-8**. | Class III for rivers near the project area. |
| Ground water quality | *Quality Standard for Ground Water (GB/T 14848-2017)*, see **Table II 9.** | Class III for groundwater near the project area. |
| Wastewater discharge | *Integrated Wastewater Discharge Standard* (GB8978-1996) | Discharge into Municipal Sewers:<br>COD: ≤500 mg/l<br>$BOD_5$: ≤350 mg/l<br>SS: ≤400 mg/l<br>$NH_3$-N: ≤45 mg/l<br>Effluence of the wastewater treatment facility:<br>COD: ≤50 mg/l<br>$BOD_5$: ≤10 mg/l<br>SS: ≤10 mg/l |
| Solid waste | *Standards for Pollution Control on the Storage and Disposal Site for General Industrial Solid Wastes (GB18599-2001) and its revision in 2013 apply.* | Approaches and measures appropriate to mitigate adverse impacts from the project activities |
| Soil | *PRC standard GB 15618-2018 and Western Australian guidelines,* see **Table II 14.** | Both the PRC standard GB 15618-2018 and Western Australian guidelines are applied, as the maximum allowable concentrations are higher for some parameters in one standard than the other and vice versa |
| 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)* | Approaches and measures appropriate to mitigate adverse impacts from the project activities |
| Environmental adverse impacts | *WB EHS Guidelines: Environment* | Approaches and measures appropriate to mitigate adverse impacts from the project activities |
| Occupational health and safety | *WB EHS Occupational Health and Safety Guidelines* | Approaches and measures appropriate to mitigate adverse impacts from the project activities |
| Community health and safety | *WB EHS Community Health and Safety Guidelines* | Approaches and measures appropriate to mitigate adverse impacts from the project activities |
| Construction and Decommissioning | *WB EHS Construction and Decommission Guidelines* | Approaches and measures appropriate to mitigate adverse impacts from the project activities |

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

## G. International Agreements

60. 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 PROJECT

## A. Introduction

61. 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.

62. The Qinzhou District 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

63. **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.

64. **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.

65. 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.

66. 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.

67. 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.

68. 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.

69. **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.

70. **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 (CO2) 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.

71. **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 lose of manpower. Today tourists demand more on the overall living and leisure condition of the destination. 3. 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.

72. 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.

73. 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.

74. **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.

75. 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.

76. 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.

77. **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. [20]

78. **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 Qinzhou District Subproject Description by Component

79. The Subproject includes three components (not including capacity building in which there are no physical works) and all components will be located at Pingnan Town. The subproject's scope by component is presented in **Table III-1** and the locations of the components are presented in **Figure III-1**.

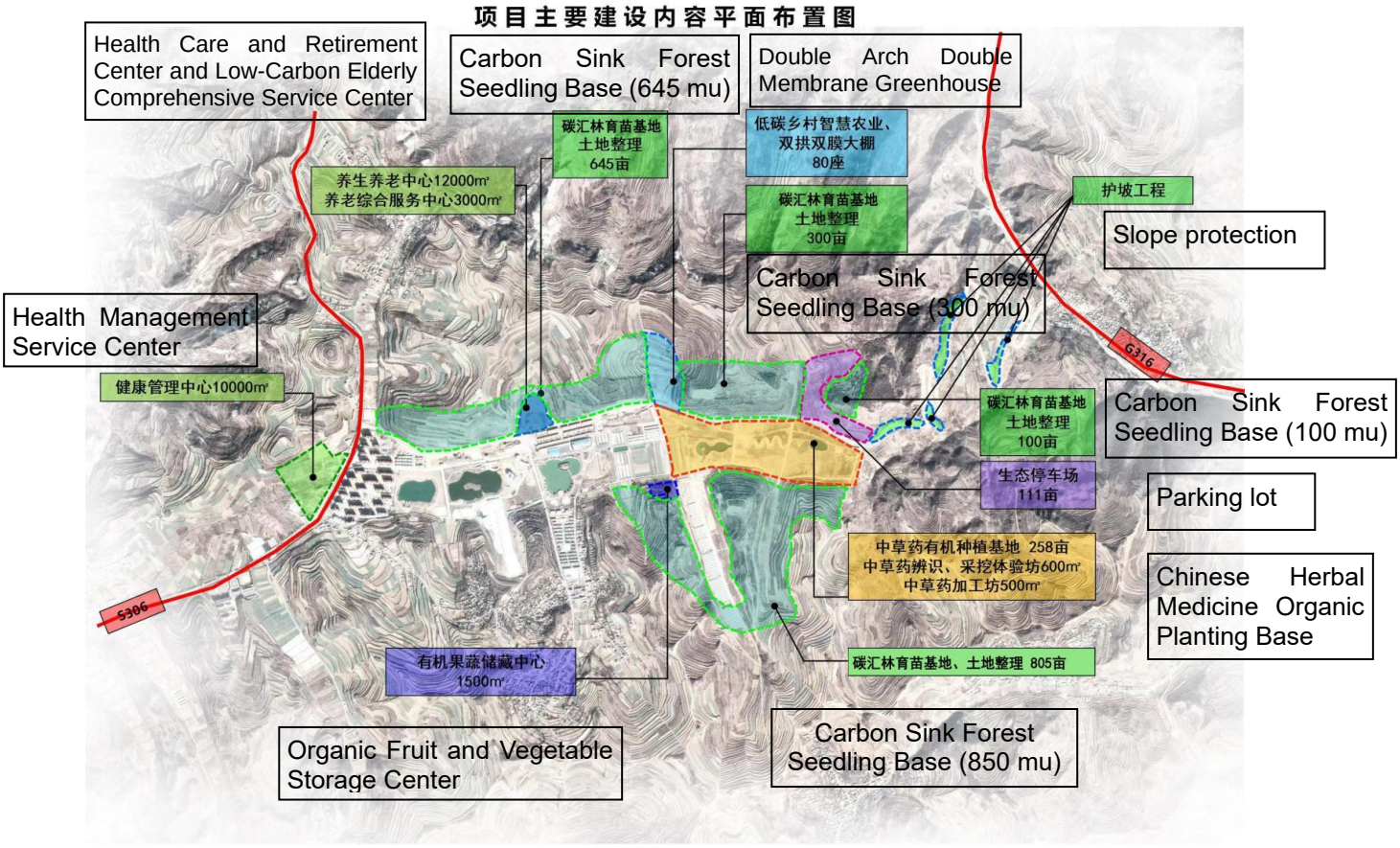
20 ADB. 2021. *Country Partnership Strategy: People's Republic of China, 2021–2025 — Toward High-Quality, Green Development*. Manila.

**Table III-1:** Qinzhou District Subproject activities.

| Output | Scope | Scale | Location |
|---|---|---|---|
| Output 2 | 1. Mountain Ecological Development (component 1) | | Pingnan Town, |
| | a. Double Arch Double Membrane Greenhouse; | 80 units | Sunji Village. |
| Output 3 | b. Chinese herbal medicine identification and collection experience workshops; | 600 $m^2$ | |
| Output 2 | c. Chinese Herbal Medicine Processing Workshops; | 500 $m^2$ | |
| | d. Organic Fruit and Vegetable Storage Center; | 1,500 $m^2$ | |
| | e. Chinese Herbal Medicine Organic Planting Base; | 172,000 $m^2$ | |
| Output 4 | f. Carbon Sink Forest seedling base; | 1,233,333 $m^2$ | |
| | g. Slope Protection Works for landslides and collapsed slopes; | 8500m | |
| | h. Water Saving Irrigation System; | | |
| | i1. Water saving irrigation system for carbon sink forest seedling base; | 56,200 m | |
| Output 2 | i2. Water saving irrigation system for double arch double membrane greenhouse | | |
| | i3. Water saving irrigation system for Chinese herbal medicine organic planting base | | |
| Output 3 | i. Water Supply and Drainage Pipe Network System; | 8,800 m | |
| | j. Outdoor Lighting; | 1,100 units | |
| | k. Heating System, including 7,000 m pipeline and 2 heating boilers; | 7,000 m | |
| | l. Waste Treatment Works, including 1 waste transferring truck,1 medical waste transportation truck, and 120 environmental protection waste bins; | 2 vehicles | |
| | m. Ecological Parking Lot, including 96 solar street lights, 112 charging piles, 20 electric sightseeing buses and 2 electric shuttle buses. | 74,000 $m^2$ | |
| Output 3 | 2. Urban and Rural Elderly Caring Demonstration Base (component 2) | | |
| | a. Health Management Service Center; | 10,000 $m^2$ | |
| | b. Health Care and Retirement Center including one Low-Carbon Elderly Comprehensive Service center (3,000 $m^2$) and health care and retirement center (12,000 $m^2$); | 15,000 $m^2$ | |
| | c. Rooftop PV; | 10,000 $m^2$ | |
| | d. Outdoor Lighting; | 630 units | |
| | e. Low Carbon Publicity and Education Square and Ecological Parking Lot, including 5,100 $m^2$ ecological parking lot, 2,900 leisure and fitness square, and 20 charging piles. | 8,000 $m^2$ | |
| Output 3 | 3. Low-Carbon Wellness Village Smart Management System (component 3) | various | |
| | a. Data Center Infrastructure; | | |
| | b. Smart Scenic Spot Integrated Management Platform; | | |
| | c. Smart Agriculture Monitoring Information Platform; | | |
| | d. Command and Dispatch Center; | | |
| | e. Video Surveillance System and Analysis System; | | |
| | f. Call For Help System; | | |
| | g. Security Check System; | | |
| | h. Parking Management System; | | |
| | i. Electronic Patrol System; | | |
| | j. Scenic Public Broadcasting System; | | |
| | k. Information Publishing and Guidance System; | | |
| | l. Disaster Early Warning Monitoring System; | | |
| | m. Computer Room with Supporting Communication Network System. | | |

Source: Domestic EIA, 2022.

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

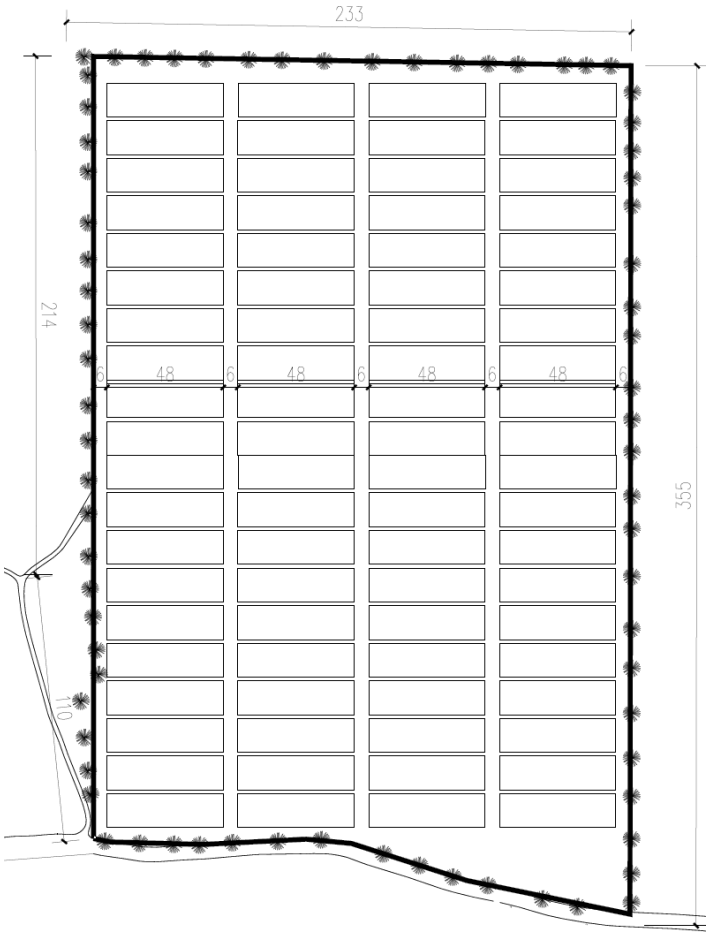



Source: FSR, 2022.

### a) Mountain Ecological Development

80. The component will be located at Sunji Village of Pingnan Town. The component will build 80 sets double arch double membrane greenhouses; one Chinese herbal medicine identification and collection experience workshops (600 $m^2$); one Chinese herbal medicine processing workshops (500 $m^2$); one organic fruit and vegetable storage center (1,500 $m^2$); one Chinese herbal medicine organic planting base (258mu), one carbon sink forest seedling base (1,850 mu); slope protection works for landslides and collapsed slopes; water saving irrigation system (56,200 m); water supply and drainage pipe network system (8,800 m); outdoor lighting; heating system, including 7,000 m pipeline and 2 heating boilers; waste treatment works, including 1 waste transferring truck,1 medical waste transportation truck, and 120 environmental protection waste bins; one ecological parking lot (74,000 $m^2$), including 112 charging piles, 20 electric sightseeing buses and 2 electric shuttle buses.

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




Source: FSR, 2022.

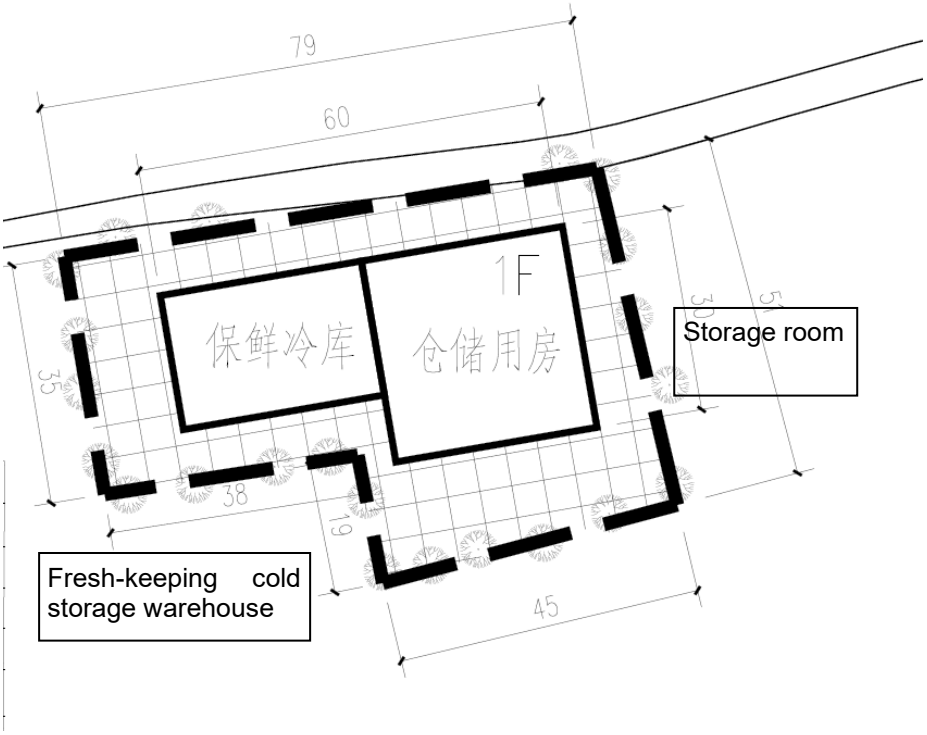
81. Each greenhouse will be 48 m long, 14 m wide and 2.5 m height with a floor area of 1 mu and a height of 2.5 m. The skeleton structure will be steel structure and the distance between the skeletons is 4.15 meters. Both internal and external membranes will anti-drop films.

82. Besides, water supply pipelines will be installed for the greenhouses. 1.2 km high density polyethylene DN 160 pipelines will be installed. And DN100 PVC pipelines (10km) and Φ16 pipelines will be installed in the greenhouses for irrigation.

83. During operation, drip irrigation and integrated water and fertilizer technology will be utilized. The component will install drip irrigation system (1,944 m) for the greenhouses. Organic fertilizer and biological and physical pest control measures will be implemented to reduce the consumption of fertilizer, pesticides and insecticides.

84. One organic fruit and vegetable storage center (1,500 $m^2$) will be built for the greenhouses. The total floor area is 3639.81m2 and the building area is 1500m2, including 700m2 of fresh-keeping cold storage warehouse and 800m2 of storage room. The roof is equipped with photovoltaic panels, and the green area is 655m2. Solar PV will be installed at the roofs of the center.

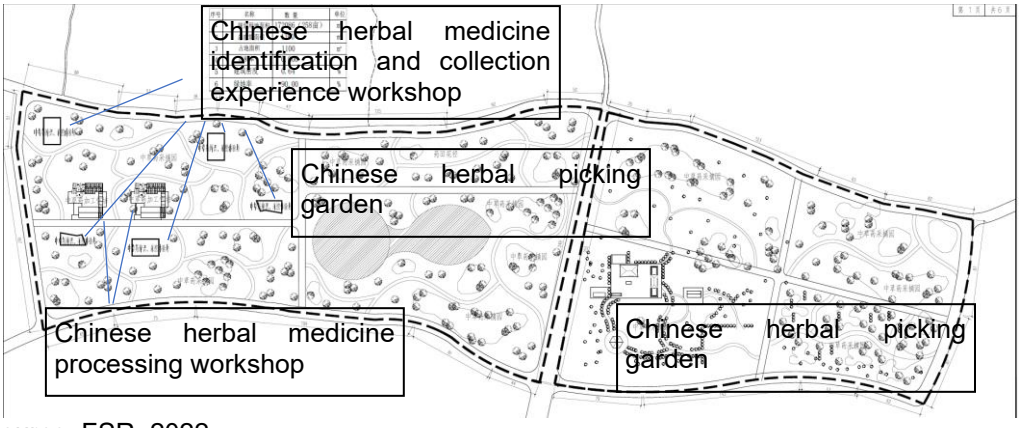
**Figure III-3:** Layout of the organic fruit and vegetable storage center.




Source: FSR, 2022.

85. The Chinese herbal medicine organic planting base will have a floor area of 258mu. The Chinese herbal medicine identification and collection experience workshops (600 $m^2$) and Chinese herbal medicine processing workshops (500 $m^2$) will be located within the base.

**Figure III-4:** Layout of the Chinese herbal medicine organic planting base.

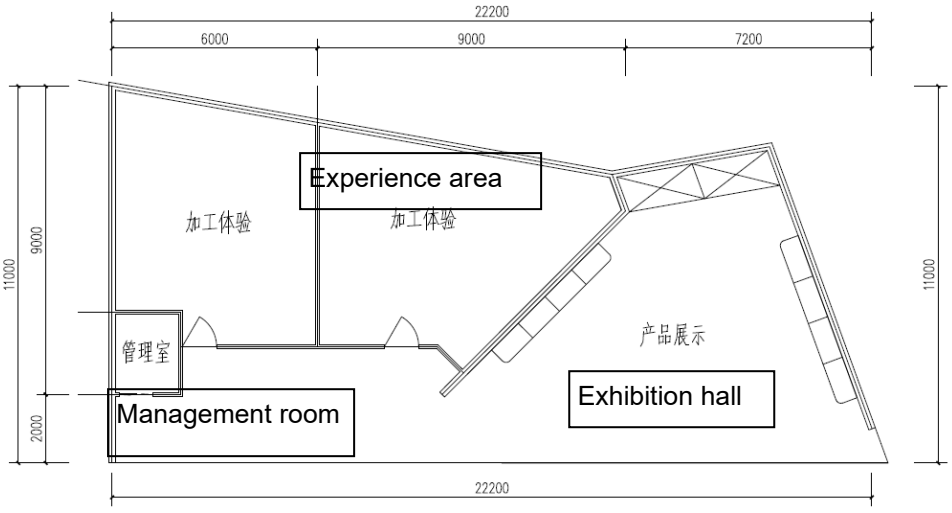



Source: FSR, 2022.

86. The total area of Chinese herbal medicine identification and collection experience workshops will be 600 $m^2$. The workshops will be one-floor frame structure building with a height of 4.05 m.

87. The total area of Chinese herbal medicine processing workshops will be 500 $m^2$. The workshops will be one-floor frame structure building with a height of 4.05 m.

**Figure III-5:** Layout of the Chinese herbal medicine identification and collection experience workshop.




Source: FSR, 2022.

88. Soil improvement/replacement (112,389.5 $m^2$) will be implemented at the base. Land preparation (67,433.7 $m^2$), raised path through fields construction and ridge restoration (22,477.9 $m^2$) will also be implemented. New earth roads (6,448 $m^2$) will be built in the base with a width of 1.5-2.0m.

89. The workshops and warehouses 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 (thermal conductivity 0.62 w/($m^2$.k)); (ii) the windows will be broken bridge aluminum alloy hollow glass windows with steel-plastic composite insulating glass (thermal conductivity 2.1 w/($m^2$.k)); (iii) nano negative oxygen ion coating will be used; and (iv) air source heat pump and roof solar PV and heating system will be utilized. With these measures, the energy saving effect of the buildings will be more than 72%.

90. Carbon sink forest seedling base (1,850 mu) will be planted by the component including 1665 mu of planting soil stripped, land leveling of sloping land (1,665 mu), soil replacement (1,850.00 mu). The forest will be located at four locations. Detailed information of the carbon sink forest seedling base is presented in **Table III-2**.

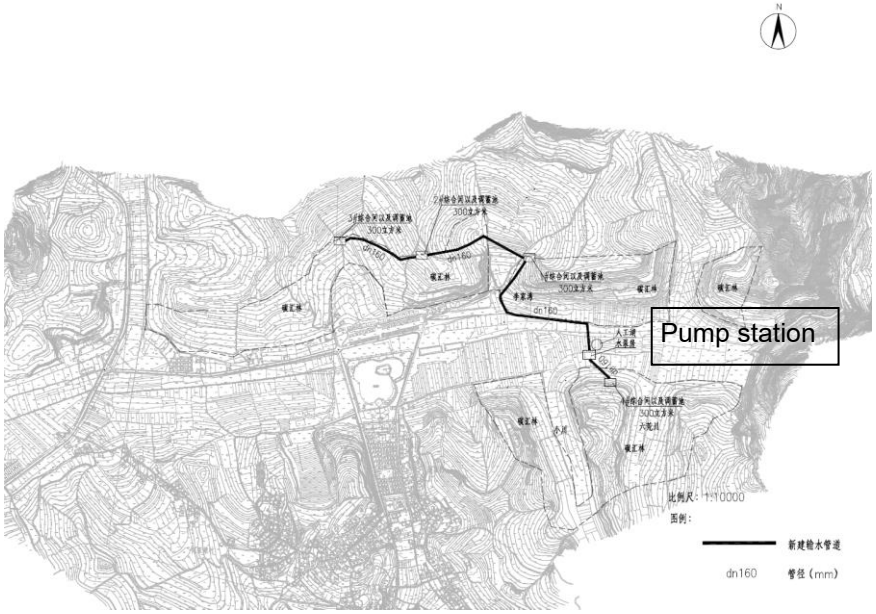
**Table III-2:** Detailed information of the trees to be planted.

| No. | Plants | Specification | Area (mu) |
|---|---|---|---|
| 1 | Pinus tabulaeformis | Height≥1.2m, 166 per mu | 200 |
| 2 | spruce | Height≥1.2m, 166 per mu | 800 |
| 3 | Oil purple leaf plum | Height≥1.2m, 166 per mu | 500 |
| 4 | Tabor | Height≥1.2m, 220 per mu | 130 |
| 5 | clove | Height≥1.0m, 220 per mu | 100 |
| 6 | Forsythia | Height≥1.0m, 220 per mu | 120 |

Source: FSR, 2022.

91. Water delivery system will be built for the forest, including 1 pressurized pump station, DN160 high-density polyethylene water delivery pipeline (1.0MPa) 3km. The pump station will also be built for the Chinese herbal medicine organic planting base.

**Figure III-6:** Layout of the water delivery system.




Source: FSR, 2022.

92. Water distribution system will be built for the forest, including 4km of dn250 high-density polyethylene water distribution pipeline (1.0MPa), 4 comprehensive rooms and regulating and storage tanks (300m3).

93. Irrigation system will be built for the forest, including 7km DN160 high-density polyethylene water supply pipelines (1.0MPa), 20km DN 90 high-density polyethylene water supply pipelines (1.0MPa), 1600kmΦ16PE capillary pipelines.

94. During operation, drip irrigation and integrated water and fertilizer technology will be utilized. The component will install drip irrigation system (1,944 m) for the greenhouses. Organic fertilizer and biological and physical pest control measures will be implemented to reduce the consumption of fertilizer, pesticides and insecticides.

95. The component will implement slope protection works for landslides collapsed slopes. The slope protection works will include drainage ditch (200m), intercepting ditch (1800m,) anti-slide pile (4650m), slope protection (900m) and embankment wall (950m).

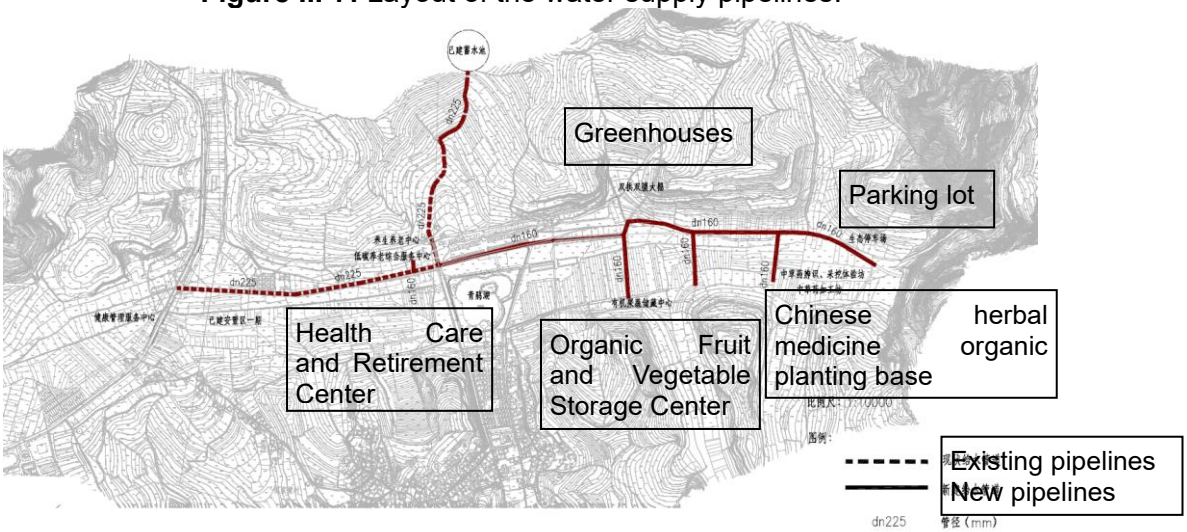
96. There will three landslides to be treated. For the landslide at K0+365-470, the methods will be: the surface soil will be cleaned up the inclined drainage holes will be installed to drain the water in the soil. At the same time intercepting ditch will be set up above the slope body and anti-slide piles will be set up at the shallow exit of the landslide body. For the landslide at K2+280-k3+000, the methods will be: the landslide will be removed, then stable slop will be installed. The water in the soil on the slope will be discharged by the inclined drainage pipe, and the intercepting ditch will be installed on the side slope. The anti-sliding piles will be installed at the outer edge of the roadbed at the turning back. For the landslide at K3+100-165, the methods will be: the damaged retaining wall and loose soil will be removed and the subgrade of this section will be improved. Anti-sliding piles will be set on the edge of the subgrade. The stable slope (1:1.5) will be set above the pile. Drainage ditch will be installed outside the anti-sliding pile for water drainage. Besides, all the damaged roads under the landslides will be excavated and restored.

97. For the collapsed slopes, the methods will be: the collapsed soil will be removed and stable slop will be installed according to the slope height. Inclined PVC-U drainage pipes will be installed on the slope surface for water discharge and inclined retaining wall will be installed at

the first slope and the upper slopes will be installed with an arch frame for slope protection.

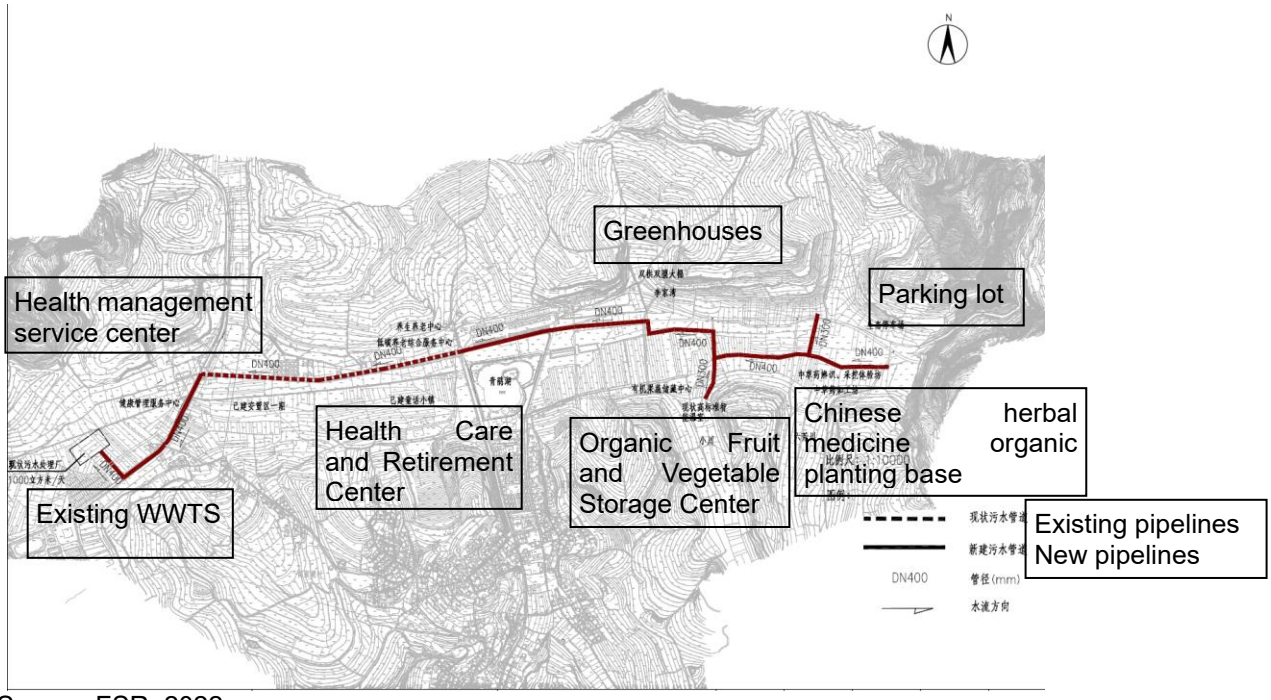
98. The component will install water supply and drainage pipe network system as supporting pipelines. The water supply pipelines will be DN160 high density polyethylene pipelines (4.8km). The wastewater pipelines will be DN300 (1.0 km) and DN400 (3.0 km) double-wall corrugated pipe sewage pipelines.

**Figure III-7:** Layout of the water supply pipelines.




Source: FSR, 2022.

**Figure III-8:** Layout of the wastewater pipelines.




Source: FSR, 2022.

99. The component will installed 1,100 units outdoor lighting will include 360 solar street lights, 300 solar floor lights, 200 energy-saving spotlights, and 150 energy-saving wall lights. Besides, 25 km power lines will be installed for these lights.

100. The component will install heating system with a heating area of 60,000 $m^2$ for the component, including 7,000 m pipeline and 2x 2.8 MW gas fired heating boilers.

101. The component will also purchase waste treatment facilities, including 1 compressed waste trucks (20 m3), 1 medical waste transportation truck, and 120 environmental protection waste bins.

102. The componetn will build one ecological parking Lot, including 96 solar street lights, 112 charging piles and purchase 20 electric sightseeing buses and 2 electric shuttle buses. Sponge city measures will be utilized. Grass- planting bricks will be installed at the parking lots.

103. 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).

104. During operation, the main pollutants will be domestic waste, waste package materials (package for organic fertilizers), agricultural waste (plastic film), and domestic wastewater. Domestic wastewater will be treated by the Pingnan Town WWTS, then recycled as landscape water. Domestic solid waste will be collected by local sanitary department and transported to the existing Tianshui Municipal Landfill for treatment. Waste packaging such as fertilizer and pesticide will be collected and recycled by manufacturers. 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 vegetable will be recycled for organic fertilizer production in nearby organic fertilizer production plant.

**b) Urban and Rural Elderly Caring Demonstration Base**

105. The component will be located at Sunji Village of Pingnan Town. The component will build one urban and rural elderly caring demonstration base, including one health management service center (10,000 $m^2$); one health care and retirement center (12,000 $m^2$); rooftop PV (10,000 $m^2$); outdoor lighting (630 units); one low carbon publicity and education square and ecological parking lot (8,000 $m^2$), including 5,100 $m^2$ ecological parking lot, 2,900 leisure and fitness square, and 20 charging piles.

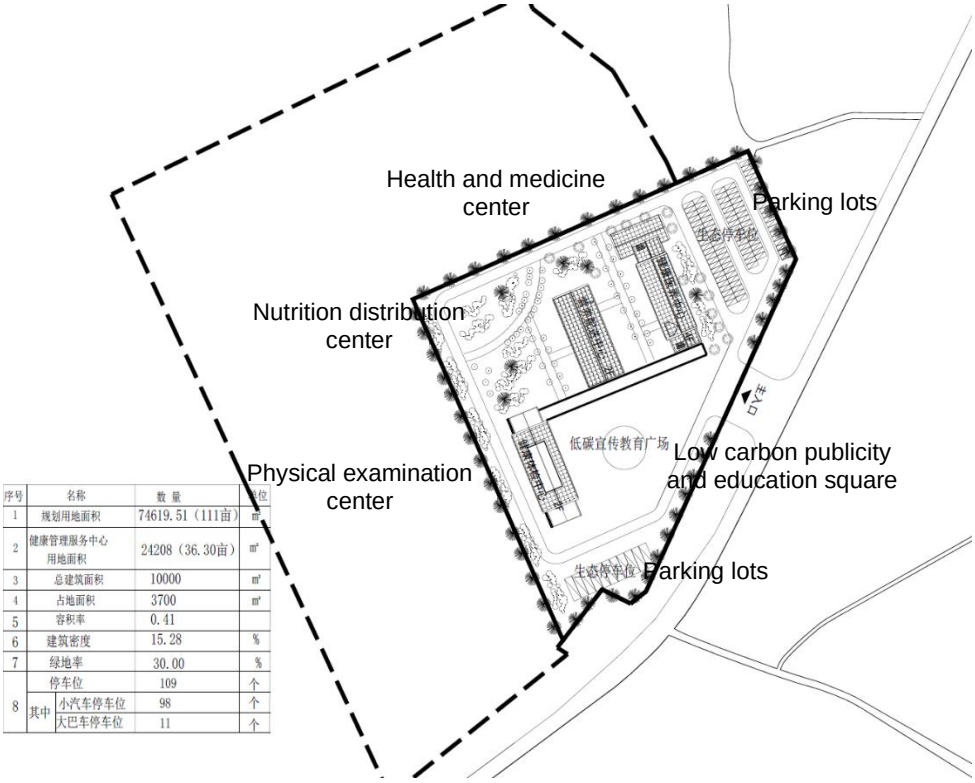
106. The health management service center will have a floor area of 74,619.51 $m^2$ and a building area of 10,000 $m^2$. The center will include one physical examination center, one nutrition distribution center, one health and medicine center, one low carbon publicity and education square and parking lots. All the buildings will be installed with rooftop solar PV (1,000 $m^2$).

107. The physical examination center will be two-floors frame structure building with a floor area of 1,505 $m^2$ and a building area of 3,010 $m^2$. The height of the center will be 9.5m.

108. The nutrition distribution center be two-floors frame structure building with a floor area of 1,290 $m^2$ and a building area of 2,580$m^2$. The height of the center will be 8.6m.

109. The health and medicine center be four-floors frame structure building with a floor area of 1,600 $m^2$ and a building area of 4,558$m^2$. The height of the center will be 13.0m.

**Figure III-9:** Layout of the health management service center

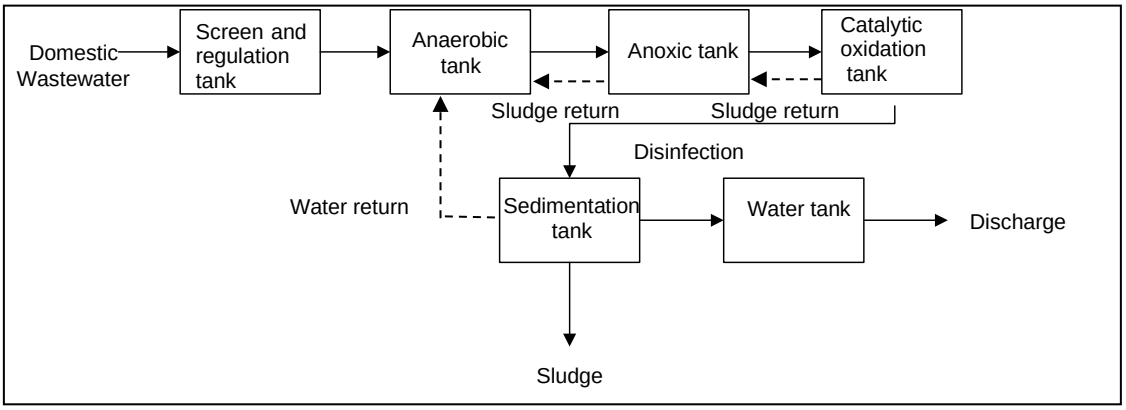



| 序号 | 名称 | | 数量 | 单位 |
|---|---|---|---|---|
| 1 | 规划用地面积 | | 74619.51（111亩） | ㎡ |
| 2 | 健康管理服务中心用地面积 | | 24208（36.30亩） | ㎡ |
| 3 | 总建筑面积 | | 10000 | ㎡ |
| 4 | 占地面积 | | 3700 | ㎡ |
| 5 | 容积率 | | 0.41 | |
| 6 | 建筑密度 | | 15.28 | % |
| 7 | 绿地率 | | 30.00 | % |
| 8 | 停车位 | | 109 | 个 |
| | 其中 | 小汽车停车位 | 98 | 个 |
| | | 大巴车停车位 | 11 | 个 |

Source: FSR, 2022.

110. A WWTS for domestic wastewater and medical wastewater treatment (30 $m^3$/d capacity, including 14.4 $m^3$/d of medical wastewater) will be built for the health management service center and health care and retirement center. The wastewater treatment technology will be anaerobic, anoxic and biological contact oxidation (**Figure III-10**). The effluence of the WWTS will meet PRC's Reuse of Urban Recycling Water-Water Quality Standard for Green Space Irrigation (GB/T 25499-2010) and Discharge Standard of Water Pollutants for Medical Organization (GB 18466-2005). The effluence of the WWTS will be recycled as landscape water. The effluence will be stored in a water tank (10 $m^3$). The water tank will be connected to the irrigation system of the component. During operation, the sludge from the WWTS of the subproject will be concentrated by filter press and disinfected, then transported to Tianshui Municipal Landfill for treatment.

**Figure III-10:** Process diagram of WWTS.




111. The collected domestic wastewater and medical wastewater from the health management service center will be 30 $m^3$/d in total. Estimated pollutant reduction of the

subcomponent will be 2.74 tons of chemical oxygen demand (COD) per year, 1.53 tons of Biochemical Oxygen Demand (BOD) per year, 2.08 tons of suspended solids (SS) per year, 0.27 tons of ammonia nitrogen ($NH_4$-N) per year, 0.49 tons of total nitrogen (TN), 0.03 tons of total phosphorus (TP) and 1.10E+14 fecal coliform.

**Table III-3:** Wastewater pollutants emission reduction of the subcomponent.

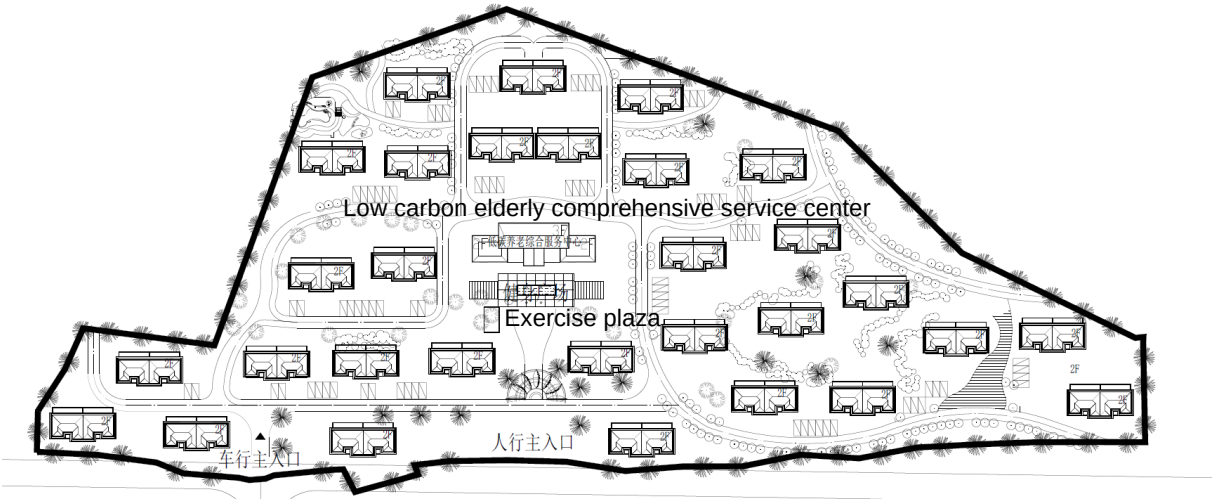
| Item | Influence | | Effluence | | Annual reduction of pollutants (t/a) |
|---|---|---|---|---|---|
| | Concentration (mg/L) | Quantity (t/a) | Concentration (mg/L) | Quantity (t/a) | |
| COD | 300 | 3.29 | 50 | 0.55 | 2.74 |
| BOD5 | 150 | 1.64 | 10 | 0.11 | 1.53 |
| SS | 200 | 2.19 | 10 | 0.11 | 2.08 |
| $NH_4$-N | 30 | 0.33 | 5 | 0.05 | 0.27 |
| TN | 60 | 0.66 | 15 | 0.16 | 0.49 |
| TP | 3 | 0.03 | 0.5 | 0.01 | 0.03 |
| Fecal coliform | $10^7$/L | 1.10E+14 | 200/L | 2.19E+9 | 1.10E+14 |

Source: Domestic EIA, 2022.

112. The health care and retirement center will be three-floors frame structure building with a floor area of 37,129 $m^2$ and a building area of 12,000 $m^2$.

113. The health care and retirement center will have a floor area of 37,129 $m^2$ and a building area of 15,000$m^2$. The center will include one low carbon elderly comprehensive service center (3,000 $m^2$), one exercise plaza and health care and retirement buildings (12,000 $m^2$).

**Figure III-11:** Layout of the health care and retirement center.




Source: FSR, 2022.

114. The one low carbon elderly comprehensive service center will be three-floors frame structure building with a floor area of 1,000 $m^2$ and a building area of 3,000 $m^2$. The height of the center will be 15.0m.

115. The health care and retirement center will be consist of two-floors reinforced concrete buildings. The height of the building will be 7.5m. The total building area will be 12,000 $m^2$.

**Figure III-12:** Concept image of the health care and retirement building.

Source: FSR, 2022.

116. The outdoor lighting (630 units) will include 100 solar street lights, 200 solar floor lights, 150 energy-saving spotlights, and 180 energy-saving wall lights. Besides, 9km power lines will be installed for these lights.

117. The centers and 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 (thermal conductivity 0.62 w/($m^2$.k)); (ii) the windows will be broken bridge aluminum alloy hollow glass windows with steel-plastic composite insulating glass (thermal conductivity 2.1 w/($m^2$.k)); (iii) nano negative oxygen ion coating will be used; and (iv) air source heat pump and roof solar PV and heating system will be utilized. With these measures, the energy saving effect of the building will be more than 72%.

118. 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).

119. During operation, the main pollutants will be domestic waste, medical waste, and domestic wastewater. Domestic wastewater will be treated by the WWTSs of the component. Domestic solid waste will be collected by local sanitary department and transported to the existing Tianshui Municipal Landfill for treatment. 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.

### c) Low-Carbon Wellness Village Smart Management

120. The component will build one low-carbon wellness village smart management, system including data center infrastructure; smart scenic spot integrated management platform; smart agriculture monitoring information platform; command and dispatch center; video surveillance system and analysis system; call for help system; security check system; entrance/exit and parking management system; electronic patrol system; scenic public broadcasting system; information publishing and guidance system; disaster early warning monitoring system; communication network system; computer room; integrated pipeline network system.

121. The main activities of the component will be software development, hardware purchase and installation at computer room. The component will not involve construction activities.

122. The smart scenic spot integrated management platform will include tickets selling and checking management system for scenic spots, ticketing system for theatre performance, scenic spots OTA distribution system, tourist agency distribution system, self-service terminals system, scenic spots OA system, business management system, scenic spots analysis, scheduling and dispatch system, publicity and marketing system, payment system, consumption system, smart tour guide system and emergency management platform.

123. The smart agriculture monitoring information platform will include modern agricultural data center architecture, natural resource data application platform, ecological data and production data application platform, agricultural and rural data application platform, agricultural product circulation data application platform, agricultural disaster early warning and prevention data application platform, agricultural products quality traceability data application platform, information management system, crop production data application platform, Constant temperature cold storage warehouse management data, agricultural product price system, partner assistance data application platform and modern agricultural data application development.

124. The command and dispatch center will include monitoring system, data system, management system, emergency system, GPS system, travel Information push system and meeting system.

125. The video surveillance system and analysis system will include video monitoring equipment installation at scenic spots, tourist management and analysis system, management system and hazardous area warning and alarm system.

126. The call for help system; security check system will include outdoor call for help equipment, data transmission system and management platform (software).

127. The security check system will be installed at the entrances of scenic spots and will include security check equipment purchase including security door, and security check equipment.

128. The parking management system will be used for parking lots management of the scenic spots including entrances and exits. The system will include vehicle identification system and billing and charging system.

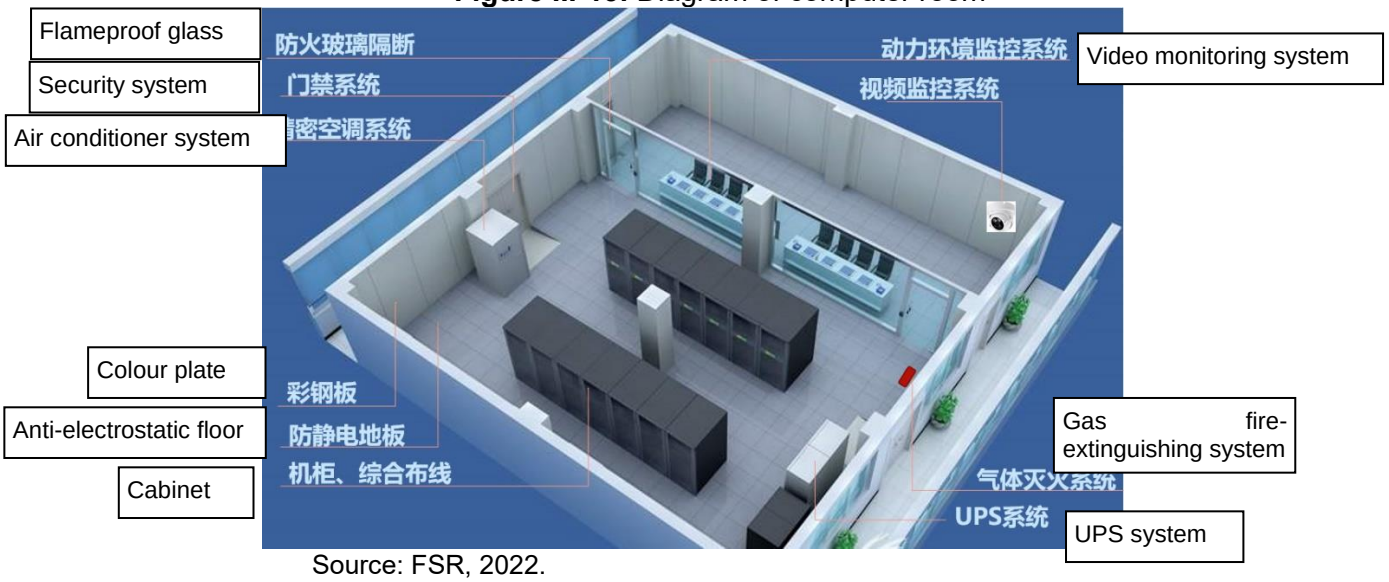
129. The electronic patrol system will be used by the security patrol staff and will include staff location recording and management, patrol line management system, record system, and data upload system, warning system and data analysis system.

130. The scenic public broadcasting system and information publishing and guidance system will be established for the scenic spots.

131. The disaster early warning monitoring system will include water level monitoring system, scenic spots fire monitoring system, forest fire monitoring system and alarm system.

132. The computer room will be built with the supporting communication network system. The computer room is presented in **Figure III-13**.

**Figure III-13:** Diagram of computer room




Source: FSR, 2022.

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

## D. Associated and Existing Facilities

134. 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.

135. The subproject involves one existing facilities, the Tianshui Municipal Landfill (which will receive the domestic waste from the subproject during construction and operation) and Pingnan Town WWTS (which will receive the domestic wastewater during operation).

136. **Tianshui Municipal Landfill.** It has a total area of 21.46 ha, a landfill capacity of 0.245 million tons, a design daily capacity of 400 ton/d, and a projected service life of 20 years (2012-2032). 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. In 2021, the actual capacity of the Tianshui Municipal Landfill was about 310 t/d and the domestic waste from the subproject will be 0.4 t/d, which has a limited impact on the landfill.

137. **Pingnan Town WWTS.** The DEIA was prepared for the WWTS and approved by local EEB in 2020. Operational capacity and current operation of the Pingnan Town WWTS is presented in **Table III-4**, which has sufficient capacity to receive the incoming wastewater from the subproject. No due diligence issues were documented.

**Table III-4:** Information of Pingnan Town WWTS.

| Name | Treatment process | Effluent standard | Design capacity($m^3$/d) | Actual operational capacity ($m^3$/d) | Wastewater volume from subproject ($m^3$/d) | Status | EIA approval date | Service scope |
|---|---|---|---|---|---|---|---|---|
| Pingnan Town WWTS | CASS | Class I-A | 1,000 | 650 | 100 | Operational from 2022 | November 2020 | Pingnan Town urban area |

CASS= cyclic activated sludge technology; WWTS = wastewater treatment station.
Source: TrTA consultant.

138. **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 irrigation water is stored at the water storage lake (33,000 $m^3$) and the irrigation water storage lake is also a landscape lake. In recent years, Tianshui City has developed high-efficiency water-saving modern agriculture and the total water consumption of Tianshui City was reduced to 0.37 billion $m^3$ in 2021 from 0.41 billion $m^3$ in 2019. Besides, the subproject will result in water savings by irrigation system transformation for the existing farmlands, thus water supply of the subproject can be guaranteed.

139. **Gas supply.** The subproject will source natural gas from Suiji Village gas regulation station. The gas regulation station was operated from May, 2022 and was responsible for gas supply in Sunji Village. The capacity of the gas regulation station is about 30,000 $m^3$/h. The gas consumption of the subproject will be 608 $m^3$/h in heating season. The gas consumption of the subproject can be guaranteed.

### E. Implementation Arrangements

140. 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 Qinzhou District subproject will be Qinzhou District Government and the IAs for other subprojects will be Yongchang County Government for project components in Yongchang County, Ganzhou District Government for project components in Ganzhou District, Qinzhou District Government for project components in Qinzhou District, 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.

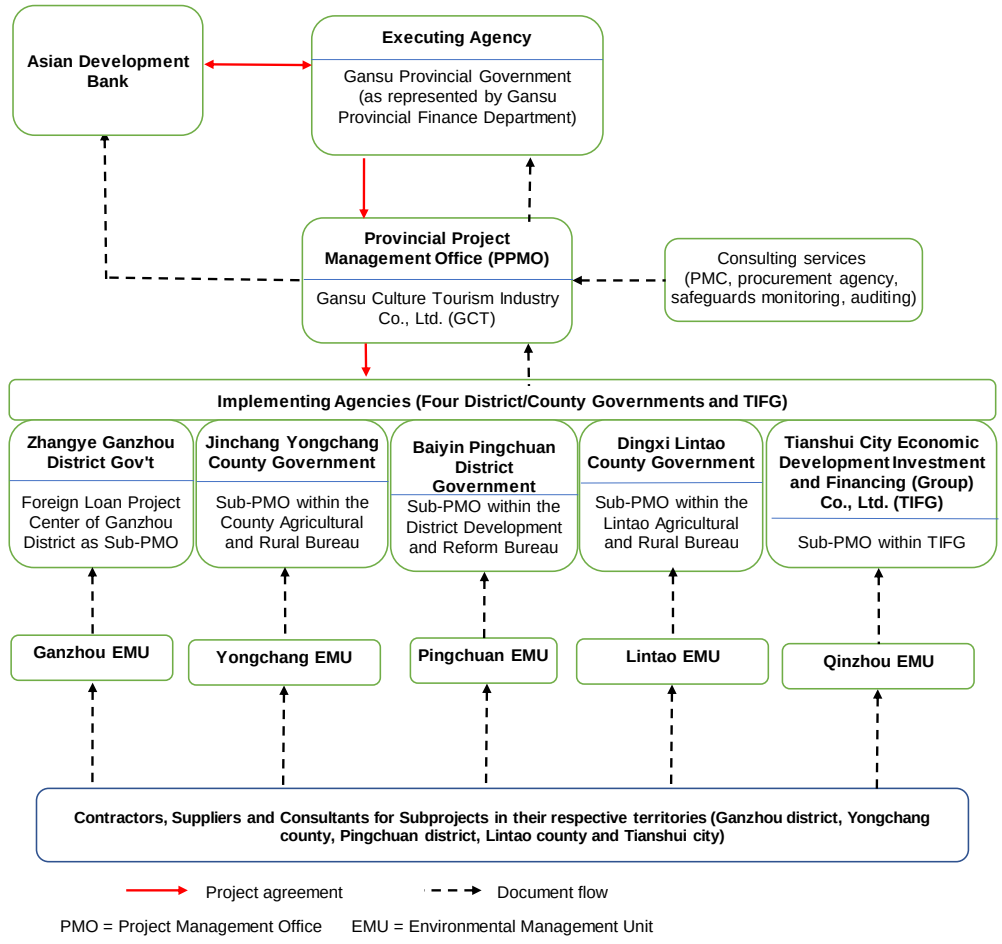
141. The PPMO will be suitably staffed, including a qualified Environment, Health and Safety Officer (PPMO EHSO), who will take overall responsibility for supervising the implementation of environment mitigation measures, coordinating the project level GRM and preparing monitoring reports for submission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

142. 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).

143. 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 CEMPs prior to construction and operation.

**Figure III-14:** Project organization chart.




Source: TrTA consultant.

144. 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.

145. 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.

146. 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.

147. 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.

148. 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.

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

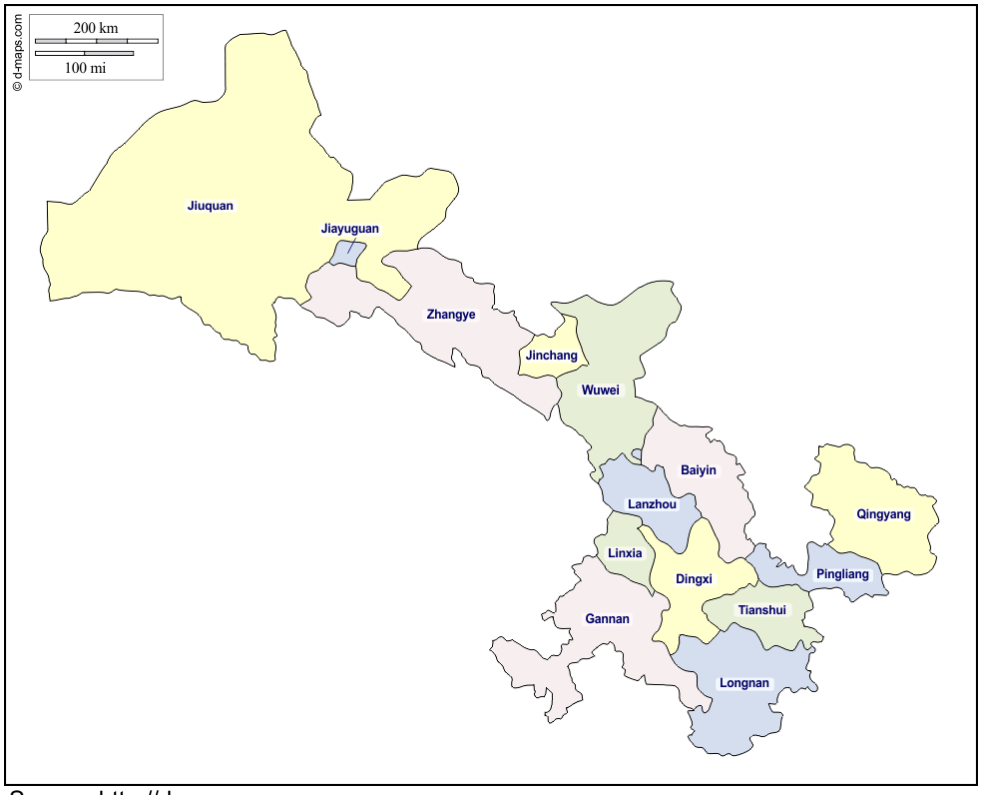
# IV. DESCRIPTION OF THE ENVIRONMENT

## A. Location and Setting

150. The subproject will be implemented in Pingnan Town, Qinzhou District, Tianshui City in Gansu Province the People's Republic of China (PRC).

151. **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

152. **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.

153. 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.

154. **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.

155. **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 m3 and the groundwater at a level of 0.730 billion m3 in 2014, reaching a total amount of 28.944 billion m3 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 $m^3$) | | | Groundwater (million $m^3$) | Total Water Resources (MCM) | Percentage of Total | Water Yield Coefficient (10,000 $m^3/km^2$) |
|---|---|---|---|---|---|---|---|
| | 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.

156. **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). [21]

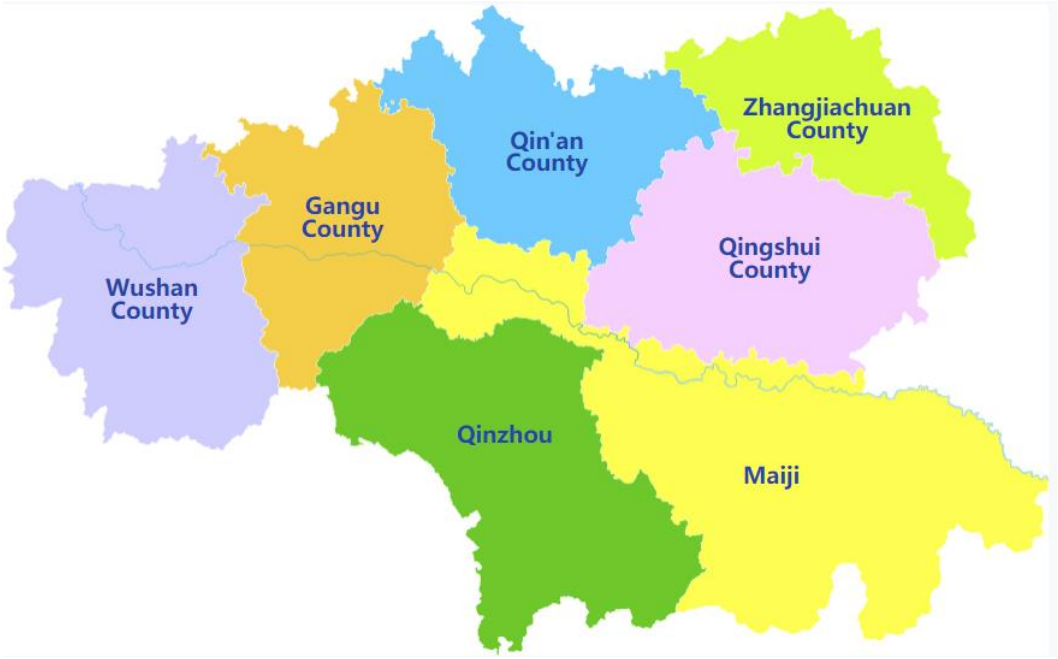
157. The loess soils of eastern Gansu are deeply eroded with steep hillsides and gullies, from which soil is lost during rainstorms, increasing siltation of dams and reservoirs, and increasing maintenance costs of drainage and rural roads. Reforestation efforts have been ongoing in Gansu – especially 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 sites in Tianshui county. Sea-buckthorn is added to the mix where grazing pressure is high.

21 Data sources: 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

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

159. Tianshui is the second-largest city in Gansu Province, China. The city is located in the southeast of the province, along the upper reaches of the Wei River and at the boundary of the Loess Plateau and the Qinling Mountains.

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



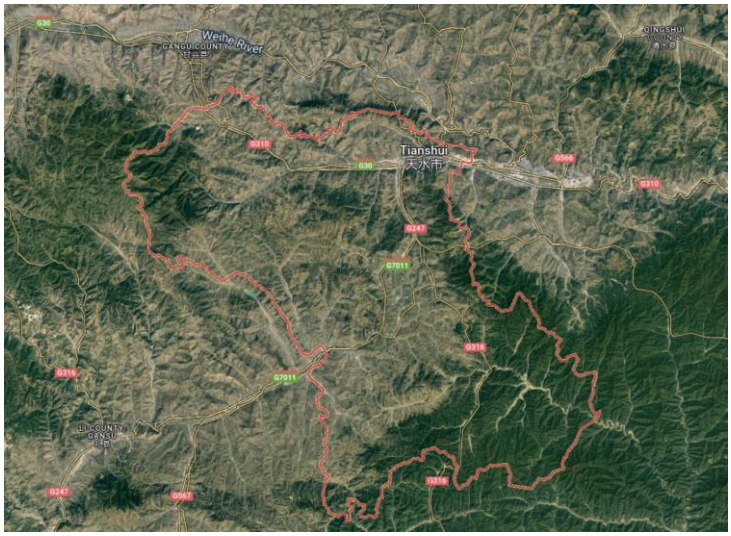

Source: Wikipedia, 2022

## B. Physical Resources

160. **Topography**. Tianshui is located in the valley of the Jie River, a major tributary of the Wei River, and on the boundary between the Loess Plateau and Qinling Mountains. The terrain is high in the northwest and low in the southeast, with an altitude between 1000 and 2100 m. The highest point in Tianshui is Tianyeliang Moutain with an elevate of 3,120m high and the lowest point is Niubei Village with an elevate of 760m. There are obvious differences in geomorphological regions of Tianshui. The eastern and southern of Tianshui are uplifted by ancient strata folds, forming mountainous landforms. Due to geological subsidence and the deposition of red and loess layers in the northern of Tianshui, the loess layer is deposited and the loess hilly landform is formed in the northern of Tianshui. A small part of the central part was fractured by the zonal tectonic belt, forming the Weihe graben, and the Weihe valley landform was formed through the development and erosion of the Quaternary rivers. The northern part of the central part is the Loess hilly and gully region. The Wei River and its tributaries traverse it, forming basins and valley terraces with wide valleys and canyons. The soil in the river and valley area is silt soil and meadow soil formed by impact and alluvial deposits. The central and eastern part are Qinling Mountains and Guanshan Mountains. The west of Tianshui is the West Qinling Mountains with Jinhuang Mountain, Yunwu Mountain and Jingdongliang as the main body. The east is Bagua Mountain, Huoyan Mountain etc.

161. **Soil**. The soil types in Tianshui City are mainly loess soil, lateritic soil and green clay. Loess soil is mainly distributed in Loess gully region. Loess soil is suitable for the growth of various crops, and is the main farming soil in Tianshui. There is a small amount of laterite in some places on both sides of the valley. Green clay is mainly distributed in landslide areas with serious soil erosion and on both sides of gully. In the subproject area, the main soil type is loess soil.

**Figure IV-3:** Topography in Qinzhou District, Tianshui City.




Source: Google Maps, 2022.

162. **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).

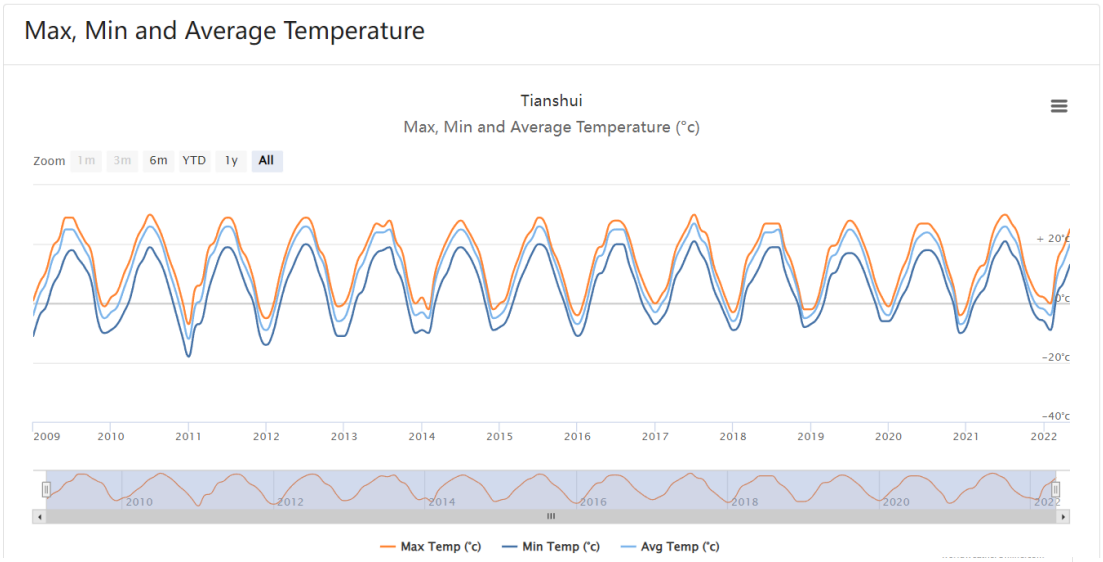
163. **Climate**. Tianshui has a monsoon-influenced, cool semi-arid (Köppen BSk)/humid continental (Dwa) climate with four distinct seasons of comparatively equal length. Winters are cold but dry, with January 24-hour average temperature of −1.5 °C, while summers are warm and somewhat humid, with July 24-hour average temperature of 23.2 °C. Much of the annual rainfall occurs from June to September, and the annual mean temperature is 11.44 °C. With monthly percent possible sunshine ranging from 34% in September to 50% in December, the city receives 1,911 hours of bright sunshine annually.

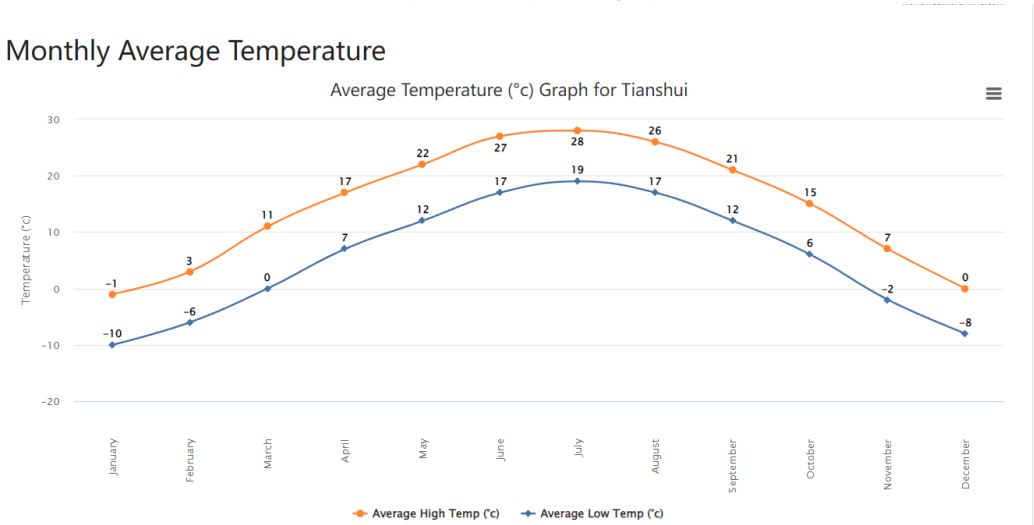
**Table IV-2:** Climate data for Tianshui

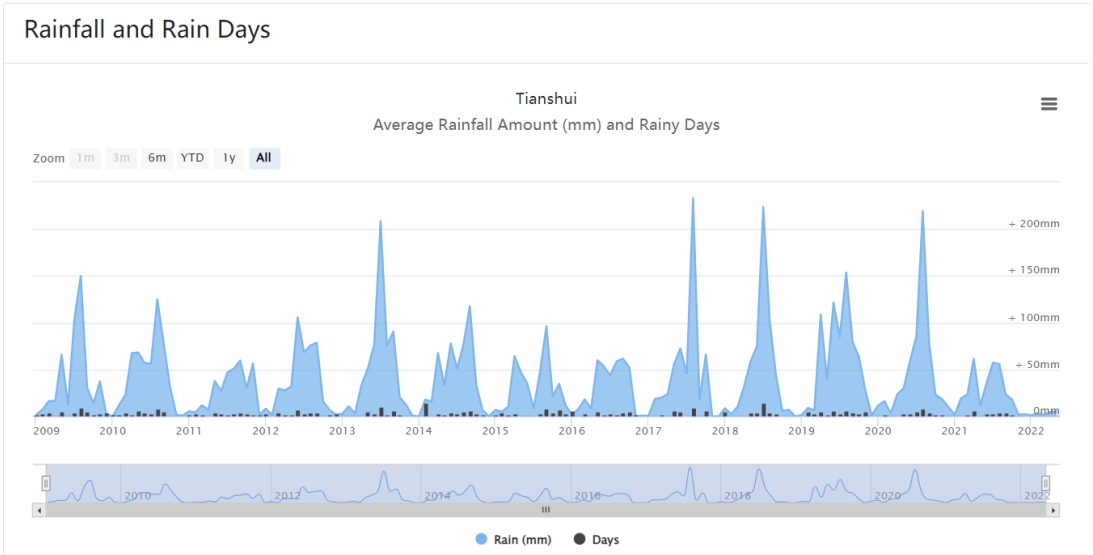
| Month | Jan | Feb | Mar | Apr | May | Jun | Jul |
|---|---|---|---|---|---|---|---|
| Average high | 3.9 | 7.5 | 13 | 19.7 | 24.3 | 27.5 | 29.3 |
| Daily mean | −1.5 | 1.9 | 6.9 | 13 | 17.5 | 21.1 | 23.2 |
| Average low | −5.4 | −2.2 | 2.2 | 7.4 | 11.8 | 15.6 | 18.2 |
| Average precipitation (mm) | 4.9 | 6.8 | 17.8 | 34.9 | 53.1 | 71.4 | 87.2 |
| **Month** | **Aug** | **Sep** | **Oct** | **Nov** | **Dec** | **Year** | |
| Average high | 27.9 | 22.6 | 16.8 | 10.9 | 5.2 | 17.4 | |
| Daily mean | 22 | 17.2 | 11.3 | 5.1 | −0.4 | 11.4 | |
| Average low | 17.4 | 13.3 | 7.5 | 1 | −4.3 | 6.9 | |
| Average precipitation (mm) | 86.9 | 76.9 | 46.5 | 10.7 | 3.7 | 500.8 | |

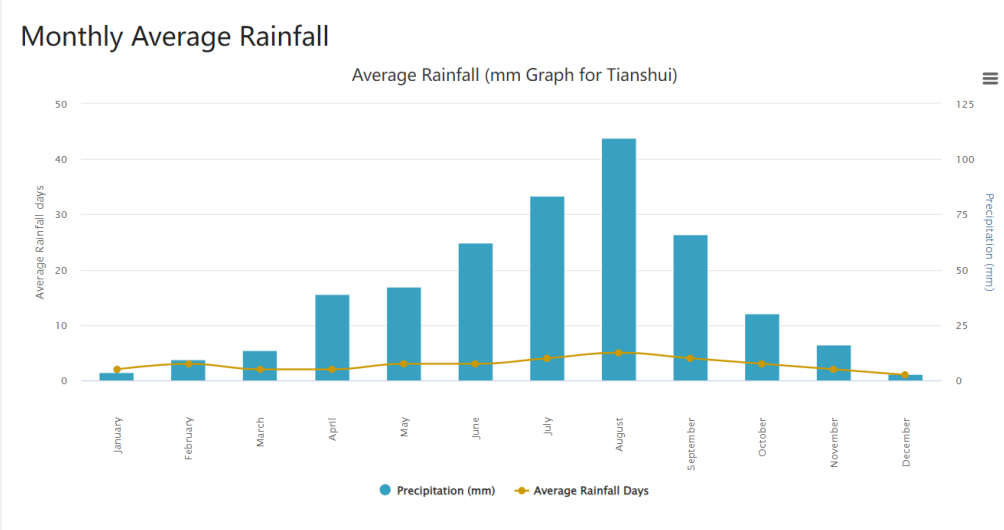
Source: DEIA, 2022.

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



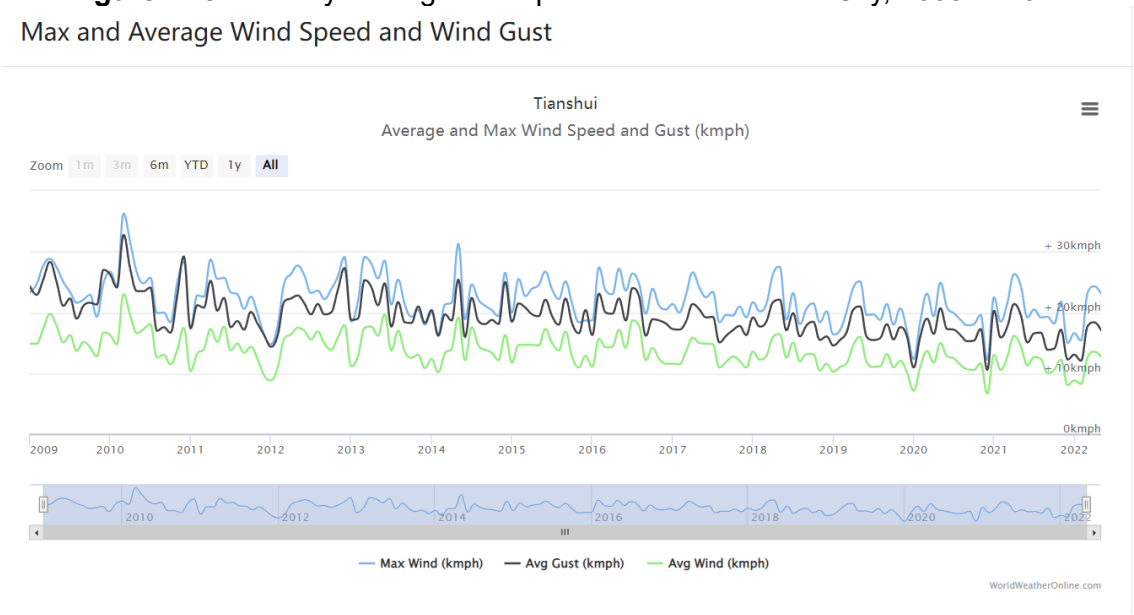






Source: https://www.worldweatheronline.com/Tianshui-weather-averages/gansu/cn.aspx

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




Source: https://www.worldweatheronline.com/ Tianshui -weather-averages/gansu/cn.aspx

164. **Hydrology.** Tianshui is located at the Yangtze River and Yellow River basins which are divided by the West Qinling Watershed. The northern part belongs to the Weihe River basin of the Yellow River system, and the southern part is the Jialing River basin of the Yangtze River system. The surface water runoff in Tianshui City is decreasing year by year, and the groundwater level is decreasing year by year. The groundwater per capita is only 362 $m^3$. The main river in the urban area is the Wei River and its tributaries.

165. According to the data of the hydrological station, the annual average runoff of Wei River is 1.271 billion m3, the maximum is 3.034 billion m3, and the minimum is 526 million m3. The seasonal changes of water flow are very obvious. The water flow increases in the wet season and the maximum flow is 4920m3/s. The flow decreases suddenly in the dry season and the minimum is flow only 0.34m3/s. The average sand content in Wei River is 73kg/m3.

166. Ji River is the first-class tributary of the right bank of the Weihe River. It originates in Gangu County and enters the Weihe River at Xiakou Village, Huaniu Town, Maiji District. The

elevation of Ji River basin is 1100~2700m. The width of the Ji River is 500-1700m, and the average gradient of the river is 7.91‰. The Ji River basin belongs to the loess rocky mountain forest area, and the underlying surface of the river basin is mainly loess, shrubs, and artificial forests. The vegetation in Ji River basin is good.

167. The groundwater of Tianshui is mainly replenished by the precipitation, surface water and underground lateral runoff. The distribution of groundwater is uneven in Tianshui and the buried depth of the groundwater level is uncertain, and there is no uniform groundwater level line.

## C. Ecological Values

168. **Flora and Fauna**. Tianshui City is located at the intersection of North China, Central China, Mengxin and Himalayan plants. The vegetation is also known as the transition zone from warm temperate deciduous broad-leaved forest, mixed coniferous and broad-leaved forest to grassland. It has a significant difference in unstable secondary vegetation types. Characteristics, vegetation types are more complex. Forest resources are abundant in Tianshui. The total forest area of Tianshui City is 5.8991 million mu, and the forest coverage rate is 26.5%. The natural forest land is mainly distributed in the eastern and southeastern forest areas. There are 804 species of woody plants in 87 families and 224 genera, including 312 species of trees, 437 species of shrubs, 55 species of vines and 122 species of evergreen plants including the Class I national protected plants such as Metasequoia; Class II national protected plants such as Lianxiangshu, Xingyecao, Eucommia, Ginkgo biloba, Great White Sequoia, Daguoqingzhu, Qiang pine, Xiaobaishu, and Shuiqingshu; Class III national protected plants such as Qinling fir, Miaotai maple, Suihua fir, Huazhen, collar tree, walnut catalpa, deer pine, green sandalwood, etc. There are more than 660 kinds of wild medicinal plants, in which 220 plants are commonly used medicinal plants.

169. Tianshui City is rich in forest resources. Many rare birds and beasts can be found in the vast natural forest, and more than 30 kinds of wild animals can be found, including Class I national protected animals such as takin, sika deer, golden cat, clouded leopard, etc., Class II national protected animals such as Horse musk deer, white-hipped deer, goral, stone marten, otter, lynx, macaque, red-bellied pheasant, blue horse chicken, red-bellied golden pheasant, giant salamander, dark-bellied snow chicken, light-bellied snow chicken, spoon bird, blood pheasant , black bear, Qinling sockeye salmon, etc.

170. Due to the agricultural activities in the past, there are few species of wild animals in the area, which are mostly consists of small fauna, and most of them are common species such as hare, mice, etc.

171. 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.

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

**Table IV-3:** Land use conditions

| Component No. | Land use |
|---|---|
| 1 | Construction land, farm land, collective land and forest land |
| 2 | Construction land |
| 3 | Not applicable |

Source: Consultants

## D. Social and Economic Conditions

173. **Area and Population.** Gansu has an area of 453,700 km$^2$ and a population of 25,019,831 (2020). Tianshui City has an area of 21,209 km$^2$ and a population of 1,512,200 (2020), of which approximately 867,100 live in urban areas giving an urbanization rate of 57.69%; of which 51.05% are male and 48.95% are female.

**Table IV-4:** Population, Area and Density by District of Tianshui City.

| Name | Population (2020) | Area (km$^2$) | Density (p/km$^2$) |
|---|---|---|---|
| Qinzhou District | 643,906 | 2,442 | 263.7 |
| Maiji District | 553,268 | 3,452 | 160.3 |
| Qingshui County | 266,908 | 2,003 | 133.3 |
| Qin'an County | 515,423 | 1,601 | 321.9 |
| Gangu County | 559,713 | 1,572 | 356.1 |
| Wushan County | 437,265 | 2,011 | 217.4 |
| Zhangjiachuan Hui Autonomous County | 286,063 | 1,311 | 263.7 |
| Total | 3,262,546 | 14,392 | 226.7 |

Source: Consultants

174. **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.

175. Tianshui City's GDP was CNY 75.033 billion in 2021, a year-on-year increase of 7.3%. Of this, the output value ratio of primary, secondary, tertiary industries was 18.8/26.1/55.1. Tianshui City's per capita GDP was CNY 25,279 in 2021, lower than the provincial average and national average (**Table IV-5**).

**Table IV-5:** 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 |
| Tianshui City | 75.033 | 25,279 |

Source: China's National Bureau of Statistics, 2022.

176. Per capita disposable income of Tianshui City urban persons in 2021 was lower than the national average and national average, while per capita disposable income of Tianshui City rural persons was lower than the provincial average and national average. As with the rest of China urban incomes were considerably higher than rural ones (**Table IV-6**).

**Table IV-6:** 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 |
| Tianshui City | 32,251 | 10,034 |

Source: China's National Bureau of Statistics, 2022.

## E. Environmental Baseline Quality

177. 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

178. The is no surface water body near the subproject and the nearest surface water body near the subprojec is Xihanshui River which is about 15 km away from the subproject site. Therefore, surface water sampling was not conducted by the DEIA Institute.

### b) Groundwater Quality

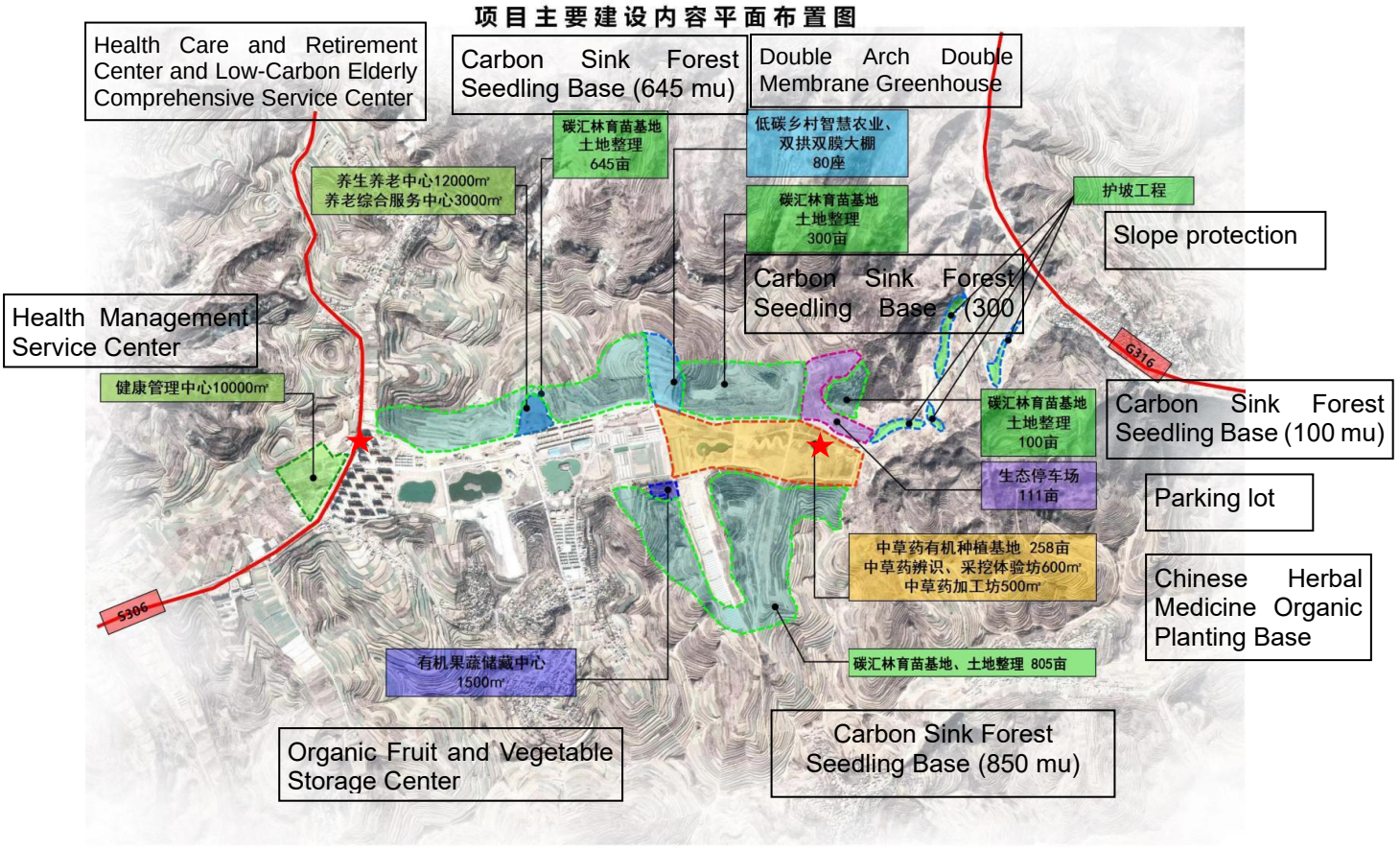
179. Groundwater sampling and analysis was carried out by the DEIA Institute in March 2022. The results are presented below. The quality of the groundwater complies with the Grade III of the PRC Groundwater Quality Standard GB/T14848-2017 (there are no World Bank EHS guidelines).

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

| Item | Concentration range | Limit | Standard compliance |
|---|---|---|---|
| pH | 7.51-7.88 | 6.5-8.5 | Yes |
| Ammonia nitrogen | 0.16-0.29 | ≤0.5 | Yes |
| DO | 3.5-4.3 | ≥3.0 | Yes |
| Sulfate | 0.005L | ≤250 | Yes |
| Chloride | 0.003L | ≤250 | Yes |
| Nitrate | 7.8-13.4 | ≤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).

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




Source: DEIA (2022).

### c) Air Quality

180. According to the “Environmental Quality Report of Tianshui City in 2020, the pollutants $PM_{10}$, $PM_{2.5}$, $SO_2$, $NO_2$, CO and $O_3$ of Tianshui City 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 Tianshui City. 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-8**, 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-8:** Tianshui City urban area ambient air quality, 2020(mg/m$^3$).

| Item | Monitoring results (annual average) | | | | | |
|---|---|---|---|---|---|---|
| | $SO_2$ | $NO_2$ | $PM_{10}$ | CO | $O_3$ | $PM_{2.5}$ |
| Tianshui City (2020) | 10 | 29 | 51 | 1.2 | 122 | 27 |
| 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 Sunji villages. The results in **Table IV-9** show that noise baseline at all points met the PRC Class II standards in PRC Environmental Quality Standards for Noise (GB3096-2008).

**Table IV-9**: Noise monitoring data. Unit dB(A).

| No. | Location | Monitoring time | Monitoring result | PRC Limit | Standard compliance |
|---|---|---|---|---|---|
| 1 | Sunji Village | Daytime | 41.6-45.2 | 60 | Yes |
| | | Nighttime | 38.7-41.3 | 50 | Yes |
| 2 | Qingjuan Mountain Resort | Daytime | 38.5-42.3 | 55 | Yes |
| | | Nighttime | 36.2-39.5 | 45 | Yes |

Source: DEIA, 2022.

### e) COVID-19 Outbreak

181. From January 23, 2020, to June 1, 2022, there were 55 confirmed Covid-19 cases in Tianshui City, of which 55 cases were recovered.[22] As of June 1, 2022, no new cases have been found since March 26, 2022, and the 55 confirmed case was recovered before April 19, 2022. Nonetheless, Tianshui City is required to follow the PRC and Gansu Province requirements to strictly control and monitor public movements within, and in and out of, Tianshui City. Body temperature scanners were installed at bus stations, and persons who enter Tianshui 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 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 Tianshui City or is allowed to enter Tianshui City.

182. Tianshui City 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.

183. 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.

22 https://news.sina.cn/project/fy2020/yq_province.shtml?wm=3049_0016&city=CN62050000000000

# V. POTENTIAL ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

## A. Subproject Area of Influence and Sensitive Receptors

184. 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.

185. 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**.

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

| Sensitive Receptor | Distance (m) |
|---|---|
| Sunji Village | Components are located within the area |
| Qingjuan Mountain Resort | The Qingjuan Mountain Resort is about 40 m from the health care and retirement center |

Source: DEIA, 2022.

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

186. 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 247 mu (164,667 $m^2$) of land. There will be no physical house relocation. In addition, temporary land occupation will occur during construction period, and the subproject will use 2,170 mu of trough 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; (b) the Sub-PMO will each assign one full-time, qualified environment and social officer and each EMU will include one qualified environment officer; 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 Tianshui City.

(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 conditions will have to be updated due to significant project delays to accurately reflects actual conditions prior to project commencement.

## C. Construction Phase Impacts and Mitigation Measures

187. 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 or rare or threatened flora or fauna species.

188. 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

189. **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.

190. **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 ($m^3$) | Volume of soil to be reused ($m^3$) | Surplus volume (spoil, $m^3$) |
|---|---|---|---|
| Component 1 | 536,306 | 508,047 | 28,259 |
| Component 2 | 18,177 | 15,148 | 3,029 |
| Component 3 | 0 | 0 | 0 |
| Total | 554,483 | 523,195 | 31,288 |

Source: DEIA, 2022.

191. **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) For the slope protection works, plan and implement construction in staged sections (≤500 m), with one section completed and stabilized before beginning the next. Construct intercepting channels to prevent runoff from entering nearby waterways. Provide temporary detention ponds or containment to control silt runoff. Limit construction and material handling, during rainy and high wind days.
(iv) 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).
(v) 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.
(vi) Construction and material handling, in particular for the excavation works, will be limited during rain (rainy season is May to September) and high winds.
(vii) During earthworks, the area of soil exposed to potential erosion at any time will be minimized through good project and construction management practices.
(viii) Spoil and aggregate (which will be purchased from the local suppliers) piles will be covered with landscape material and/or regularly watered.
(ix) Waste construction material such as residual concrete, asphalt, etc., will be properly handled for reuse or disposal.

(x) Earthwork areas will be stabilized within 15 days after earthworks have ceased at the sites.
(xi) Construction camps and storage areas will be situated to minimize land area required.
(xii) Construction wastes will be removed from the site to approved disposal sites.

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

193. **Measures for disposal of surplus spoil.** In the event that surplus spoil cannot be re-used and must be disposed of (currently estimated at 31,288 $m^3$), preference will be to use existing and Tianshui 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. The new borrow sites should be rehabilitated/revegetated after the works have been undertaken.

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

### b) Soil and Water Contamination

195. 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.

196. **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.

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

### c) Noise

198. 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.

199. **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.

200. Construction equipment generates noise as a point source. An analysis was undertaking 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.

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

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

202. **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 |
| **Grade II of GB12523 − 2011** | 70 (daytime) | | | | | | | | |
| | 55 (nighttime) | | | | | | | | |
| **World Bank EHS Guideline** | 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, TA Consultant.

203. 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.

204. **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.

205. 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.

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

### d) Vibration

207. 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))

| Equipment | At 5 m | At 10 m | At 20 m | At 30 m |
|---|---|---|---|---|
| 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.

208. 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.

209. To reduce this risk: (i) high noise activities, such as compaction operations, will be prohibited at night (between 20:00 and 06:00); (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**).

### e) Solid Waste

210. 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 150 (DEIA, 2022). Domestic refuse generated by construction workers is estimated to be 0.5 kg per worker per day, or 75 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 60 tons over about 5 years of construction.

211. 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 Tianshui Municipal Landfill.

212. 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 waste 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 Tianshui 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.

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

### f) Ecology

214. **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.

215. **Impacts on fauna.** Risks to fauna during construction include: (i) pollution of aquatic habitats in Tao 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).

216. **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.

217. **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.

218. 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.

219. 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.

220. **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.

221. 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 registered in 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

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

### g) Community Health and Safety

223. Construction may cause unexpected interruptions in public services and utilities because of damage to pipelines for water supply and drainage, potential safety risks from the slope protection 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**).

224. 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.

vi) **Slope protection works for landslides and collapsed slopes.** Site-specific EMP for landslide-based works including an emergency preparedness and response plan will be prepared following GIP guidance such as *INGAA Guidelines for Management of Landslide Hazards for Pipelines (2020)* [23] and the USGS Landslide Preparedness [24] to reduce potential health and safety risks from landslide-based woks. The nearby residents will be informed of the potential risks, site-specific EMP and the emergency preparedness and response plan.

### h) Occupational Health and Safety

225. 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.

226. 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.

227. 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[25].

(ii) Provide an adequate number of on-site latrines at construction sites and work camps and

[23] Available at: https://www.ingaa.org/Foundation/FDNreports/38063.aspx

[24] Available at: https://www.usgs.gov/programs/landslide-hazards/landslide-preparedness.

[25] Available at: www.ifc.org/wps/wcm/connect/topics_ext_content/ifc_external_corporate_site/sustainability-at-ifc/publications/publications_gpn_workersaccommodation.

ensure that they are cleaned and maintained in a hygienic state.

(iii) Waste 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.

(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.

(xi) **Slope protection works for landslides and collapsed slopes.** Site-specific EMP for landslide-based woks including an emergency preparedness and response plan will be prepared following GIP guidance such as *INGAA Guidelines for Management of Landslide Hazards for Pipelines (2020)* and the USGS Landslide Preparedness to reduce potential health and safety risks from landslide-based woks.

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

#### i) Physical Cultural Resources

229. 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 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.

230. 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.

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

## D. Operation Phase Impacts and Mitigation Measures

232. Potential negative operation phase impacts include air pollution, 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.

233. 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) Sustainable use of water resources and Wastewater

234. The subproject will source domestic water and production water from municipal water supply system and the irrigation water from the existing irrigation water system. In recent years, Tianshui City has developed high-efficiency water-saving modern agriculture and the total water consumption of Tianshui City was reduced to 0.37 billion $m^3$ in 2021 from 0.41 billion $m^3$ in 2019. Besides, the subproject will result in water savings by irrigation system transformation for the existing farmlands, thus water supply of the subproject can be guaranteed.

235. Besides, domestic wastewater and medical wastewater from the component 2 will be treated by the WWTS of the subproject, then recycled as landscape water. Domestic water from the component 1 will be treated by Sunjin Village WWTS, then recycled as landscape water.

**Table V-6:** Water balance of the subproject. Unit: $m^3/a$

| Item | Fresh water consumption | Water loss | Wastewater |
|---|---|---|---|
| Domestic water | 29200 | 5840 | 23360 |
| Water for tourists | 43800 | 8760 | 35040 |
| Water for health management service center | 6570 | 1314 | 5256 |
| Boiler make up water | 1716 | 0 | 1716 |
| Greenhouse irrigation water | 32000 | 32000 | 0 |

| | | | |
|---|---|---|---|
| Chinese Herbal Medicine Organic Planting Base | 38850 | 38850 | 0 |
| Carbon Sink Forest Seedling Base | 51600 | 51600 | 0 |
| Landscape water | 35915 | 35915 | 0 |
| Total | 239651 | 174279 | 65372 |

Source: Domestic EIA, 2022.

236. The subproject will result in conservation of water resources, through the avoided future use of about 0.21 million $m^3$ 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-7:** Water savings of the subproject. Unit: m3/a

| Item | Baseline water consumption | Project Water consumption | Water savings |
|---|---|---|---|
| Carbon Sink Forest Seedling Base | 154,800 | 51,600 | 103,200 |
| Chinese Herbal Medicine Organic Planting Bas | 116,550 | 38,850 | 77,700 |
| Double Arch Double Membrane Greenhouse | 64,000 | 32,000 | 32,000 |
| Total | 335,350 | 122,450 | 212,900 |

Source: Domestic EIA and FSR, 2022.

237. During operation domestic wastewater, boiler blow down and medical 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 by Pingnan Town WWTS (component 1) and the WWTS of the component (component 2).
(ii) Medical wastewater and boiler blow down from the component 2 will be treated by the WWTS of the component.
(iii) Storm water and sewage will be drained separately.

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

### b) Air Pollution

239. During operation, exhaust gas will be generated from the two gas boilers during heating season. The main pollutants of concern in natural gas-fired boilers emissions are SO2 and NOx.

**Table V-8:** Exhaust Gas Emission Parameters of gas fired boilers

| No. | Capacity | Stack height (m) | Inner diameter (m) | Natural gas consumption ($m^3$/a) | Exhaust air flow ($m^3$/a) | Emission rate (kg/h) | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | $SO_2$ | $NO_x$ | PM |
| 1 | 2.8MW | 8 | 0.8 | 734,460 | 10,016,700 | 0.100 | 0.285 | 0.067 |
| 2 | 2.8MW | 8 | 0.8 | 734,460 | 10,016,700 | 0.100 | 0.216 | 0.067 |

240. Based on **Table V-8** , the estimated annual SO2, NOx and PM emission from the two boilers will be 0.242 tons, 0.687 tons and 0.162 tons separately. The following mitigation measures will be implemented.

(i) The two boilers will be equipped with low NOx burner.
(ii) Regular exhaust gas monitoring will be conducted.

### c) Noise

241. Noise sources during operation will be mainly from the activities and waste transportation. 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).

242. 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).

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

### d) Solid Waste

244. 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 prevision of waste and recycling bins throughout the subproject sites; domestic waste will be collected, transported and disposed at the Tianshui Municipal Landfill by the local sanitary department.

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

246. For agricultural waste from the component 1, these waste will be recycled for organic fertilizer production in nearby organic fertilizer production plant.

247. 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.

248. For waste packaging such as chemical fertilizer and pesticide, 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.

249. For medical waste from the component 2, mitigation measures are:

(i) Medical wastes from component 2will 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.

250. 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 Tianshui Municipal Landfill by the local sanitary department
(iii) Waste battery and waste PV panels will be recycled by manufactures
(iv) Waste resin from the boiler room will be collected, transported and recycled by the manufacturers.
(v) Publicity and education on domestic waste classification and collection will be provided to the tourists.
(vi) During operation, sludge from the WWTS of the subproject will be concentrated by filter press and disinfected, then collected, stored and transported by 3rd party company for final treatment at Tianshui Municipal Landfill.

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

### e) Use of Agricultural Chemicals

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

253. **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.

254. 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 875.2 ton per year.

255. **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 2.2 ton and 0.7 ton separately.

256. 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 [26] will be prohibited.

### f) Chemicals and Hazardous Materials

257. 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 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.
(xi) The coolants with a lower climate impact shall be used and the coolants shall not contain ozone-depleting substances.

### g) Occupational and Community Health and Safety

258. Project operation poses potential safety risks to workers and communities including potential fire hazard and noise pollution. To mitigate potential health and safety risks to workers

26 The Chinese Recommended Classification of Pesticides by Hazard and guidelines to classification is available at: www.who.int/publications/i/item/9789240005662. The PRC’ list is available at: www.moa.gov.cn/nybgb/2017/dsq/201802/t20180201_6136189.htm.

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.

259. 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[27], such as disinfection/cleaning of offices and work places, on-site temperature checks, social distancing measures, 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.

260. To minimize risks associated with leaks of natural gas, the following measures will be taken:

(i) All natural gas works will be in compliance with relevant PRC building code requirements, including the Code for Design of City Gas Engineering (GB 50028-2006) and Regulation on Electric Apparatus Design for Explosion and Fire Risk Environment (GB50058-92).
(ii) The boiler rooms will be equipped with flammable gas detection, alarm and fire suppression systems. Electrical devices within the explosion risk area will be safety equipped.
(iii) Gas pipelines will be grounded and equipped with anti-lightning devices where applicable.
(iv) All gas related devices will be brightly colored and equipped with warning signs.

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27 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.pdfhttps://www.cca-acc.com/wp-content/uploads/2020/04/CCA-COVID-19-Standardized-Protocols-for-All-Canadian-Construction-Sites-04-16-20.pdf.

(v) The nearby communities will be informed of the potential risks fire and explosion, and the emergency response plan.

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

### h) Emergency Response Plan

262. 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

263. 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.[28]

264. **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.

265. **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. Successful operation of the subproject will result in increased rural domestic waste and domestic wastewater treatment, which will increase the load on the capacity of existing facilities and will shorten their service life. However, as noted above, through master planning of Tianshui, utilities are expected to scale up services such as sewerage and solid waste collection and disposal, to address this development and reduce environmental impacts. Significant induced impacts are not anticipated.

266. 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.

267. **Cumulative impacts**. The cumulative impacts of the subprojects in combination with existing and future agricultural projects will include increased use in water resources and

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

agricultural chemicals and potential soil pollution from the agricultural activities. 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 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, and use of drip irrigation in controlled circumstances (acknowledging the limitation of drip irrigation such as risk of clogging).

## F. Greenhouse Gas Emissions

268. **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-9**. The annual GHG emissions from the power consumption are estimated at 868.4 tons of $CO_2$.

**Table V-9:** Annual energy consumption.

| Component | Power consumption (thousand kwh) | $CO_2$ emissions (t/a) |
|---|---|---|
| 1 | 268.7 | 155.0 |
| 2 | 411.5 | 237.4 |
| 3 | 825.0 | 476.0 |
| Total | **1505.2** | **868.4** |

Source: TrTA consultant.

269. **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 **1844.9 tons** $CO_2$e per year.

270. **GHG reduction by green building.** This will contribute to the reduction of GHG emissions. The GHG reduction is estimated at **846.0 tons** $CO_2$e per year.

271. **GHG reduction by manure treatment and fertilizer replacement.** This will contribute to the reduction of GHG emissions. The GHG reduction is estimated at **2,154.8 tons** $CO_2$e per year.

272. CHG reduction by utilization gas fired boilers. This will contribute to the reduction of GHG emissions compared to coal fired boilers. The GHG reduction is estimated at **2,239.5 tons** $CO_2$e per year.

273. **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 5,293.0 **tons** of $CO_2$e/yr.

274. **Net Emissions**. The total $CO_2$e emissions generated by the subproject, every year during the operation, will be about 868.4 tons/yr, while the total $CO_2$e reduction from the subproject will be 12,378.2 tons of $CO_2$e/yr. Hence, the net GHG emission reduction from the subproject will be 11,509.8 tons/yr.

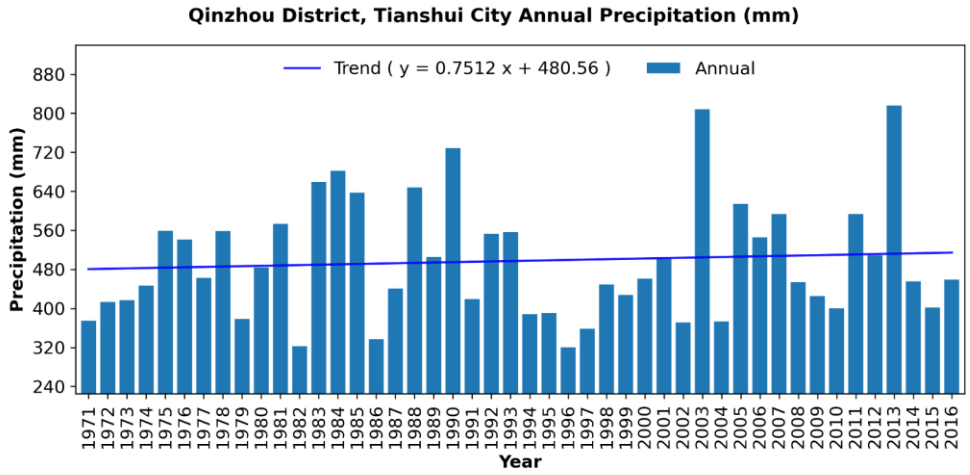
## G. Climate Risk

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

### a) Annual and Seasonal Mean Precipitation

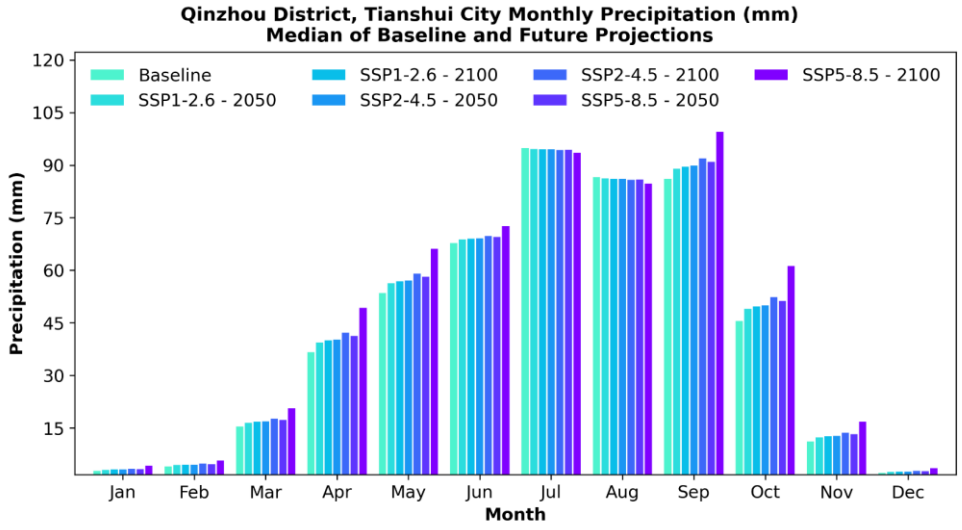
276. Qinzhou's historical annual total precipitation is only 508.6mm, mainly falling from April to October with significant interannual variabilities; highest in July, it is about 89.8 mm. The historical observational precipitation has no clear change trend. However, the precipitation is projected to increase, under the low emission scenario, SSP1-2.6, the annual precipitation will increase 6.1% in 2050 and 7.5% in 2100. Under the high emission scenario SSP5-8.5, precipitation will increase 10.4% in 2050 and 28.4% 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 a 95.3% increase.

**Figure V-1:** Qinzhou District, Tianshui City, Annual Precipitation Historical (mm).




Source: TrTA consultant.

**Figure V-2:** Qinzhou District, Tianshui City, Monthly Precipitation (mm) Median of Baseline and Future Projections.




Source: TrTA consultant.

**Table V-10:** Qinzhou District, Tianshui City, Seasonal and Annual Precipitation Baseline (mm) and Future Changes (%) – 50th Percentile (Brackets 5th and 95th Percentile).

| Season | Year | SSP1-2.6 | SSP2-4.5 | SSP5-8.5 |
|---|---|---|---|---|
| DJF | Baseline | 9.49 | 9.49 | 9.49 |
| | 2050 | 10.61 (-0.99, 32.91) | 13.79 (-1.28, 42.78) | 18.04 (-1.68, 55.94) |
| | 2100 | 12.94 (-1.20, 40.15) | 21.43 (-1.99, 66.47) | 49.23 (-4.57, 152.68) |

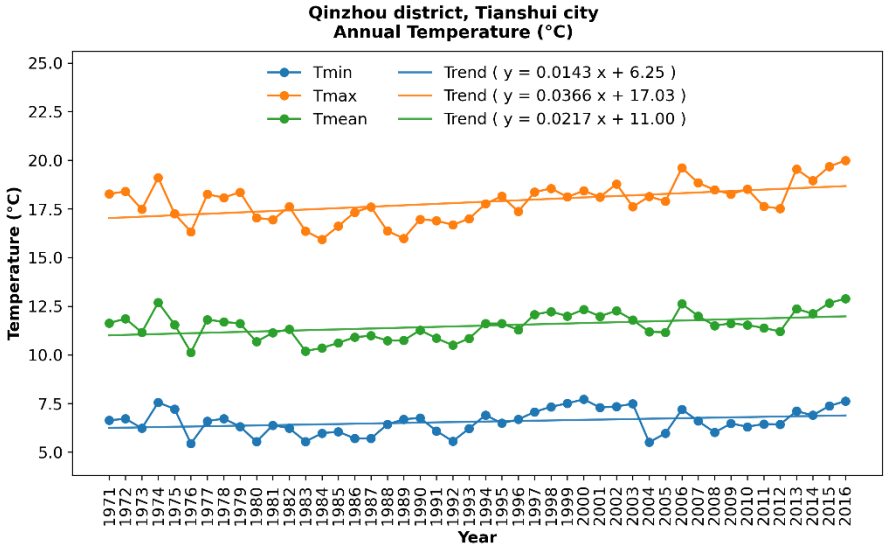
| Season | Year | SSP1-2.6 | SSP2-4.5 | SSP5-8.5 |
|---|---|---|---|---|
| MAM | Baseline | 105.93 | 105.93 | 105.93 |
| | 2050 | 6.57 (-2.25, 20.48) | 8.54 (-2.93, 26.63) | 11.16 (-3.83, 34.82) |
| | 2100 | 8.01 (-2.75, 24.99) | 13.26 (-4.55, 41.38) | 30.47 (-10.46, 95.04) |
| JJA | Baseline | 249.79 | 249.79 | 249.79 |
| | 2050 | 0.25 (-8.84, 10.04) | 0.33 (-11.49, 13.05) | 0.43 (-15.02, 17.06) |
| | 2100 | 0.31 (-10.78, 12.25) | 0.51 (-17.85, 20.28) | 1.16 (-41.00, 46.57) |
| SON | Baseline | 143.40 | 143.40 | 143.40 |
| | 2050 | 7.09 (-3.03, 18.74) | 9.22 (-3.94, 24.37) | 12.05 (-5.16, 31.87) |
| | 2100 | 8.65 (-3.70, 22.87) | 14.32 (-6.13, 37.86) | 32.89 (-14.07, 86.98) |
| ANN | Baseline | 508.62 | 508.62 | 508.62 |
| | 2050 | 6.13 (-3.78, 20.54) | 7.97 (-4.91, 26.71) | 10.42 (-6.42, 34.92) |
| | 2100 | 7.48 (-4.61, 25.06) | 12.38 (-7.63, 41.50) | 28.44 (-17.53, 95.32) |

Source: TrTA consultant.

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

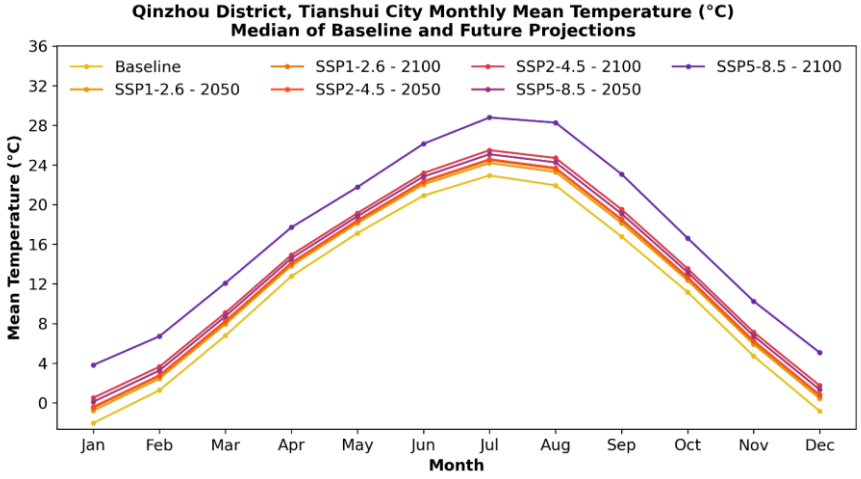
277. The project location is in a temperate climate zone, and the annual mean temperature is 11.1 oC, with -1.5 oC in January and 23.6 oC in July; the mean temperature in Qinzhou has been getting warmer 0.22 oC per decades from 1971 to 2016. The annual mean maximum temperature is 17.3 oC, and the minimum temperature is 6.4oC. The maximum temperature has 0.37oC per decade, while the minimum temperature has a 0.14 oC 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 Qinzhou will increase by 2.0oC, and in 2100 it will be 5.6 oC. The warming signal is stronger than the global average. The minimum temperature in SSP5-8.5 will increase by 5.8 oC.

**Figure V-3:** Qinzhou District, Tianshui City Historical Annual Temperature (°C) Trend.




Source: TrTA consultant.

**Figure V-4:** Qinzhou District, Tianshui City, Monthly Mean Temperature (°C) Median of Baseline and Future Projections.



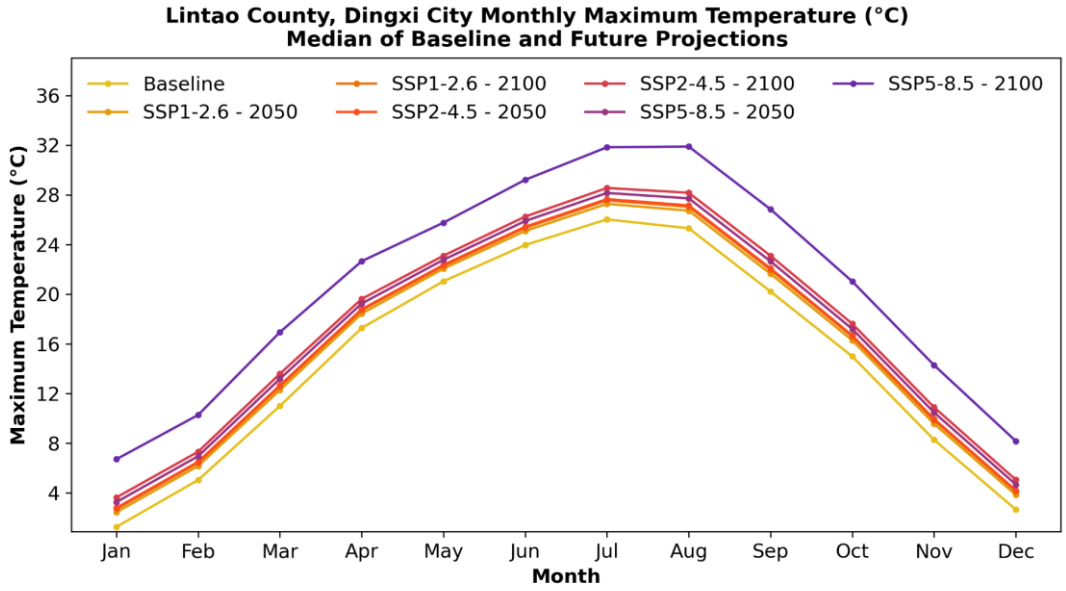

Source: TrTA consultant.

**Table V-11:** Qinzhou District, Tianshui City, Seasonal and Annual Mean Temperature Baseline (°C) and Future Changes (°C) – 50th Percentile (Brackets 5th and 95th Percentile).

| Season | Year | SSP1-2.6 | SSP2-4.5 | SSP5-8.5 |
|---|---|---|---|---|
| **DJF** | Baseline | -0.53 | -0.53 | -0.53 |
| | 2050 | 1.24 (0.80, 1.64) | 1.61 (1.04, 2.14) | 2.10 (1.35, 2.79) |
| | 2100 | 1.51 (0.97, 2.00) | 2.50 (1.61, 3.32) | 5.73 (3.69, 7.62) |
| **MAM** | Baseline | 12.26 | 12.26 | 12.26 |
| | 2050 | 1.07 (0.62, 1.52) | 1.39 (0.81, 1.97) | 1.82 (1.06, 2.58) |
| | 2100 | 1.30 (0.76, 1.85) | 2.16 (1.26, 3.07) | 4.96 (2.88, 7.04) |
| **JJA** | Baseline | 21.93 | 21.93 | 21.93 |
| | 2050 | 1.25 (0.94, 1.56) | 1.63 (1.22, 2.02) | 2.13 (1.59, 2.65) |
| | 2100 | 1.53 (1.14, 1.90) | 2.53 (1.89, 3.14) | 5.80 (4.34, 7.22) |
| **SON** | Baseline | 10.89 | 10.89 | 10.89 |
| | 2050 | 1.24 (0.93, 1.62) | 1.61 (1.22, 2.11) | 2.11 (1.59, 2.76) |
| | 2100 | 1.51 (1.14, 1.98) | 2.51 (1.89, 3.28) | 5.76 (4.34, 7.53) |
| **ANN** | Baseline | 11.14 | 11.14 | 11.14 |
| | 2050 | 1.20 (0.82, 1.58) | 1.56 (1.07, 2.06) | 2.04 (1.40, 2.69) |
| | 2100 | 1.46 (1.00, 1.93) | 2.42 (1.66, 3.20) | 5.57 (3.81, 7.35) |

Source: TrTA consultant.

**Figure V-5:** Qinzhou District, Tianshui City, Monthly Maximum Temperature (°C) Median of Baseline and Future Projections.



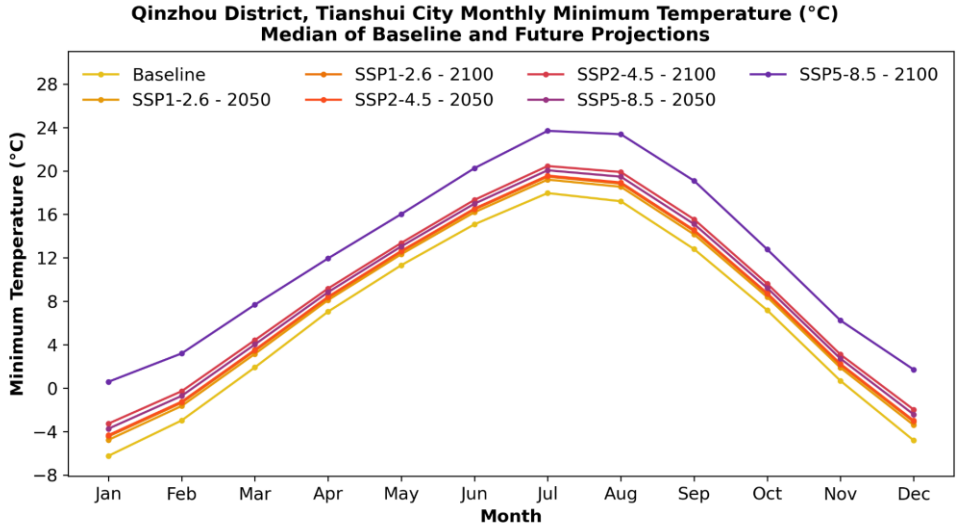

Source: TrTA consultant.

**Table V-12:** Qinzhou District, Tianshui City, Seasonal and Annual Maximum Temperature Baseline (°C) and Future Changes (°C) – 50th Percentile (Brackets 5th and 95th Percentile).

| Season | Year | SSP1-2.6 | SSP2-4.5 | SSP5-8.5 |
|---|---|---|---|---|
| DJF | Baseline | 5.38 | 5.38 | 5.38 |
| | 2050 | 1.17 (0.76, 1.66) | 1.52 (0.98, 2.15) | 1.99 (1.29, 2.82) |
| | 2100 | 1.43 (0.92, 2.02) | 2.37 (1.53, 3.35) | 5.44 (3.51, 7.69) |
| MAM | Baseline | 19.01 | 19.01 | 19.01 |
| | 2050 | 1.14 (0.65, 1.81) | 1.48 (0.84, 2.35) | 1.93 (1.10, 3.07) |
| | 2100 | 1.39 (0.79, 2.21) | 2.30 (1.31, 3.65) | 5.28 (3.00, 8.39) |
| JJA | Baseline | 28.17 | 28.17 | 28.17 |
| | 2050 | 1.30 (0.90, 1.74) | 1.69 (1.17, 2.26) | 2.21 (1.52, 2.96) |
| | 2100 | 1.59 (1.09, 2.12) | 2.63 (1.81, 3.52) | 6.04 (4.16, 8.08) |
| SON | Baseline | 16.57 | 16.57 | 16.57 |
| | 2050 | 1.26 (0.86, 1.77) | 1.63 (1.12, 2.31) | 2.13 (1.47, 3.02) |
| | 2100 | 1.53 (1.05, 2.16) | 2.54 (1.74, 3.58) | 5.83 (4.00, 8.23) |
| ANN | Baseline | 17.28 | 17.28 | 17.28 |
| | 2050 | 1.22 (0.79, 1.75) | 1.58 (1.03, 2.27) | 2.07 (1.34, 2.97) |
| | 2100 | 1.48 (0.96, 2.13) | 2.46 (1.60, 3.52) | 5.65 (3.67, 8.10) |

Source: TrTA consultant.

**Figure V-6:** Qinzhou District, Tianshui City, Monthly Minimum Temperature (°C) Median of Baseline and Future Projections.




Source: TrTA consultant.

**Table V-13:** Qinzhou District, Tianshui City, Seasonal and Annual Minimum Temperature Baseline (°C) and Future Changes (°C) – 50th Percentile (Brackets 5th and 95th Percentile).

| Season | Year | SSP1-2.6 | SSP2-4.5 | SSP5-8.5 |
|---|---|---|---|---|
| | Baseline | -4.67 | -4.67 | -4.67 |
| | 2050 | 1.40 (0.85, 1.92) | 1.82 (1.10, 2.49) | 2.38 (1.44, 3.26) |
| **DJF** | 2100 | 1.71 (1.03, 2.34) | 2.83 (1.71, 3.87) | 6.50 (3.93, 8.89) |
| | Baseline | 6.79 | 6.79 | 6.79 |
| | 2050 | 1.10 (0.71, 1.60) | 1.44 (0.92, 2.09) | 1.88 (1.20, 2.73) |
| **MAM** | 2100 | 1.35 (0.86, 1.96) | 2.23 (1.43, 3.24) | 5.12 (3.28, 7.45) |
| | Baseline | 16.75 | 16.75 | 16.75 |
| | 2050 | 1.23 (0.90, 1.45) | 1.59 (1.17, 1.88) | 2.09 (1.53, 2.46) |
| **JJA** | 2100 | 1.50 (1.10, 1.77) | 2.48 (1.82, 2.92) | 5.69 (4.18, 6.72) |
| | Baseline | 6.88 | 6.88 | 6.88 |
| | 2050 | 1.25 (0.91, 1.75) | 1.63 (1.19, 2.27) | 2.13 (1.55, 2.97) |
| **SON** | 2100 | 1.53 (1.12, 2.13) | 2.53 (1.85, 3.53) | 5.82 (4.24, 8.11) |
| | Baseline | 6.44 | 6.44 | 6.44 |
| | 2050 | 1.25 (0.84, 1.68) | 1.62 (1.10, 2.18) | 2.12 (1.43, 2.85) |
| **ANN** | 2100 | 1.52 (1.03, 2.05) | 2.52 (1.70, 3.39) | 5.78 (3.91, 7.79) |

Source: TrTA consultant.

### c) Extreme Daily Precipitation

278. In the semi-arid area, the mean precipitation is relatively low. However, extreme precipitation events can be devastating with a 100-year return precipitation event predicted to reach 119.5 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 is predicted to increase by 13.1%, and under SSP5-8.5, it could rise by 60.8%. For other scenarios, the changes are in between these two values.

**Table V-14:** Qinzhou District, Tianshui City, Extreme Precipitation Daily Baseline (mm) and Future Changes (%) – 50th Percentile (Brackets 5th and 95th 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 |
|---|---|---|---|---|---|---|---|
| **2** | 41.32 | 6.83 (0.26, 10.73) | 8.34 (0.32, 13.09) | 8.88 (0.34, 13.95) | 13.80 (0.52, 21.68) | 11.61 (0.44, 18.25) | 31.70 (1.20, 49.80) |
| **3** | 48.27 | 7.85 (0.23, 10.89) | 9.58 (0.27, 13.28) | 10.21 (0.29, 14.15) | 15.86 (0.45, 21.99) | 13.35 (0.38, 18.51) | 36.44 (1.05, 50.51) |
| **5** | 56.75 | 8.46 (0.16, 12.23) | 10.32 (0.20, 14.92) | 10.99 (0.21, 15.90) | 17.08 (0.32, 24.70) | 14.38 (0.27, 20.79) | 39.24 (0.74, 56.74) |
| **10** | 68.85 | 8.87 (-0.77, 14.23) | 10.82 (-0.94, 17.36) | 11.53 (-1.00, 18.50) | 17.91 (-1.55, 28.75) | 15.08 (-1.31, 24.19) | 41.15 (-3.57, 66.03) |
| **15** | 76.57 | 9.24 (-0.96, 15.37) | 11.27 (-1.17, 18.76) | 12.01 (-1.24, 19.99) | 18.66 (-1.93, 31.06) | 15.71 (-1.63, 26.14) | 42.87 (-4.44, 71.34) |
| **25** | 86.92 | 9.86 (-1.05, 17.18) | 12.03 (-1.29, 20.96) | 12.82 (-1.37, 22.33) | 19.91 (-2.13, 34.70) | 16.76 (-1.79, 29.21) | 45.74 (-4.89, 79.72) |
| **50** | 102.30 | 10.39 (-2.56, 20.93) | 12.68 (-3.13, 25.53) | 13.51 (-3.33, 27.21) | 20.99 (-5.18, 42.28) | 17.66 (-4.36, 35.58) | 48.21 (-11.89, 97.12) |
| **100** | 119.45 | 11.50 (-4.96, 25.06) | 14.02 (-6.05, 30.57) | 14.94 (-6.44, 32.58) | 23.22 (-10.01, 50.62) | 19.54 (-8.43, 42.60) | 53.34 (-23.00, 116.28) |
| **200** | 138.64 | 12.11 (-7.13, 29.60) | 14.78 (-8.70, 36.11) | 15.74 (-9.27, 38.48) | 24.46 (-14.41, 59.79) | 20.59 (-12.12, 50.32) | 56.19 (-33.09, 137.34) |
| **300** | 151.04 | 13.10 (-8.27, 32.49) | 15.98 (-10.09, 39.64) | 17.03 (-10.76, 42.23) | 26.46 (-16.71, 65.63) | 22.27 (-14.07, 55.23) | 60.78 (-38.39, 150.75) |

Source: TrTA consultant.

### d) Extreme Daily Maximum Temperature

279. In the semi-arid area, the mean precipitation is relatively low. However, extreme precipitation events can be devastating with a 100-year return precipitation event predicted to reach 119.5 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 is predicted to increase by 13.1%, and under SSP5-8.5, it could rise by 60.8%. For other scenarios, the changes are in between these two values.

**Table V-15:** Qinzhou District, Tianshui City, Extreme Temperature Daily Baseline (°C) and Future Changes (°C) – 50th Percentile (Brackets 5th and 95th 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 |
|---|---|---|---|---|---|---|---|
| **2** | 34.41 | 1.77 (0.74, 2.87) | 1.73 (0.82, 3.18) | 1.90 (1.01, 3.21) | 3.14 (1.70, 4.84) | 2.57 (1.34, 4.22) | 6.07 (3.30, 8.75) |
| **3** | 35.06 | 1.79 (0.83, 3.02) | 1.82 (0.74, 3.30) | 1.89 (0.99, 3.43) | 3.30 (1.67, 4.96) | 2.58 (1.48, 4.28) | 6.17 (3.35, 9.19) |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **5** | 35.76 | 1.87 (0.80, 3.15) | 1.81 (0.64, 3.44) | 1.94 (0.98, 3.67) | 3.24 (1.66, 5.09) | 2.58 (1.57, 4.58) | 6.22 (3.42, 9.58) |
| **10** | 36.58 | 2.10 (0.61, 3.22) | 1.96 (0.67, 3.60) | 2.00 (0.94, 3.74) | 3.34 (1.66, 5.25) | 2.75 (1.59, 4.95) | 6.29 (3.50, 9.76) |
| **15** | 37.03 | 2.20 (0.31, 3.30) | 2.05 (0.56, 3.67) | 1.96 (0.82, 3.78) | 3.43 (1.66, 5.35) | 2.79 (1.59, 5.16) | 6.36 (3.55, 9.84) |
| **25** | 37.56 | 2.32 (0.04, 3.44) | 2.05 (0.29, 3.76) | 1.92 (0.65, 3.82) | 3.54 (1.62, 5.47) | 2.89 (1.51, 5.42) | 6.34 (3.47, 9.94) |
| **50** | 38.24 | 2.36 (-0.05, 3.63) | 2.05 (0.15, 4.02) | 1.99 (0.40, 3.97) | 3.64 (1.37, 5.63) | 3.00 (1.38, 5.77) | 6.35 (3.32, 10.07) |
| **100** | 38.88 | 2.39 (-0.14, 3.90) | 2.13 (0.00, 4.29) | 2.08 (0.15, 4.14) | 3.66 (1.09, 5.81) | 3.02 (1.20, 6.11) | 6.38 (3.06, 10.20) |
| **200** | 39.48 | 2.50 (-0.23, 4.17) | 2.24 (-0.14, 4.55) | 2.11 (-0.09, 4.31) | 3.69 (0.78, 6.12) | 3.06 (1.10, 6.45) | 6.42 (2.65, 10.33) |
| **300** | 39.82 | 2.57 (-0.29, 4.34) | 2.31 (-0.23, 4.73) | 2.12 (-0.24, 4.41) | 3.70 (0.60, 6.31) | 3.11 (1.04, 6.65) | 6.44 (2.44, 10.43) |

Source: TrTA consultant.

### e) Extreme Wind Speed

280. Extreme wind speed in Qinzhou can be damaging, the 50-year return event is 16.7m/s, and it is 18.2m/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-16:** Qinzhou District, Tianshui City, Extreme Wind Speed Baseline (m/s) and Future Changes (%) – 75$^{th}$ Percentile (Brackets 5$^{th}$ and 95$^{th}$ 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** |
|---|---|---|---|---|---|---|---|
| **2** | 9.18 | 0.97 (-15.92, 5.32) | 0.25 (-17.19, 4.52) | 1.59 (-4.30, 3.74) | 1.70 (-5.70, 6.68) | 0.93 (-4.29, 4.28) | 1.74 (-7.26, 5.19) |
| **3** | 10.32 | 0.57 (-15.78, 5.40) | 0.21 (-17.58, 4.65) | 1.74 (-4.55, 3.68) | 2.33 (-5.58, 7.18) | 1.40 (-4.01, 3.58) | 1.77 (-7.40, 5.07) |
| **5** | 11.60 | 0.54 (-15.79, 5.83) | 0.07 (-17.97, 4.72) | 2.20 (-5.12, 4.35) | 2.89 (-5.39, 7.72) | 2.07 (-4.68, 2.85) | 2.47 (-8.30, 5.08) |
| **10** | 13.20 | 0.98 (-15.78, 6.92) | -0.35 (-18.40, 4.31) | 2.25 (-5.80, 5.21) | 2.92 (-6.61, 8.68) | 2.14 (-5.81, 3.70) | 3.31 (-9.32, 5.24) |
| **15** | 14.10 | 1.42 (-15.64, 7.12) | -0.58 (-18.91, 4.13) | 2.18 (-6.26, 5.69) | 2.89 (-7.46, 9.36) | 2.28 (-6.42, 4.39) | 3.75 (-9.86, 5.37) |
| **25** | 15.22 | 2.13 (-15.43, | -0.87 (-19.60, | 2.21 (-6.94, | 2.77 (-8.43, | 2.70 (-7.22, | 3.99 (-10.55, |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | | 7.47) | 4.22) | 6.38) | 10.00) | 5.21) | 5.72) |
| **50** | 16.73 | 3.04 (-15.20, 8.24) | -1.02 (-20.45, 4.52) | 2.34 (-7.89, 7.24) | 2.81 (-9.63, 10.61) | 3.06 (-8.15, 6.22) | 4.06 (-11.39, 6.25) |
| **100** | 18.22 | 3.83 (-15.15, 9.02) | -0.87 (-21.24, 4.83) | 2.60 (-8.81, 8.05) | 3.05 (-10.71, 11.16) | 3.41 (-8.99, 7.17) | 4.12 (-12.15, 6.90) |
| **200** | 19.70 | 4.19 (-15.32, 9.74) | -0.74 (-21.94, 5.15) | 2.90 (-9.63, 8.78) | 3.20 (-11.68, 11.66) | 3.73 (-9.74, 8.04) | 4.18 (-12.87, 7.61) |
| **300** | 20.57 | 4.42 (-15.41, 10.18) | -0.72 (-22.30, 5.32) | 3.08 (-10.09, 9.20) | 3.26 (-12.20, 11.96) | 3.93 (-10.13, 8.51) | 4.36 (-13.27, 8.03) |

Source: TrTA consultant.

### f) SPEI Drought Index

281. 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 0.48 suggests that Qinzhou will maintain as an arid zone, dropping to 0.43 in 2100 under the SSP5-8.5 scenario.

**Table V-17:** Qinzhou District, Tianshui 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 | 54.7 | 36.5 | 27.3 | 21.9 | 18.2 | 15.6 | 13.7 |
| SSP1-2.6_2050 | Moderate | 100.0 | 56.3 | 37.5 | 28.1 | 22.5 | 18.8 | 16.1 | 14.1 |
| SSP1-2.6_2100 | Moderate | 100.0 | 60.9 | 40.6 | 30.5 | 24.4 | 20.3 | 17.4 | 15.2 |
| SSP2-4.5_2050 | Moderate | 100.0 | 64.1 | 42.7 | 32.0 | 25.6 | 21.4 | 18.3 | 16.0 |
| SSP2-4.5_2100 | Moderate | 100.0 | 85.9 | 57.3 | 43.0 | 34.4 | 28.7 | 24.6 | 21.5 |
| SSP5-8.5_2050 | Moderate | 100.0 | 76.6 | 51.0 | 38.3 | 30.6 | 25.5 | 21.9 | 19.1 |
| SSP5-8.5_2100 | Moderate | 100.0 | 100.0 | 99.0 | 74.2 | 59.4 | 49.5 | 42.4 | 37.1 |
| Baseline | Severe | 37.5 | 18.8 | 12.5 | 9.4 | 7.5 | 6.3 | 5.4 | 4.7 |
| SSP1-2.6_2050 | Severe | 43.8 | 21.9 | 14.6 | 10.9 | 8.8 | 7.3 | 6.3 | 5.5 |
| SSP1-2.6_2100 | Severe | 56.3 | 28.1 | 18.8 | 14.1 | 11.3 | 9.4 | 8.0 | 7.0 |
| SSP2-4.5_2050 | Severe | 56.3 | 28.1 | 18.8 | 14.1 | 11.3 | 9.4 | 8.0 | 7.0 |
| SSP2-4.5_2100 | Severe | 78.1 | 39.1 | 26.0 | 19.5 | 15.6 | 13.0 | 11.2 | 9.8 |
| SSP5-8.5_2050 | Severe | 71.9 | 35.9 | 24.0 | 18.0 | 14.4 | 12.0 | 10.3 | 9.0 |
| SSP5-8.5_2100 | Severe | 100.0 | 92.2 | 61.5 | 46.1 | 36.9 | 30.7 | 26.3 | 23.1 |
| Baseline | Extreme | 6.3 | 3.1 | 2.1 | 1.6 | 1.3 | 1.0 | 0.9 | 0.8 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| SSP1-2.6_2050 | Extreme | 12.5 | 6.3 | 4.2 | 3.1 | 2.5 | 2.1 | 1.8 | 1.6 |
| SSP1-2.6_2100 | Extreme | 15.6 | 7.8 | 5.2 | 3.9 | 3.1 | 2.6 | 2.2 | 2.0 |
| SSP2-4.5_2050 | Extreme | 15.6 | 7.8 | 5.2 | 3.9 | 3.1 | 2.6 | 2.2 | 2.0 |
| SSP2-4.5_2100 | Extreme | 31.3 | 15.6 | 10.4 | 7.8 | 6.3 | 5.2 | 4.5 | 3.9 |
| SSP5-8.5_2050 | Extreme | 25.0 | 12.5 | 8.3 | 6.3 | 5.0 | 4.2 | 3.6 | 3.1 |
| SSP5-8.5_2100 | Extreme | 87.5 | 43.8 | 29.2 | 21.9 | 17.5 | 14.6 | 12.5 | 10.9 |

Source: TrTA consultant.

**Table V-18:** Qinzhou District, Tianshui City, Aridity Index Baseline (n/a) and Future Projections (n/a) – 50th Percentile (Brackets 5th and 95th Percentile).

| Year | SSP1-2.6 | SSP2-4.5 | SSP5-8.5 |
|---|---|---|---|
| **Baseline** | 0.48 | 0.48 | 0.48 |
| **2050** | 0.46 (0.43, 0.50) | 0.46 (0.42, 0.51) | 0.46 (0.40, 0.51) |
| **2100** | 0.46 (0.42, 0.50) | 0.45 (0.39, 0.52) | 0.43 (0.29, 0.56) |

Source: TrTA consultant.

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

282. Heating degree days (HDD) will decrease, which implies that the energy consumption for heating could reduce. The historical average HDD is 2741.5; under SSP5-8.5, 17.1% in 2050, 42.8% will be reduced. Lower reductions in HDD shows in the lower emission scenarios.

283. The cooling degree days (CDD) in Qinzhou is 495.7, the energy need for cooling buildings is relatively low. However, climate change will increase CDD quickly and increase 55.5% under SSP2-4.5 by 2050 and by 173.6% under the SSP5-8.5 scenario by 2100.

284. The frost-free season will be extended from 216 days of the historical period. Under SSP1-2.6, the frost-free season only increases 4.4% or about ten days by 2050. Under SSP5-8.5, it will be 10.5% 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.

285. The growing degree days (GDD) in Qinzhou is 3281.2 for the historical period; it is projected to increase with time. GDDs are projected to increase by between 10.0% and 17.2% in different scenarios by 2050. Alternatively, it is predicted to increase by between 12.2% and 51.0% by 2100. Rising GDDs is expected to increase crop yield opportunities for new plant species or varieties in Qinzhou.

286. The minimum temperature in the coldest month in Qinzhou is January, with -5.9 oC. It may increase by 1.5oC under SSP1-2.6 by 2050, and by 6.8 oC in 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 Qinzhou area with the warming trend.

287. July is the warmest month in Qinzhou; the average daily maximum temperature is 29.9 oC. In 2050, the maximum temperature is predicted to increase by 1.3 oC, 1.6 oC and 2.2 oC under the three scenarios. The maximum temperature could increase by 5.9oC by 2100 under SSP5-8.5. The change in the biological climate condition should guide plant selection and

management regimes.

**Table V-19:** Qinzhou District, Tianshui City, Heating Degree Days Baseline (C*day/year) and Future Changes (%) – 50th Percentile (Brackets 5th and 95th Percentile).

| Year | SSP1-2.6 | SSP2-4.5 | SSP5-8.5 |
|---|---|---|---|
| **Baseline** | 2741.47 | 2741.47 | 2741.47 |
| **2050** | -10.29<br>(-6.83, -13.77) | -13.26<br>(-8.82, -17.70) | -17.14<br>(-11.43, -22.77) |
| **2100** | -12.47<br>(-8.29, -16.66) | -20.16<br>(-13.48, -26.70) | -42.75<br>(-29.26, -54.98) |

Source: TrTA consultant.

**Table V-20:** Qinzhou District, Tianshui City, Cooling Degree Days Baseline (C*day/year) and Future Changes (%) – 50th Percentile (Brackets 5th and 95th Percentile).

| Year | SSP1-2.6 | SSP2-4.5 | SSP5-8.5 |
|---|---|---|---|
| **Baseline** | 495.70 | 495.70 | 495.70 |
| **2050** | 31.51<br>(22.84, 40.56) | 41.60<br>(30.04, 53.85) | 55.51<br>(39.83, 72.49) |
| **2100** | 38.88<br>(28.10, 50.26) | 67.07<br>(47.86, 88.07) | 173.75<br>(119.41, 237.48) |

Source: TrTA consultant.

**Table V-21:** Qinzhou District, Tianshui City, Frost-Free Season Length Baseline (days/year) and Future Changes (%) – 50th Percentile (Brackets 5th and 95th Percentile).

| Year | SSP1-2.6 | SSP2-4.5 | SSP5-8.5 |
|---|---|---|---|
| **Baseline** | 216.35 | 216.35 | 216.35 |
| **2050** | 4.38<br>(2.95, 7.73) | 6.69<br>(4.06, 11.36) | 10.49<br>(5.41, 16.12) |
| **2100** | 6.04<br>(3.45, 11.07) | 12.80<br>(7.02, 18.01) | 30.05<br>(18.59, 45.84) |

Source: TrTA consultant.

**Table V-22:** Qinzhou District, Tianshui City, Growing Degree Days Baseline (C*day/year) and Future Changes (%) – 50th Percentile (Brackets 5th and 95th Percentile).

| Year | SSP1-2.6 | SSP2-4.5 | SSP5-8.5 |
|---|---|---|---|
| **Baseline** | 3281.16 | 3281.16 | 3281.16 |
| **2050** | 9.96<br>(6.89, 13.27) | 13.03<br>(8.99, 17.43) | 17.21<br>(11.82, 23.12) |
| **2100** | 12.21<br>(8.43, 16.31) | 20.62<br>(14.11, 27.79) | 50.96<br>(33.83, 69.83) |

Source: TrTA consultant.

**Table V-23:** Qinzhou District, Tianshui City, Tmin Coldest Month Baseline (°C) and Future Changes (°C) – 50th Percentile (Brackets 5th and 95th Percentile).

| Month | Year | SSP1-2.6 | SSP2-4.5 | SSP5-8.5 |
|---|---|---|---|---|
| **Jan** | Baseline | -5.94 | -5.94 | -5.94 |
| **Jan** | 2050 | 1.47<br>(0.95, 1.97) | 1.91<br>(1.24, 2.56) | 2.50<br>(1.62, 3.35) |
| **Jan** | 2100 | 1.79<br>(1.16, 2.40) | 2.97<br>(1.93, 3.97) | 6.82<br>(4.42, 9.13) |

Source: TrTA consultant.

**Table V-24:** Qinzhou District, Tianshui City, Tmax Warmest Month Baseline (°C) and Future Changes (°C) – 50th Percentile (Brackets 5th and 95th Percentile).

| Month | Year | SSP1-2.6 | SSP2-4.5 | SSP5-8.5 |
|---|---|---|---|---|
| **Jul** | Baseline | 29.87 | 29.87 | 29.87 |
| **Jul** | 2050 | 1.26 (0.91, 1.76) | 1.64 (1.19, 2.29) | 2.15 (1.55, 2.99) |
| **Jul** | 2100 | 1.54 (1.11, 2.15) | 2.56 (1.84, 3.55) | 5.87 (4.24, 8.16) |

Source: TrTA consultant.

## H. Climate Change Adaption Options

288. Qinzhou is in the Taohe 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.

289. Qinzhou subproject has soil modification (replacement treatment) activities, which needs to be considered and need more careful investigations on actual soil characteristics, in physical and biochemical parameters, need to be carried out in order to avoid the degradation of existing soils, these are included in the EMP (**Appendix 1**).

**Table V-25:** Initial climate risk assessment for Qinzhou District subproject activities

| Project activities | Drought | Strong wind | Extreme Precipitation Flood | Heating and Cooling | Extreme temperature |
|---|---|---|---|---|---|
| **Water related:**<br>Water supply facilities<br>Water-saving pipe network<br>Water-saving irrigation systems | High | Med to high | Med to high | Med to high | Med to high |
| **Land related:**<br>Chinese medicine planting base<br>Soil improvement<br>Park lot<br>Landscape greening<br>Greenbelt | High | Med to high | Med to high | Med to high | Med to high |
| **Civil engineering and installation related:**<br>Road construction<br>Storage centre<br>Greenhouse<br>High-performance exterior wall and board<br>Energy saving building components installation<br>Water saving sanitary ware | Med to high | Med to high | Med to high | Med to high | Med to high |

Source: TrTA consultant.

290. 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 benefits (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-26:** Assumptions for adaption options and cost-benefit analysis for Qinzhou District subproject.

| Adaptation Options | Potential Climate Change | Physical Impacts of Climate change | Potential Adaptation Options | Potential Adaptation Measure Cost (% of the total project budget) | Potential Benefit Avoided Damage Assumption (% of the total project budget) |
|---|---|---|---|---|---|
| **Option A** | 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 |
| **Option B** | Extreme precipitation events; Flash or riverine flood | (Structure) Flood inundation damage to facilities and infrastructures; Horticulture loss; Woodland loss or damages Livestock loss 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 |
| **Option C** | 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% |
| **Option D** | 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 consultant.

**Table V-27:** An example of cost-benefit analysis under the SSP5-8.5 scenario for the Qinzhou District 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 | 3.8000 | 0.0000 | -3.8000 |
| **1** | 2026 | 0.03 | 0.0760 | 0.1710 | -3.7152 |
| **2** | 2027 | 0.05 | 0.0760 | 0.2850 | -3.5486 |
| **3** | 2028 | 0.08 | 0.0760 | 0.4560 | -3.2781 |
| **4** | 2029 | 0.11 | 0.0760 | 0.6270 | -2.9279 |
| **5** | 2030 | 0.14 | 0.0760 | 0.7980 | -2.5182 |
| **6** | 2031 | 0.17 | 0.0760 | 0.9690 | -2.0658 |
| **7** | 2032 | 0.20 | 0.0760 | 1.1400 | -1.5845 |
| **8** | 2033 | 0.23 | 0.0760 | 1.3110 | -1.0857 |
| **9** | 2034 | 0.27 | 0.0760 | 1.5390 | -0.5581 |
| **10** | 2035 | 0.30 | 0.0760 | 1.7100 | -0.0320 |
| **11** | 2036 | 0.33 | 0.0760 | 1.8810 | 0.4869 |
| **12** | 2037 | 0.36 | 0.0760 | 2.0520 | 0.9940 |
| **13** | 2038 | 0.40 | 0.0760 | 2.2800 | 1.4991 |
| **14** | 2039 | 0.43 | 0.0760 | 2.4510 | 1.9851 |
| **15** | 2040 | 0.47 | 0.0760 | 2.6790 | 2.4607 |
| **16** | 2041 | 0.50 | 0.0760 | 2.8500 | 2.9132 |
| **17** | 2042 | 0.54 | 0.0760 | 3.0780 | 3.3504 |
| **18** | 2043 | 0.58 | 0.0760 | 3.3060 | 3.7704 |
| **19** | 2044 | 0.61 | 0.0760 | 3.4770 | 4.1653 |
| **20** | 2045 | 0.65 | 0.0760 | 3.7050 | 4.5415 |
| **21** | 2046 | 0.69 | 0.0760 | 3.9330 | 4.8985 |
| **22** | 2047 | 0.73 | 0.0760 | 4.1610 | 5.2361 |
| **23** | 2048 | 0.76 | 0.0760 | 4.3320 | 5.5501 |
| **24** | 2049 | 0.80 | 0.0760 | 4.5600 | 5.8456 |
| **25** | 2050 | 0.84 | 0.0760 | 4.7880 | 6.1227 |
| **26** | 2051 | 0.88 | 0.0760 | 5.0160 | 6.3822 |
| **27** | 2052 | 0.92 | 0.0760 | 5.2440 | 6.6245 |
| **28** | 2053 | 0.96 | 0.0760 | 5.4720 | 6.8505 |
| **29** | 2054 | 1.00 | 0.0760 | 5.7000 | 7.0607 |
| **30** | 2055 | 1.04 | 0.0760 | 5.9280 | 7.2560 |
| **31** | 2056 | 1.07 | 0.0760 | 6.0990 | 7.4355 |
| **32** | 2057 | 1.11 | 0.0760 | 6.3270 | 7.6019 |
| **33** | 2058 | 1.15 | 0.0760 | 6.5550 | 7.7558 |
| **34** | 2059 | 1.19 | 0.0760 | 6.7830 | 7.8981 |
| **35** | 2060 | 1.23 | 0.0760 | 7.0110 | 8.0294 |
| **36** | 2061 | 1.27 | 0.0760 | 7.2390 | 8.1505 |
| **37** | 2062 | 1.31 | 0.0760 | 7.4670 | 8.2621 |
| **38** | 2063 | 1.35 | 0.0760 | 7.6950 | 8.3648 |
| **39** | 2064 | 1.39 | 0.0760 | 7.9230 | 8.4593 |
| **40** | 2065 | 1.43 | 0.0760 | 8.1510 | 8.5461 |
| **NPV20** | | | | | 4.5415 |
| **NPV40** | | | | | 8.5461 |

Source: TrTA consultant.

**Table V-28:** NPVs for three climate change scenarios, three project lifetimes, four adaptation options, and three benefit levels (million USD) for the Qinzhou District 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 A 5% | 0.13 | 1.43 | 5.32 | 1.23 | 3.08 | 8.64 | 3.47 | 6.44 | 15.35 |
| Option B 10% | -1.77 | -0.47 | 3.42 | -0.67 | 1.18 | 6.74 | 1.57 | 4.54 | 13.45 |
| Option C 15% | -3.67 | -2.37 | 1.52 | -2.57 | -0.72 | 4.84 | -0.33 | 2.64 | 11.55 |
| Option D 25% | -7.47 | -6.17 | -2.28 | -6.37 | -4.52 | 1.04 | -4.13 | -1.16 | 7.75 |
| **Lifetime 40 years** | | | | | | | | | |
| Option A 5% | 0.89 | 2.61 | 7.74 | 2.73 | 5.36 | 13.24 | 6.12 | 10.45 | 23.42 |
| Option B 10% | -1.01 | 0.71 | 5.84 | 0.83 | 3.46 | 11.34 | 4.22 | 8.55 | 21.52 |
| Option C 15% | -2.91 | -1.19 | 3.94 | -1.07 | 1.56 | 9.44 | 2.32 | 6.65 | 19.62 |
| Option D 25% | -6.71 | -4.99 | 0.14 | -4.87 | -2.24 | 5.64 | -1.48 | 2.85 | 15.82 |
| **Lifetime 60 years** | | | | | | | | | |
| Option A 5% | 0.99 | 2.75 | 8.04 | 2.99 | 5.76 | 14.05 | 6.64 | 11.22 | 24.97 |
| Option B 10% | -0.91 | 0.85 | 6.14 | 1.09 | 3.86 | 12.15 | 4.74 | 9.32 | 23.07 |
| Option C 15% | -2.81 | -1.05 | 4.24 | -0.81 | 1.96 | 10.25 | 2.84 | 7.42 | 21.17 |
| Option D 25% | -6.61 | -4.85 | 0.44 | -4.61 | -1.84 | 6.45 | -0.96 | 3.62 | 17.37 |

Source: TrTA consultant.

291. 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 SSP8.5 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 the SSP1-2.6 scenario yielding negative NPV while SSSP5-8.5 produces more substantial/positive NPVs.

292. 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.

293. 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-29:** Qinzhou District Adaptation Activities Costs

| Adaptation Activity | Target Climate Risk | Target Climate Risk | Adaptation measure | Adaptation Finance Justification |
|---|---|---|---|---|
| Main and secondary entrance and exit signs Main building project of entrance and exit (Qinzhou) | 20% | Wind, heat, drought, flood | Higher building and material standards | Incremental costs of 5 - 30% of higher design standards and climate resilient materials |
| Low-carbon Elderly Comprehensive Service Center Comprehensive service center for the elderly Green and low carbon Energy saving doors and windows(Qinzhou) | 30% | Wind, heat, drought, flood | Higher building and material standards | Incremental cost 5-30% and/or standalone components |
| Low-carbon Elderly Comprehensive Service Center Comprehensive service center for the elderly Green and low carbon High-performance exterior wall insulation and decoration integrated board (Qinzhou) | 50% | Heat and cold | Higher building and material standards | Incremental cost 5-30% and/or standalone components |
| Double arch double membrane greenhouse main structure (Qinzhou) | 10% | Wind, heat, drought, flood | Higher building and material standards | Incremental costs of 5 - 30% of higher design standards and climate resilient materials |
| Urban and Rural Elderly Caring Demonstration Base Health Management Service Center Civil cost (Qinzhou) | 20% | Wind, heat, drought, flood | Higher building and material standards | Incremental costs of 5 - 30% of higher design standards and |

| | | | | |
|---|---|---|---|---|
| | | | | climate resilient materials |
| Urban and Rural Elderly Caring Demonstration Base Health care and retirement center Civil cost (Qinzhou) | 20% | Wind, heat, drought, flood | Higher building and material standards | Incremental costs of 5 - 30% of higher design standards and climate resilient materials |
| Institutional Capacity Low-carbon rural smart management (Qinzhou) | 20% | Wind, heat, drought, flood | 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 (Qinzhou) | 25% | | | Institutional capacity building |
| Institution building and capacity strengthening Rural tourism(Qinzhou) | 10% | | | Institutional capacity building |
| Institution building and capacity strengthening Interinstitutional cooperation mechanism(Qinzhou) | 5% | | | Institutional capacity building |
| Double arch double membrane greenhouse Qinzhou Land levelling | 100% | Wind, heat, drought, flood | wind and flood resilience design and material | Standalone natural based solutions |
| Qinzhou Double arch double membrane greenhouse Soil improvement | 100% | Wind and drought | New land management technology | Standalone natural based solutions |
| Qinzhou Slope protection project Slope protection project | 100% | Drought and strong wind | wind and flood resilience design and material | Standalone natural based solutions |
| Urban and Rural Elderly Caring Demonstration Base Health Management Service Center High-performance exterior wall insulation and decoration integrated board | 100% | Heat and cold | Higher building and material standards | Standalone natural based solutions |
| Urban and Rural Elderly Caring Demonstration Base Health care and retirement center High-performance exterior wall insulation and decoration integrated board | 100% | Heat and cold | Higher building and material standards | Standalone natural based solutions |
| Health Management Service Center Green and low carbon Energy saving doors and windows | 100% | Wind, heat, drought, flood | Energy saving material and design | Standalone natural based solutions |
| Health Management Service Center | 100% | Wind, heat, drought, | Higher building and material | Standalone natural based |

| | | | | |
|---|---|---|---|---|
| Green and low carbon Outdoor Engineering (Plumbing and Electricity) | | flood | standards | solutions |
| Health care and retirement center Green and low carbon Outdoor Engineering (Plumbing and Electricity) | 100% | Wind, heat, drought, flood | Higher building and material standards | Standalone natural based solutions |
| Health care and retirement center Green and low carbon Energy saving doors and windows | 100% | Wind, heat, drought, flood | Energy saving material and design | Standalone natural based solutions |
| Health Management Service Center Green and low carbon Garden greening | 100% | Flood and strong wind | wind and flood resilience design and material | Standalone natural based solutions |
| Health care and retirement Green and low carbon Garden greening | 100% | Flood and strong wind | wind and flood resilience design and material | Standalone natural based solutions |
| Health care and retirement Green and low carbon Water saving sanitary ware | 100% | Flood and drought | New water technology | Standalone natural based solutions |
| Health Management Service Center Green and low carbon Water saving sanitary ware | 100% | Flood and drought | New water technology | Standalone natural based solutions |

Source: TrTA consultant.

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

295. **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

296. **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.

297. **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.

298. 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

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

## A. No Subproject Alternative

301. If the Qinzhou District 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;
- 42,700 residents of Pingnan Town, and particularly vulnerable groups including 20,300 women and 3,211 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 555,388 residents of Qinzhou District will not indirectly benefit from the subproject as secondary beneficiaries, including approximately 326,576 women, 13,933 EM people, and 49,355 low-income people.

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

## B. Types of Coolants

303. The subproject will use coolants for controlled atmosphere storage. The coolants are not determined in the domestic FSR. The coolants suitable for controlled atmosphere storage are medium temperature coolants (condensing pressure is less than 20kg/cm and evaporating temperature is more than -60 °C). The potential candidates of the coolants include R22 (a widely used coolant in the past in China), R407F and R 507. Comparation of these coolants are presented in **Table VI-1**.

**Table VI-1:** Comparison of Coolants

| No. | Factor | R22 | R507 | R407F |
|---|---|---|---|---|
| 1 | Global Warming Potential | 1700 | 3985 | 1825 |
| 2 | Ozone depletion | Contains ozone-depleting substances | Does not contain ozone-depleting substances | Does not contain ozone-depleting substances |
| 3 | Comparison | R22 will be prohibited in developed countries from 2020 and developing countries from 2030 base on the Montreal Protocol. Hence not recommended. | High global warming potential, not recommended | Recommended since it does not contain ozone-depleting substances and lesser global warming potential compared to R507 |

304. The coolants with a lower climate impact shall be used and the coolants shall not

contain ozone-depleting substances.

## C. Treatment of Rural Wastewater

305. Two engineering designs were considered for wastewater treatment stations (WWTSs), based on cost, projected waste volumes, and locations: (i) Chinese made septic systems using conventional anaerobic/aerobic (A/O) process; and (ii) integrated equipment using the anaerobic-anoxic-MBR method) (**Table VI-2**).

306. The A/O process consists of a sequential anaerobic and aerobic stage for the biological phosphorus removal. The A/O process has been widely used for sewage treatment in both urban and rural areas and is favored for its high efficiency and low energy consumption. The anaerobic-anoxic-MBR method is a wastewater treatment method whose main purpose is to remove nitrogen and phosphorus from wastewater, and reaction tank is configured by three tanks which are called anaerobic tank, anoxic tank, and MBR tank.

307. Because protection of the surface water is necessary for ecology environment improvement, anaerobic-anoxic-MBR method options will be adopted for the subproject for water recycling.

**Table VI-2:** Options for the Rural Wastewater Treatment Process

| Item | Option I - A/O Septic System | Option II - anaerobic-anoxic-MBR Septic System |
|---|---|---|
| Scope of application | Suitable for a few households, single villas, requires common quality influent water | Suitable for towns, residential communities, adaptable to a large range of intake water quality |
| Effluent quality | Effluent quality can meet the standard, and the process is stable. | Effluent quality is good and process is stable. |
| Operation | Fully automatic control, unattended operation, convenient maintenance, and management | Resistance to heavy load, automatic control, unattended operation, use solar energy, convenient maintenance, and management |
| Location and land occupation | Small land occupation, can be buried underground installation and flexible location | Small land occupation, can be buried underground installation and flexible location. |
| Works and Investment | Less civil works, no need for on-duty room, less investment | Less civil works, no need for on-duty room, less investment |
| Operational cost | Automatic operation, low management cost | Automatic operation, low management cost |
| Secondary pollution | A little sludge needed to be drained regularly | A little sludge needed to be drained regularly |
| Facility maintenance | High-strength equipment, stable operation and simple maintenance. | High-strength equipment, stable operation and simple maintenance. |

Source: FSR 2022, DEIA 2022.

## D. Agricultural technologies adopted

308. 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.

309. 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.

310. 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.

## E. Overall Alternative Analysis

311. 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

312. 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.

313. 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. [29]

314. 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.

315. 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.

316. 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

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

318. 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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[29] 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.

319. 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

320. 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.

321. 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=20530k761W). 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 Tianshui 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—秦州区子项目 环境影响报告表

—@— 发表于 2022-05-30 17:05

Project description

根据生态环境部《环境影响评价公众参与办法》（部令 第4号）规定，现面向社会公众进行第一次环境信息公示，以征求意见。

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中子项，建设于甘肃省天水市秦州区平南镇孙集村，总投资51015.46万元，由亚行贷款和国内配套资金组成。主要建设内容包括包括养老中心、健康管理服务中心、护坡工程、生态碳汇林、中草药有机种植基地、有机果蔬大棚、低碳乡村智慧景区及锅炉房、污水处理站等配套设施，总占地面积166.87hm$^2$。

二、**主要环境影响及治理措施**

1、生态环境

（1）施工期：主要防治水土流失及施工扰动对区域动植物影响。

防治措施：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。开挖土石方严格按环评中提出的措施实施，严禁随意排放；对作业人员进行教育，提高环保意识；加强生态环境建设；合理安排施工时序，减少土石方开挖量，禁止土方、石渣乱堆乱放，边开挖、边回填、边碾压、边采取挡渣防护措施，尽量避开雨季施工；料场及临时堆渣场应要盖篷布，采取上述措施后，施工期对生态环境影响较小。

（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面源影响。

防治措施：灌溉就近引水，使用滴灌等节水灌溉措施，可有效节约水资源；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

Mitigation measures

施工废气主要为扬尘，防治措施如下：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，运输车辆全要盖；并及时清理、粉状材料堆放必须有防尘防雨棚或采用篷布要盖；减少传播：设置围挡、限制车速及承载量。

（2）运营期

2台2.8MW燃气锅炉分别配备低氮燃烧器及8m排气筒；各子项垃圾及时清理，污水处理站各处理池密封，并定期投放除臭剂。

3、声环境

项目建设及运行过程中主要噪声均来及机械设备运行。为防治噪声影响，采取以下措施：选用低噪声施工机械设备；加强设备维护，保障施工机械正常运行；固定设备合理布局并设置减振基础；施工时临近敏感点进行遮挡，禁止夜间施工。

4、水环境

（1）施工期

混凝土养护废水通过蒸发全部损耗，无外排；施工人员生活污为盥洗废水，成分简单，用于泼洒降尘；施工期严禁废水及其他污染物外排。

（2）运营期

锅炉废水及健康管理服务中心废水进入污水处理站处置，达到满足《医疗机构水污染物排放标准》（GB 18466-2005）及《城市污水再生利用 绿地灌溉水质》（GB/T 25499-2010）用于厂内绿化灌溉；其他各子项生活污水均接入健康管理中心西侧污水处理站，此污水处理站正在建设中，规模为1000m$^3$/d。

5、固体废物污染防治

（1）施工期

废弃土方用于施工后期场地平整及绿化平整；生活垃圾集中收集，定期清运至镇区垃圾收集点；建筑垃圾集中暂存，统一清运至市政指定地点处置。

（2）运营期

每子项均配备生活垃圾桶，配备生活垃圾转运车统一收集项目区生活垃圾转运至秦州区生活垃圾填埋场；配备医疗废物转运车将健康管理服务中心医疗废物每天转运至秦州区医疗废物暂存处。

设置废弃物回收点，尾菜、农膜、农药包装物、化肥包装物等农业生产固废分类收集，定期清运至甘州区相关回收部门进行处置；回收点均需进行硬化防渗。

三、**征求意见方式**

Request for questions, suggestions and feedback from the public

（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，反馈对本项目建设在环保方面的意见或建议。

（2）公众意见表的网络链接：https://www.wjx.cn/vm/rhq3xv8.aspx。

（3）建设单位：甘肃文旅集团国际金融组织贷款项目管理办公室

联 系 人：裴利银　　联系电话：19993811755

报告编制单位：甘肃恒鑫创新科技发展有限公司

联 系 人：杜明倩　　联系电话：18189558615

E-mail：1181252047@qq.com

Contact information of the EIA institute and Sub-PMO

Source: TrTA consultant., 2022.

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

323. 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

324. 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 draft EIA was developed. 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 Sunji Village (first round)

Survey in Sunji Village (first round)

Meeting in Sunji Village (first round)

Survey in Sunji Village (second round)

Survey in Sunji Village (second round)

Survey inSunji Village (second round)

Meeting in Sunji Village (second round)

Survey in Sunji Village (second round)

Source: TrTA consultant.

325. 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** | | 116 Participants | % |
|---|---|---|---|
| Gender | Male | 62 | 53.4% |
| | Female | 54 | 46.6% |
| Age Group | <20 | 9 | 7.8% |
| | 20-40 | 38 | 32.8% |
| | 41-60 | 42 | 36.2% |
| | ≥60 | 27 | 23.3% |
| Education | Illiterate | 6 | 5.2% |
| | Primary school | 12 | 10.3% |
| | Junior high school | 31 | 26.7% |
| | Senior high school | 27 | 23.3% |
| | Vocational school | 22 | 19.0% |
| | College and above | 18 | 15.5% |
| Ethnic | Han | 116 | 100.0% |
| | Hui (minority) | 0 | 0.0% |
| | Others (minority) | 0 | 0.0% |
| Occupation | Farmer | 75 | 64.7% |
| | Civil servant | 10 | 8.6% |
| | Employee | 19 | 16.4% |
| | Others | 12 | 10.3% |

**Table VII-2:** Results of the Questionnaire.

| Name | Sex | Age | |
|---|---|---|---|
| Education level | Occupation | Nationality | |
| Contact information | | | |
| **Question** | **Choices** | **Yes** | **Comments** |
| | Ambient air | 26 | 22.4% |
| | Noise | 27 | 23.3% |

| | | | |
|---|---|---|---|
| 1. In your opinion, what are the major environment pollution issues in your areas? | Surface water | 12 | 10.3% |
| | Groundwater | 9 | 7.8% |
| | Soil | 8 | 6.9% |
| | Solid waste | 23 | 19.8% |
| | Odor | 3 | 2.6% |
| | Other concern | 8 | 6.9% |
| 2. Distance between your working place and project site | <1 km | 52 | 44.8% |
| | 1-3 km | 41 | 35.3% |
| | 3-5 km | 14 | 12.1% |
| | > 5km | 9 | 7.8% |
| 3. Distance between your house and project site | <1 km | 42 | 36.2% |
| | 1-3 km | 48 | 41.4% |
| | 3-5 km | 15 | 12.9% |
| | > 5km | 11 | 9.5% |
| 4. Do you know this project before this public consultation? | Yes | 105 | 90.5% |
| | No | 11 | 9.5% |
| 5. Do you understand the potential adverse impacts during the construction of the proposed project subprojects? | Clearly understand | 77 | 66.4% |
| | Somewhat understand | 23 | 19.8% |
| | Barely understand | 10 | 8.6% |
| | Do not understand | 6 | 5.2% |
| 6. What would be the major impacts during project construction? | Noise | 43 | 37.1% |
| | Dust | 36 | 31.0% |
| | Solid waste | 22 | 19.0% |
| | Traffic congestion | 9 | 7.8% |
| | No major impacts | 6 | 5.2% |
| 7. After learning about mitigation measures during the construction, do you accept anticipated construction phase impacts? | Accept | 88 | 75.9% |
| | Barely accept | 18 | 15.5% |
| | Do not accept | 5 | 4.3% |
| | Have no idea | 5 | 4.3% |
| 8. Do you understand all the anticipated environmental and health and safety adverse impacts of the project during operation? | Clearly understand | 88 | 75.9% |
| | Somewhat understand | 15 | 12.9% |
| | Barely understand | 7 | 6.0% |
| | Do not understand | 6 | 5.2% |
| 9. What are the major impacts of this project during operation period? | Air pollution | 11 | 9.5% |
| | Noise pollution | 32 | 27.6% |
| | Waste water pollution | 19 | 16.4% |
| | Soil pollution | 8 | 6.9% |
| | Solid waste pollution | 28 | 24.1% |
| | Odor gas | 1 | 0.9% |
| | Impacts associated with increased tourists | 9 | 7.8% |
| | No major impacts | 8 | 6.9% |
| 10. Do you accept the adverse impacts of the project after you understand the mitigation measures? | Accept | 90 | 77.6% |
| | Barely accept | 15 | 12.9% |
| | Do not accept | 5 | 4.3% |
| | Have no idea | 6 | 5.2% |
| **Question** | **Choices** | | |
| 11. Do you think construction of this project can improve local economic development or not? | Yes | 116 | 100% |
| | No | 0 | 0 |
| | I do not know | 0 | 0 |
| 12. Do you support the project? | Yes | 116 | 100% |
| | No | 0 | 0 |
| | I do not know | 0 | 0 |
| Suggestions or requirements for environment protection of the project | | | |

326. Of the respondents in the public consultation meeting, 90.5% knew about the subproject either from other people, newspapers, or information signs. The top three

environmental issues respondents identified in their neighborhoods are noise (23.3%), ambient air (22.4%) and solid waste (19.8%). Noise (37.1%), dust (31.0%) and solid waste (19.0%) were identified as the top three issues during the construction phase. Only 5.2 % of the respondents indicated that they didn't understand the adverse impacts of the subproject during the construction period. Noise (27.6 %), solid waste (24.1%) and waste water (16.4%) 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**).

327. 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

328. 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. 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

329. 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.

330. 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.

331. 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.

332. 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)[30] published updated Measures on Environmental Letters and Visits (Decree No. 15) in December 2010.

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

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

## IX. PROJECT ASSURANCES

334. 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

335. 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.

336. The subproject is aligned with ADB's Strategy 2030. The proposed project activities in six rural towns in five project counties/districts for five 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 Qinzhou District of Tianshui 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%).

337. The primary beneficiaries of the Qinzhou District Subproject will be 42,700 residents in Pingnan Town, including 2,640 persons in one subproject village. In addition, the 555,388 population in Qinzhou District will indirectly benefit from the subproject as secondary beneficiaries, including approximately 326,576 women (49.73% of the beneficiaries), 13,933 EM people (2.12%), and 49,355 low-income people (7.52%).

338. The subproject will directly benefit vulnerable groups including 20,300 women and 3,211 low-income people (or 7.52%) 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.

339. 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, or rare or threatened flora or fauna species.

340. Potential negative operation phase impacts include water usage, wastewater discharge, solid waste management, 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, good waste and health and safety management practices and safety plans. Detailed mitigation measures are presented in the EMP (**Appendix 1**).

341. **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 0.21 million $m^3$ 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 875.2 tons per year, and reduced use of pesticides by about 2.2 tons and insecticides by 0.7 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 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.

342. 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.

343. **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.

344. 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 QINZHOU DISTRICT SUBPROJECT

## Prepared by the Provincial Government of Gansu for the Asian Development Bank

## A. Objectives

1. This environment management plan (EMP) is for the Qinzhou District 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

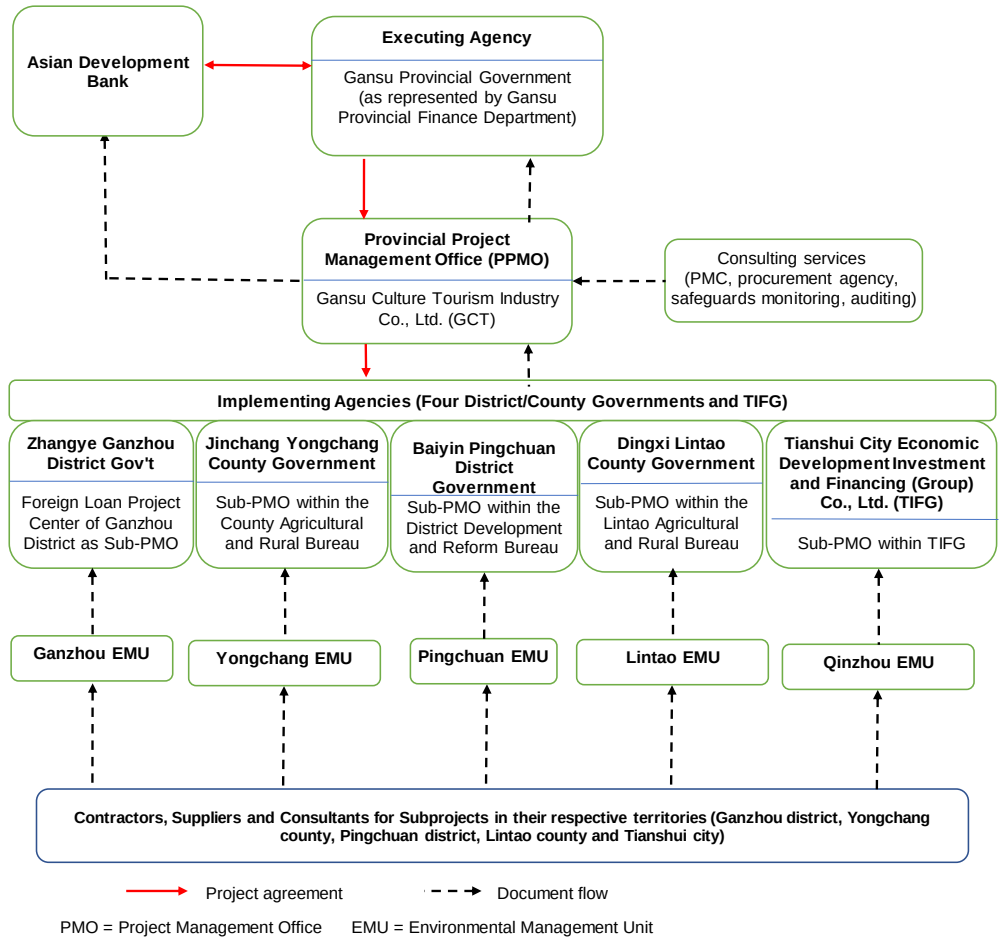
4. The Gansu Provincial Government will be the executing agency (EA) for the project and has established a provincial project management office (PPMO) under Gansu Culture Tourism Industry Co. Ltd. (GCT) to manage project preparation and implementation. The implementing agency (IA) of Qinzhou District Subproject will be Qinzhou District Government for project components in Ganzhou District and the IAs for other subprojects will be Qinzhou District Government for project components in Qinzhou District, Qinzhou District Government for project components in Qinzhou District, Qinzhou District Government for project components in Qinzhou District, 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.

**Table EMP-1:** Summary of Institutional Responsibilities for EMP Implementation.

| Agency | Role and Responsibility |
|---|---|
| Gansu Provincial Government (represented by Gansu Provincial Finance Department) | • The project executing agency (EA) and contact point for ADB.<br>• Responsible for overall implementation and compliance with loan assurances and the EMP.<br>• Establishes provincial level project management office (PPMO)<br>• Overall accountability and responsibility for project planning, management, and implementation<br>• Ensure timely and effective execution of the loan agreements<br>• Coordinate with ADB |
| 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) | **Overall project management and environment safeguards**<br>• Supervise and manage daily project implementation<br>• Recruit and manage design institutes, procurement agents, consultants, in accordance with government and ADB regulations<br>• Submit bidding documents, bid evaluation reports and other documents as needed to ADB for endorsement<br>• Coordinate with ADB on all aspects of project implementation<br>• Assign 1 PPMO Environment Officer and 1 PPMO Social Officer<br>• Engage PMC and LIEC<br>**Role of the PPMO Environment Officer (full-time):**<br>• Update IEE and/or EMP as needed, especially during the stage of detailed engineering designs<br>• Ensure that the EMP, especially all relevant mitigation measures, are included in the detailed engineering designs<br>• Establish and coordinate implementation of the GRM<br>• Supervise the implementation of mitigation measures during project design, construction, and operation<br>• Ensure that environmental management, monitoring, and mitigation measures are incorporated into bidding documents, construction contracts and operation management manuals<br>• Respond to any unforeseen adverse environmental impacts and take corrective actions as needed<br>• Ensure project compliance with the environmental safeguard assurances in the loan and project agreements<br>• Receive safeguard reports from the EMUs (see next row) and review and compile these<br>• Prepare annual environment monitoring reports to ADB |
| (i) Ganzhou District Government, (ii) Qinzhou District Government, (iii) Qinzhou District Government, (iv) Qinzhou District Government, and (v) Tianshui City Economic Development Investment and Financing (Group) Co., Ltd. | • The project implementing agencies (IAs).<br>• Establish Sub-PMO.<br>• 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.<br>• 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. |
| Sub-PMO | • Daily coordination, monitoring, and reporting of all aspects of administration for each subproject and their components |

| Agency | Role and Responsibility |
|---|---|
| | • Carry out procurement of contract packages to its related subproject, with the assistance with Procurement Agency and PICs;<br>• Organize, participate and/or facilitate capacity building activities;<br>• Submitting annual environmental monitoring and semi-annual progress reports to PPMO<br>• Coordinating the GRM<br>• Responding to any unforeseen adverse impacts. |
| Environmental Management Units (EMUs) | • Daily coordination, monitoring, and reporting of all aspects of safeguards for each subproject and their components<br>• Supervising the implementation of mitigation measures during subproject design, construction and operation, including the implementation of contractors' site-EMPs<br>• Ensuring that environmental management, monitoring, and mitigation measures are incorporated into bidding documents, construction contracts and operation management manuals<br>• Act as local entry point for the project GRM<br>• Assess contractors' compliance with EMP and PRC environmental quality standards for ambient air, water, and noise quality<br>• Submit quarterly inspection results to the Sub-PMO environment officers, for review, verification, and confirmation |
| Loan Implementation Start-Up Consultant (Environment) (national; continuous; short-term in the earliest stage of project effectiveness) | • 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<br>• Work with the PPMO and EMU safeguard officers<br>• Especially, assist establishment of the grievance redress mechanism<br>• 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<br>• Assist PPMO as needed to review and/or update the TOR for the external environment monitoring agency<br>• Assess whether any changes have been made to the project design and/or whether the detailed engineering designs require any update to the EMP |
| Loan Implementation Environmental Consultant (LIEC) (intermittent throughout project) | • To be recruited under the loan implementation consulting services<br>• Assist in updating the EMP and environmental monitoring program, as needed<br>• Support the PPMO and EMUs social-and-environment safeguard officers to plan, coordinate, monitor, and report on implementation of the EMP<br>• Assist the PPMO environment officer to prepare the annual environment monitoring reports to ADB<br>• 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)<br>• Help identify any environment-related implementation issues and propose corrective actions<br>• Undertake site visits for EMP inspection as required |
| External environment monitoring agency (EMA, intermittent throughout project) | • Several qualified independent environmental monitoring agencies will be recruited to implement the ambient monitoring portion of the environmental monitoring plan. |
| Contractors (intermittent throughout construction) | • Prepare CEMPs which detail the means by which the contractors will comply with the EMP.<br>• 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.<br>• Identify a lead focal point for environmental issues ( Environment, Health and Safety Officer) who will oversee CEMP and Occupational Health and |

| Agency | Role and Responsibility |
|---|---|
| | 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.<br>• Report any spills, near misses, accidents, and grievances received, and take appropriate action.<br>• Responsible for implementation of resolutions identified during GRM operation during the construction phase. |
| Construction supervision company (intermittent throughout construction) | • 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<br>• Supervise construction progress and quality<br>• Appoint qualified EHS officer for regular onsite supervision of contractors<br>• Supervise the contractor's EMP implementation performance<br>• 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<br>• Submit monthly EMP monitoring reports to Sub-PMO and EMUs |
| Asian Development Bank | • Oversee project administration and timely execution of the loan agreements by the executing and implementing agencies<br>• Disburse loan proceeds<br>• Review procurement, consultant recruitment, progress reports, and audit reports<br>• Review project compliance and targets against the design and monitoring framework, EMP, and project administration manual<br>• Review and endorse updated IEE and EMP as needed<br>• Monitors project progress and conducts review missions<br>• Discloses monitoring reports on ADB public website |

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 |
|---|---|---|---|---|
| **A. DESIGN AND PRE-CONSTRUCTION PHASE** | | | | |
| **Detailed design stage** | Institutional strengthening for EMP implementation and supervision | • At least 2 months before any construction, PPMO engages LIEC.<br>• At least 2 months before any construction, provide training to all environmental staff for EMP implementation and supervision.<br>• 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.<br>• Confirm that at least one certified EMA has been recruited for the subproject at least 2 months before any construction.<br>• **Coronavirus (COVID-19) safety management – prescreening ahead of works**. 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. | PPMO, Sub-PMO/EMU | PPMO |
| | Updating EMP | **Update the mitigation measures defined in this EMP**<br>• Update the EMP as needed, based on the final detailed designs.<br>• Submit the updated EMP to ADB for review.<br>**Changes in project locations or scope**<br>• 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. | Sub-PMO/EMU, LIEC, DEIA Team | EEBs, ADB |
| **Construction Preparation** | Environmental monitoring plan | • Prepare detailed monitoring plan in accordance with the monitoring plan in this EMP.<br>• Prior to construction, the Sub-PMO or EMU will hire EMAs for environmental monitoring. | Sub-PMO/EMU | PPMO |
| | Bidding and contract documents | • Mitigation measures in the EMP are incorporated in all bidding documents.<br>• Bidding documents are submitted to ADB for review.<br>• Prepare environmental contract clauses for contractors. | Tendering Agency, Sub-PMO, PPMO | ADB |
| | EMP training | • 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, EMU, contractors, and CSCs, in accordance with the training plan in this EMP. | LIEC | PPMO, EEB |
| | Establish GRM | • 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.<br>• PPMO and EMU personnel will be aware of, and trained in, the GRM, and will help support the environmental and social officers when necessary.<br>• 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. | PPMO, Sub-PMO/EMU | ADB |

| Item | Potential impacts / issues | Mitigation measures | Who implements | Who supervises |
|---|---|---|---|---|
| | Site EMPs | • 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. | Contractors | CSC, Sub-PMO, LIEC |
| | | • Review and ensure site EMP complies with the measures in this EMP. | PPMO, Sub-PMO/EMU | LIEC, EEB |
| **B. CONSTRUCTION PHASE** | | | | |
| **Topography and Soils** | Earthwork, soil erosion, soil contamination | • 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.<br>• Land excavation and filling will be balanced so as to minimize the requirement for fill material sourcing and transportation.<br>• For the slope protection works, plan and implement construction in staged sections (≤500 m), with one section completed and stabilized before beginning the next. Construct intercepting channels to prevent runoff from entering nearby waterways. Provide temporary detention ponds or containment to control silt runoff. Limit construction and material handling, during rainy and high wind days.<br>• 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).<br>• 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.<br>• Construction and material handling, in particular for the excavation works, will be limited during rain (rainy season is May to September) and high winds.<br>• During earthworks, the area of soil exposed to potential erosion at any time will be minimized through good project and construction management practices.<br>• Spoil and aggregate (which will be purchased from the local suppliers) piles will be covered with landscape material and/or regularly watered.<br>• Waste construction material such as residual concrete, asphalt, etc., will be properly handled for reuse or disposal.<br>• Earthwork areas will be stabilized within 15 days after earthworks have ceased at the sites.<br>• Construction camps and storage areas will be situated to minimize land area required. | Contractors | CSC, Sub-PMO/EMU, EEB, WRB, LIEC |

| Item | Potential impacts / issues | Mitigation measures | Who implements | Who supervises |
|---|---|---|---|---|
| | | • Construction wastes will be removed from the site to approved disposal sites<br><br>**Disposal of spoil (surplus spoil), if required**<br>• 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 Tianshui City. 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 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<br>• Use the existing and EEB approved disposal sites in Tianshui City.<br><br>**Borrow pits, if required**<br>• 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.<br>• No new borrow sites will be established for the subproject.<br>• 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 | | |
| **Soil and water contamination** | Impact from wastewater, fuels, solid wastes | • Labor camps, fuel storage, machinery maintenance workshop and vehicle cleaning areas must be stationed at least 500 m away from waterways.<br>• Storage facilities for fuels, oil, and other hazardous materials will be within secured areas on impermeable surfaces and provided with bunds and cleanup installations.<br>• Prior to any earthworks along rivers and channels, install sediment traps and curtains, to minimize sediment runoff.<br>• Collect construction wastewater in retention ponds and filter tanks to remove silts, oil.<br>• Equip machine wash-down sites with water collection basins and sediment traps.<br>• Install oil-water separators before the sedimentation tank for oily wastewater treatment.<br>• Equip all sites for washing of construction equipment with water collection basins and sediment | Contractors | CSC, Sub-PMO/EMU, PPMO, LIEC |

| Item | Potential impacts / issues | Mitigation measures | Who implements | Who supervises |
|---|---|---|---|---|
| | | traps.<br>• Install portable toilets at worksites and on-site wastewater pre-treatment systems for worker camps along with maintenance protocols.<br>• 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 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.<br>• Contractors will develop actions for control of oil and other dangerous substances as part of their site EMPs.<br>• 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). | | |
| **Ambient Air** | Dust generated by construction activities, gaseous air pollution ($SO_2$, CO, $NO_x$) from construction machinery and asphalt pavement | • 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<br>• Storing petroleum or other harmful materials in the appropriate places and covering to minimize fugitive dust and emission.<br>• Transport vehicles will be limited to low speeds at construction sites.<br>• 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.<br>• 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.<br>• Transport routes and delivery schedules will be planned to avoid densely populated and sensitive areas, and high traffic times.<br>• 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.<br>• Temporary fencing will be erected around dusty activities.<br>• 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.<br>• Muddy or dusty materials on public roads outside the exits of works areas will be cleaned immediately.<br>• Disturbed site will be revegetated as soon as possible after the completion of works<br>• Ensure emissions from vehicle and machinery comply with PRC standards of GB18352-2005, GB17691-2005, GB11340-2005, GB2847-2005, and GB18285-2005.<br>• Commercial concrete will be purchased. Purchase pre-mixed asphalt for road surface paving. | Contractors | CSC, Sub-PMO/EMU, PPMO, LIEC |

| Item | Potential impacts / issues | Mitigation measures | Who implements | Who supervises |
|---|---|---|---|---|
| | | On-site asphalting and concrete batching are prohibited. | | |
| **Noise and vibration** | Noise and vibration generated from construction activities | **Noise**<br>• Ensure construction machinery conform to PRC standard of GB12523-2011. Properly maintain vehicles and machineries to minimize noise.<br>• Apply noise reduction devices or methods where noisy machinery is operating, within 200 m of sensitive sites.<br>• 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.<br>• 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.<br>• 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<br>• Place temporary hoardings or noise barriers around noise sources during construction.<br>• 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.<br>• Conduct interviews with residents adjacent to construction sites to identify and resolve issues, including adjustment of work hours of noise-generating machinery.<br>• Concrete mixing is prohibited. Commercial concrete will be purchased.<br>• 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.<br><br>**Vibration**<br>• High noise activities, such as compaction operations, will be prohibited at night (between 20:00 and 06:00);<br>• 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 | Contractors | CSC, Sub-PMO/EMU, PPMO, LIEC |

| Item | Potential impacts / issues | Mitigation measures | Who implements | Who supervises |
|---|---|---|---|---|
| | | • If there are buildings near to high impact areas, pre- construction crack surveys and post construction crack surveys will be conducted with proper records | | |
| **Solid Waste** | Solid waste generated by construction activities and from workers' camps | • 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.<br>• The lead construction contractor will be responsible for providing sufficient construction waste dumpsters at all work sites, and sufficient covered waste 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<br>• The lead construction contractor will be responsible for recycling and reusing construction wastes to the extent possible (including concrete and brick debris).<br>• The lead construction contractor will be responsible for ensuring regular collection and transport of domestic recyclables to appropriate authorities and remaining wastes to Tianshui 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.<br>• Littering by workers will be prohibited.<br>• 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).<br>• There should be no final waste disposal on site. Waste incineration at or near the site is strictly prohibited.<br>• 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. | Contractors | CSC, Sub-PMO/EMU, PPMO, LIEC |
| **Ecology** | Impacts to vegetation and flora and fauna | • Clearance of vegetation will be restricted to construction sites.<br>• Prior to construction, any adjacent areas of vegetation or habitat will be clearly demarcated as no-go zones for workers and machinery.<br>• 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 registered in local Gardens Bureau.<br>• 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 | Contractors | CSC, Sub-PMO/EMU, PPMO, LIEC |

| Item | Potential impacts / issues | Mitigation measures | Who implements | Who supervises |
|---|---|---|---|---|
| | | Academy of Agricultural Sciences), available at http://www.chinaias.cn/wjPart/index.aspx | | |
| **Physical cultural resources** | Damage to known or unknown above or below-ground cultural relics | **Implement the following chance-find procedure at all sites:**<br>• 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.<br>• Contractor is to immediately report these to the CSC and EMU.<br>• If an artefact is found during this check or during works, stop works immediately. Notify the CSC and EMU.<br>• The EMU notify the PPMO and Cultural Relics Bureau.<br>• 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. | Contractors, CSC | Sub-PMO/EMU, LIEC, cultural relic bureau |
| **Community and occupational health and safety** | Community consultation, health, and safety | **Community consultations**<br>• 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.<br>• 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.<br>• Record all community feedback and solutions discussed and agreed.<br>• 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.<br><br>**Community health, safety, and minimizing disruption to daily life and utilities**<br>• 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;<br>• 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. | Contractors, CSC | CSC, Sub-PMO/EMU, PPMO, LIEC |

| Item | Potential impacts / issues | Mitigation measures | Who implements | Who supervises |
|---|---|---|---|---|
| | | **Construction Site Protection**<br>• Install signs at construction sites to inform people of the project GRM, potential dangers (e.g. moving vehicles, hazardous materials, excavations) and safety issues.<br>• Install safety barricades around all excavations, including open trenches.<br>• Assign personnel to direct pedestrians around dangerous work areas.<br>• Ensure that all sites are secure, discouraging access through appropriate fencing.<br>• Lock and secure all work sites to prevent unauthorized access.<br>• Night-time (8:00pm – 6:00am) use of heavy machinery is strictly prohibited.<br>• Site-specific EMP for landslide-based woks and emergency preparedness and response plan will be prepared following GIP guidance such as INGAA Guidelines for Management of Landslide Hazards for Pipelines (2020) [31] and the USGS Landslide Preparedness [32] to reduce potential health and safety risks from landslide-based woks. The nearby residents will be informed of the potential risks, site-specific EMP and the emergency preparedness and response plan. | | |
| | Occupational health and safety | Prepare **Environmental, Health and Safety (EHS) plan**, to include:<br>• worker campers will be constructed following IFC's Workers' accommodation: processes and standards;<br>• clean and sufficient supply of fresh water for construction sites, camps, offices;<br>• sufficient latrines and other sanitary arrangements at construction sites and work camps;<br>• waste receptacles and regular emptying;<br>• provision of PPE as needed, in accordance with health and safety regulations (e.g., safety boots, helmets, gloves, protective clothing, respirators, goggles, and earplugs).<br><br>Prepare **Emergency Preparedness and Response Plan** for accidents and emergencies, including environmental and public health emergencies associated with hazardous material spills and similar events, potential landslides and working in proximity to water bodies.<br>• 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.<br>• 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.<br>• Occupational health and safety matters will be given a high degree of publicity to all work | Contractors EHS Officer | CSC, Sub-PMO/EMU, PPMO, LIEC |

[31] Available at: https://www.ingaa.org/Foundation/FDNreports/38063.aspx
[32] Available at: https://www.usgs.gov/programs/landslide-hazards/landslide-preparedness.

| Item | Potential impacts / issues | Mitigation measures | Who implements | Who supervises |
|---|---|---|---|---|
| | | personnel and posters will be displayed prominently at construction sites.<br>• 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.<br>• Provide personal protection equipment to workers as needed, e.g. safety boots, helmets, gloves, protective clothing, goggles, ear protection, life rings and buoyancy aids.<br>• 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<br><br>**COVID-19.** Prepare and implement a **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<br>• measures to record the locations that workers have visited/lived immediately before and during project work;<br>• schedules for disinfecting/cleaning offices, yards, stores and labor camps;<br>• measures to implement temperature checks and other health checks on site;<br>• physical distancing measures, particularly in worker camps;<br>• requirements for mandatory use of personal protective equipment such as facemasks, and provision of handwashing stations, hand sanitizers, and other appropriate protective measures;<br>• how workers and residents living near project sites will be provided with information to protect themselves from COVID-19;<br>• procedures to be adopted in the event a worker is suspected to have contracted COVID-19; and<br>• other COVID-19 prevention and control measures appropriate for the local context.<br>**Slope protection works for landslides and collapsed slopes.** Site-specific EMP for landslide-based works including an emergency preparedness and response plan will be prepared following GIP guidance such as INGAA Guidelines for Management of Landslide Hazards for Pipelines (2020) and the USGS Landslide Preparedness to reduce potential health and safety risks from landslide-based woks. The plan will include<br>• Installation of warning signs, fences around the sites<br>• Training and awareness improvement plan<br>• Mitigation measures to reduce health and safety risks<br>• Traffic management during construction | | |

| Item | Potential impacts / issues | Mitigation measures | Who implements | Who supervises |
|---|---|---|---|---|
| | | • Regular inspection of the construction sites before, during and after the construction and/or during and after the rain.<br>• Action plan if any risk is observed.<br>• Water drainage methods<br>Emergency preparedness and response plan | | |
| **C. OPERATION PHASE** | | | | |
| **Wastewater** | Discharge of Production and Domestic Wastewater | • Domestic wastewater will be collected and treated by Pingnan Town WWTS (component 1) and the WWTS of the component (component 2).<br>• Medical wastewater and boiler blow down from the component 2 will be treated by the WWTS of the component.<br>• Storm water and sewage will be drained separately. | EMU | LIEC, PPMO |
| **Air Pollution** | Pollution from the gas boilers | • The two boilers will be equipped with low NOx burner.<br>• Regular exhaust gas monitoring will be conducted. | EMU | LIEC, PPMO |
| **Noise** | Impact on Sensitive Receptors | • Site layout for the will be planned to reduce noise levels, especially with respect to sensitive receptors.<br>• 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.<br>• All equipment will be properly maintained to minimize noise.<br>• 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). | EMU | LIEC, PPMO |
| **Solid Waste** | Collection and Disposal | • For waste package materials (package for fertilizers and pesticides excluded), the waste package material will be sold out for recycling.<br>• For agricultural waste from the component 1, these waste will be recycled for organic fertilizer production in nearby organic fertilizer production plant.<br><br>For plastic film of the subprojects, mitigation measures are:<br>• 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;<br>• 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, | EMU | LIEC, PPMO |

| Item | Potential impacts / issues | Mitigation measures | Who implements | Who supervises |
|---|---|---|---|---|
| | | for sale to manufacturers for various uses. These centers are established and operating throughout farming areas of Gansu Province; and,<br>• Film mulching practices which optimize the timing of mulching and timely removal of film to shorten the mulching period.<br>• 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.<br><br>For waste packaging such as chemical fertilizer and pesticide, mitigation measures are:<br>• The project will result in significant reduction in the use of chemical fertilizers and pesticides, which will reduce the amount of plastic packaging;<br>• Training will be conducted for farmers on reducing the use of fertilizers and pesticides, and, responsible disposal of packaging; and<br>• Plastic packaging will be collected by manufacturers for subsequent recycling.<br><br>For waste from the component 2, mitigation measures are:<br>• Medical wastes from component 2will 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.<br><br>For other waste, the following mitigation measures will be implemented:<br>• Waste dumpsters and recycling bins will be provided at all sites.<br>• Domestic waste will be collected on a regular basis and disposed at the Tianshui Municipal Landfill by the local sanitary department<br>• Waste battery and waste PV panels will be recycled by manufactures<br>• Waste resin from the boiler room will be collected, transported and recycled by the manufacturers<br>• Publicity and education on domestic waste classification and collection will be provided to the tourists.<br>• During operation, sludge from the WWTS of the subproject will be concentrated by filter press and disinfected, then collected, stored and transported by 3rd party company for final treatment at Tianshui Municipal Landfill | | |
| **Agricultural Chemicals** | Environmental pollution | • Application of combined water and fertilizer application through drip irrigation systems<br>• Conversion of field-based farming to greenhouse farming (resulting in less exposure to pests)<br>• Utilization of physical pest control methods (lamps with sticky pads) and biological pest control methods<br>• Safe storage of pesticides in a specific room, with limited access<br>• Training of staff and farmers in integrated pest management | EMU | LIEC, PPMO |

| Item | Potential impacts / issues | Mitigation measures | Who implements | Who supervises |
|---|---|---|---|---|
| | | • PPE will be provided to staff and farmers.<br>• Usage of pesticides which are classified as “hazardous” or for restricted-use by WHO and/or the government will be prohibited | | |
| **Chemicals and Hazardous Materials** | Negative impacts on human health and the environment | • 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.<br>• All chemicals, toxic, hazardous, and harmful materials will be transported in spill-proof tanks with filling hoses and nozzles in working order.<br>• 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.<br>• Good housekeeping procedures will be established to avoid the risk of spills.<br>• Spills will be dealt with immediately, and personnel will be trained and tasked with this responsibility.<br>• Workers will be properly trained before handling hazardous wastes and have the requisite protective equipment.<br>• 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.<br>• Hazardous wastes including oily waste and waste chemicals will be collected and disposed of by licensed contractors.<br>• The waste battery of the sightseeing vehicles will be recycled by manufactures during operation.<br>• Waste solar PV panel will be recycled by manufactures during operation.<br>• The coolants with a lower climate impact shall be used and the coolants shall not contain ozone-depleting substances. | EMU | LIEC, PPMO |
| **Occupational and community health and safety** | Occupational and community health and safety | • 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:<br>• 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.<br>• Nearby communities will be informed of the potential risks of the project operation.<br>• Training will be provided to workers on occupational health and safety, and emergency response.<br>• Vehicles will slow down and not use their horn when passing through or nearby sensitive locations, such as residential communities, schools and hospitals. | EMU | LIEC, PPMO |

| Item | Potential impacts / issues | Mitigation measures | Who implements | Who supervises |
|---|---|---|---|---|
| | | • 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.<br>• 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.<br>To minimize risks associated with leaks of natural gas, the following measures will be taken:<br>• All natural gas works will be in compliance with relevant PRC building code requirements, including the Code for Design of City Gas Engineering (GB 50028-2006) and Regulation on Electric Apparatus Design for Explosion and Fire Risk Environment (GB50058-92).<br>• The boiler rooms will be equipped with flammable gas detection, alarm and fire suppression systems. Electrical devices within the explosion risk area will be safety equipped.<br>• Gas pipelines will be grounded and equipped with anti-lightning devices where applicable.<br>• All gas related devices will be brightly colored and equipped with warning signs.<br>• The nearby communities will be informed of the potential risks fire and explosion, and the emergency response plan | | |

| Item | Potential impacts / issues | Mitigation measures | Who implements | Who supervises |
|---|---|---|---|---|
| **Emergency Response** | Emergency Response | An **Emergency Risk and Response Plan** 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 including the natural gas leakage and fire during operation. The plan must be established and in place before the project is operational.<br><br>**Indicative plan requirements are as follows:**<br>– Procedures for responding to different types of emergency situations will be identified in the response plan.<br>– Emergency exercises will be conducted and they should include different emergency scenarios.<br><br>**Training Requirements**<br>– 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:<br>– Initial training to all employees.<br>– When new equipment, materials, or processes are introduced.<br>– When emergency response procedures have been updated or revised.<br><br>**Annual Emergency Simulation**<br>– Simulated emergency exercises will be conducted at least annually.<br><br>**Receiving Notification of a Possible Emergency**<br>– When a supervisor receives a report of a possible emergency situation, he/she should obtain at minimum the following information from the reporting person:<br>– Name of person reporting emergency;<br>– Nature of emergency - leak, fire, interruption of service if leak, etc.<br>– Details of emergency: location, amount, what actions have been taken, etc.<br>– Leaks or other emergencies require prompt investigation.<br><br>**Immediate On-site Action**<br>– 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.<br>– If there is a gas leakage detected in the boiler room: | EMU | LIEC, PPMO |

| Item | Potential impacts / issues | Mitigation measures | Who implements | Who supervises |
|---|---|---|---|---|
| | | – Clear the building of all occupants.<br>– Eliminate potential ignition sources.<br>– Localize or isolate the problem and shut off gas as needed.<br>– Determine the extent of the hazardous area and establish a restricted area.<br>–<br>– 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.<br>–<br><br>**Communication with Public Officials**<br>• 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. | | |

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.<br>(ii) EMUs staffed appropriately.<br>(iii) Qualified LIEC recruited.<br>(iv) Qualified 3rd party environmental monitoring agencies engaged. |
| 2 | Budgeting | (i) Environment mitigation cost during construction and operation is sufficiently and timely allocated.<br>(ii) Environment monitoring cost is sufficiently and timely allocated.<br>(iii) Budget for capacity building is sufficiently and timely allocated. |
| 3 | Monitoring | (i) Compliance monitoring is conducted by Sub-PMO safeguard officers and LIEC.<br>(ii) Ambient air quality and noise monitoring is conducted by 3rd party environmental monitoring company. |
| 4 | Supervision | (i) ADB mission to review EMP implementation at least once a year during the construction phase.<br>(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.<br>(ii) Training on Construction Environmental Management Plans, ADB safeguard policy, EMP implementation, and GRM is provided prior to start of construction.<br>(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.<br>(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.

| Subject | Parameter/Methodology | Monitoring Location | Frequency | Implemented by | Supervised by |
|---|---|---|---|---|---|
| **A. Construction Phase** | | | | | |
| **Air Pollution** | Ambient dust monitoring (TSP, $PM_{10}$, $PM_{2.5}$) following PRC requirements | 2 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 |
| **Wastewater** | 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 |
| **Noise** | 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 |
| **Solid Waste** | 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 |
| **Hazardous and Polluting Materials** | Compliance inspections of implementation of hazardous materials management measures | Storage facilities for fuels, oil, chemicals and other hazardous materials. Vehicle and equipment maintenance areas. | Monthly during construction | Contractor EHS Officer, LIEC (periodically) | Sub-PMO, EEB |

| Subject | Parameter/Methodology | Monitoring Location | Frequency | Implemented by | Supervised by |
|---|---|---|---|---|---|
| **Flora and Fauna** | 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 |
| **Health and Safety and Emergency Response** | 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. Operation Phase** | | | | | |
| **Wastewater** | Wastewater sampling - COD, SS, pH, BOD, fecal coliform, petroleum, etc. following PRC GB/T 25499-2010 and GB 18466-2005 | One treated water sample from the WWTS | Semi-annually | EMA | EA, EEB |
| **Air Pollution** | Exhaust gas sampling – PM, SO2 and NOx | 2 samples from the two boilers | Annually | EMA | EA, EEB |
| **Solid Waste** | Compliance inspection to of operation phase solid waste management measures implementation | 2 sites (rotating), as selected by Sub-PMO | Semi-annually | EMUs | PPMO, LIEC, EEB |
| **Water Consumption** | Water consumption monitoring for the agricultural activities | All agricultural activities | Annually | EMUs | PPMO, LIEC, EEB |
| **Usage of Agricultural Chemicals** | Agricultural Chemicals consumption monitoring for the agricultural activities | All agricultural activities | Annually | EMUs | PPMO, LIEC, EEB |
| **Soil** | Soil quality sampling | Two replaced soil samples | Semi-annually | Qualified soil test company | PPMO, LIEC, EEB |

| Subject | Parameter/Methodology | Monitoring Location | Frequency | Implemented by | Supervised by |
|---|---|---|---|---|---|
| **Noise** | Noise monitoring (day and night Leq dB(A)) | 3 sites (rotating), as selected by Sub-PMO | Quarterly | EMA | PPMO, LIEC, EEB |
| **Health and Safety and Emergency Response** | 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 |
| **Environmental acceptance** | Compliance testing for environment acceptance | Project sites | Once | EMUs | PPMO, EEB |

$BOD_5$ = 5-day biochemical oxygen demand; $COD_{cr}$ = 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/AC 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 |
|---|---|---|---|
| **A. Construction Phase** | | | |
| 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. Operation Phase** | | | |
| 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.

| Training program | Scope of Training | Trainer | Trainee | Time | Days | Persons |
|---|---|---|---|---|---|---|
| Procurement and contract management (emphasizing EMP implementation) | • ADB procurement guidelines<br>• Bidding document and contract preparation, including EMP clauses<br>• Risk of improper procurement and mitigation measures, and handling variation orders and contract management | LIEC | PPMO, Sub-PMO EMUs, contractors and CSCs | 2 | 2/ year | 20 |
| Implementation of EMP | • ADB safeguard policy statement requirements for EMP implementation and progress reporting<br>• Roles, responsibilities, monitoring, inspection, reporting in EMP – especially, at each level of responsibility (PPMO, Sub-PMOs/EMUs)<br>• Environment monitoring program;<br>• Public consultation and participation;<br>• GRM implementation, coordination, reporting, working with the public;<br>• Environment, health and safety, including health and safety risks from landslide-based works during project construction and operation for workers and the community;<br>• 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) | LIEC, EEB | PPMO, Sub-PMO EMUs, contractors and CSCs | 2 | 2 / year | 20 |
| Climate change adaption | • Energy saving and GHG emission reduction<br>• Climate change adaption | LIEC | PPMO, Sub-PMO EMUs, contractors, CSCs | 1 | 1 | 20 |
| Environmental monitoring report preparation | • Outline and main contents of environmental monitoring report<br>• Introduction of EMP and ADB safeguard policy statement requirements for EMP implementation and progress reporting | LIEC | PPMO, Sub-PMO EMUs, contractors, CSCs | 1 | 1/year | 20 |
| Integrated pest management training | • Safe storage of pesticides<br>• Prohibition of usage of pesticides which are classified as “hazardous” or for restricted-use by WHO and/or the government | LIEC | PPMO, Sub-PMO EMUs, staff and farmers | 2 | 1 | 500 |
| Emergency preparedness and response planning | • Response mechanism<br>• Emergency response team, procedure and actions | LIEC | PPMO, Sub-PMO EMUs, contractors, CSCs | 1 | 1 | 20 |
| **Total** | | | | **9** | **8** | **600** |

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.

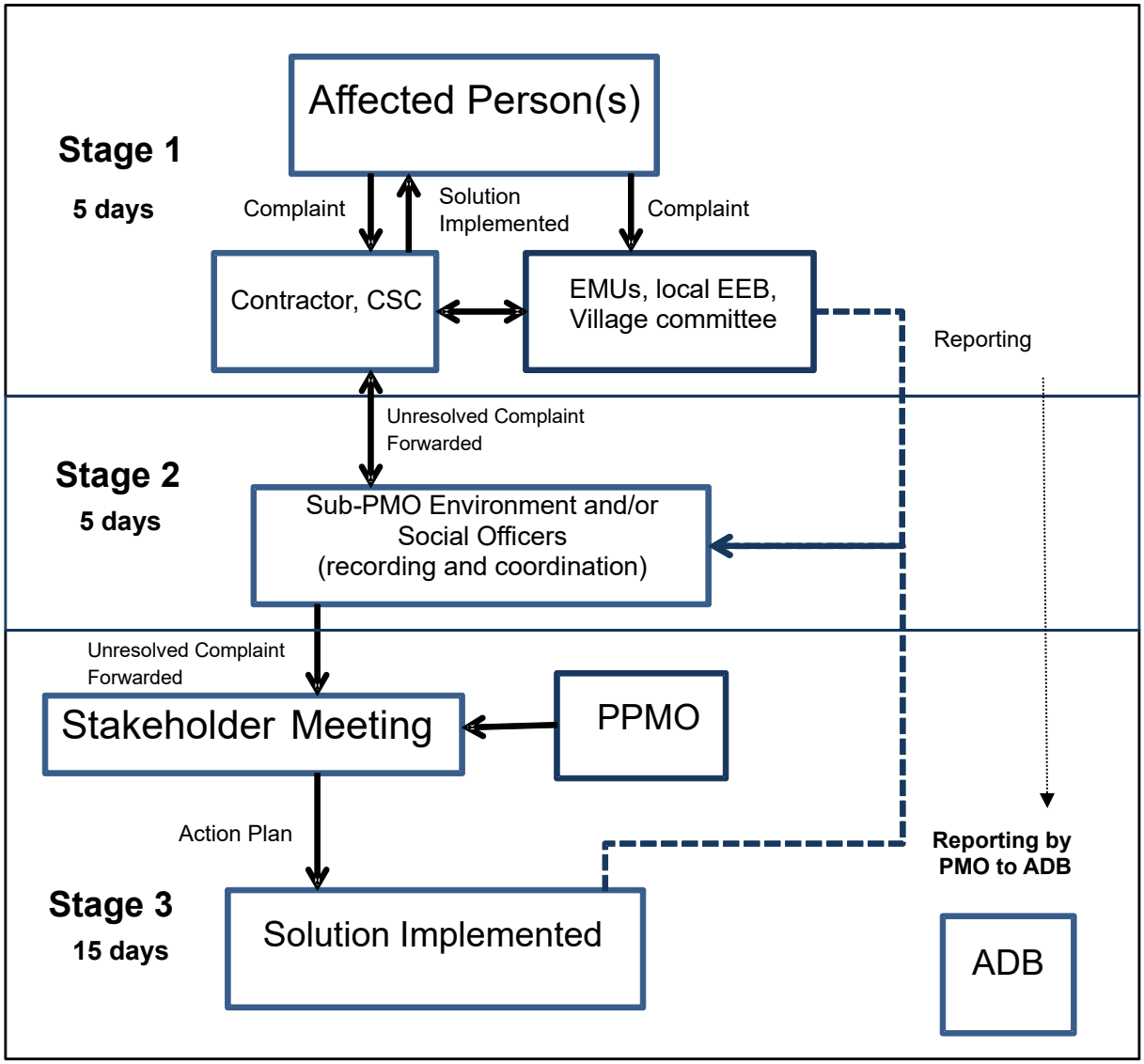
- **Stage 2 (5 calendar days)**: If the issue cannot be resolved in Stage 1, after five calendar days, the Sub-PMO will take over responsibility. Eligibility of the complaint will be assessed and a recommended solution given to the complainant and contractors within two calendar days. If the solution 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, 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 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 and LIEC.

**Table EMP-7:** Public Consultation and Participation Plan.

| Organizer | Approach | Times/Frequency | Subjects | Participants |
|---|---|---|---|---|
| **Construction** | | | | |
| 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, 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 |
| **Operation** | | | | |
| Sub-PMO /EMU, implementing agencies | 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 |
| | Public workshop | As needed based on consultations | As above | 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 **Table 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 Consultant 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 |
|---|---|---|---|---|---|
| **1 Pre-construction phase (Table EMP-2) – Paid by PPMO** | | | | | |
| 1.1 Public consultation | Meeting, survey | | | 2.0 | |
| **Subtotal** | | | | **2.0** | |
| **2 Construction phase (Table EMP-2) – Paid by Contractors** | | | | | |
| 2.1 Soil erosion and contamination | | | | 600 | |
| 2.2 Dust and air pollution control | | | | 250 | |
| 2.3 Noise and vibration | | | | 150 | |
| 2.4 Surface water pollution | | | | 50 | |
| 2.5 Solid waste | | | | 100 | |
| 2.6 Protection of flora and fauna | | | | 100 | |
| 2.7 Community health & safety | | | | 30 | |
| 2.8 Occupational health & safety | | | | 30 | |
| **Subtotal** | | | | **1,310** | |
| **3 Operational phase (Table EMP-3) – paid by IA** | | | | | |
| 3.1 Wastewater treatment | | | | 500 | 500 |
| 3.2 Waste collection | | | | 400 | 400 |
| 3.3 Noise control | | | | 50 | 50 |
| 3.4 Landscape | | | | 400 | 400 |
| 3.5 Exhaust gas treatment | | | | 20 | 20 |
| **Subtotal** | | | | **1,370** | **1,370** |
| **4 Monitoring during construction (costs paid by Contractors)** | | | | | |
| 4.1 Surface water quality | 2 times/a | 2.5 | 10 | 25 | 5 |
| 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 |
| **Subtotal** | | | | **77** | **15.4** |
| **5 Monitoring during operation (costs to be paid by IA)** | | | | | |
| 5.1 Wastewater | 2 times/a | 0.5 | 10 | 25 | 5 |
| 5.2 Noise | 2 times/a | 0.3 | 10 | 15 | 3 |
| 5.3 Exhaust gas | 1 times/a | 0.2 | 1 | 1 | 0.2 |
| **Subtotal** | | | | **41** | **8.2** |
| **Grand total (xCNY10,000)** | | | | **2,800** | |

## 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, 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 and 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)

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)

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 | • Preparation of awareness materials on COVID-19 e.g., signs, posters<br>• Installation of awareness signs at work sites, for visibility to workers and the general public | Contractor | CSC, Sub-PMO/EMU, LIEC |
| Detection Measures | • Control and document the entry/exit to the work site for both workers and other parties.<br>• 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.<br>• All workers to self-monitor their health, possibly with the use of questionnaires, and take their body temperature regularly.<br>• 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. | Contractor | CSC, Sub-PMO/EMU, LIEC |
| Physical Distancing measures | • 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).<br>• Reduce density of people in the building (no more than 1 person per every 10 $m^2$), 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.<br>• Avoid crowding by staggering working hours to reduce the congregation of employees at common spaces such as entrances or exits.<br>• Implement or enhance shift or split-team arrangements, or teleworking.<br>• 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 form affected areas).<br>• Minimize the workers' contact with local community. | Contractor | CSC, Sub-PMO/EMU, LIEC |
| Respiratory measures | • All workers should wear a face mask.<br>• 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.<br>• 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 | Contractor | CSC, Sub-PMO/EMU, LIEC |
| Hand Hygiene measures: | • 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 | Contractor | CSC, Sub-PMO/EMU, LIEC |

| Item | Good Practices | Who implements | Who supervises |
|---|---|---|---|
| | 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.<br>• 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 | | |
| Cleaning and Disinfection | • Cleaning and Disinfection off all site facilities, including offices, accommodation, canteens and common spaces:<br>• Cleaning (soap, water, and mechanical action) to remove dirt, debris, and other materials from surfaces. Disinfection of dirty surfaces and objects only after cleaning.<br>• 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.<br>• 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.<br>• 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.<br>• Provide appropriate PPEs to the cleaners.<br>• Manage the waste as the medical waste, and dispose of it in accordance with local regulations. | Contractor | CSC, Sub-PMO/EMU, LIEC |
| Response measures if workers found with COVID-19 symptoms | • 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).<br>• 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.<br>• 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 contact in accordance with WHO recommendations.<br>• Set out differentiated procedures for the treatment of sick persons, based on the | Contractor | CSC, Sub-PMO/EMU, LIEC |

| Item | Good Practices | Who implements | Who supervises |
|---|---|---|---|
| | case severity. Pay workers throughout periods of illness, isolation or quarantine.<br>• Set aside a part of worker accommodation for precautionary self-quarantine.<br>• Establish communications with local medical services and refer sick workers to there. | | |
| Adjusting Work Practices and Manage Work Related Travels | • 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).<br>• Cancel or postpone non-essential travel to areas with community transmission of COVID-19.<br>• 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.<br>• 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. | Contractor | CSC, Sub-PMO/EMU, LIEC |
| Communication and Contact with the Community | • Carefully manage the relations with the community with clear and regular communication.<br>• Made aware of the procedures put in place at the site to address issues related to COVID-19.<br>• Practice social distancing with the local community. | Contractor | CSC, Sub-PMO/EMU, LIEC |
| Risk communication, training, and education | • 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.<br>• 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.<br>• 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.<br>• Train the workers on procedures in place by the project, and their own responsibilities in implementing them. | Contractor | CSC, Sub-PMO/EMU, LIEC |