

China-ASEAN Sea-Rail Multimodal Logistics Project

**Financed by
The Asian Infrastructure Investment Bank**

**Environmental and Social Impact
Assessment Report
(ESIA)**

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Qinzhou Huangma Asset Management Group Co., Ltd.

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Borui Huachuang (Beijing) International Project Management Consulting Co., Ltd.**

CURRENCY EXCHANGE RATE

(Exchange rate as of December 25, 2025)

Currency Unit - Chinese Yuan (CNY)

1 CNY = 0.1428 USD

1 USD = 7.0000 CNY

ABBREVIATIONS

AIDS	Acquired Immune Deficiency Syndrome
AIIB	Asian Infrastructure Investment Bank
ASEAN	Association of Southeast Asian Nations
AQG	Air Quality Guidelines
BOD ₅	5-Day Biochemical Oxygen Demand
CNY	Chinese Yuan
CO ₂	Carbon Dioxide
COD	Chemical Oxygen Demand
CSC	Construction Supervision Company
DEIA	Domestic Environmental Impact Assessment
DO	Dissolved Oxygen
EEB	Ecology and Environment Bureau
EHS	Environment, Health, and Safety
EMDP	Ethnic Minority Development Plan
ES	Environment and Social
ESEL	Environment and Social Exclusion List
ESMP	Environmental and Social Management Plan
ESIA	Environmental and Social Impact Assessment
ESF	Environmental and Social Framework
ESP	Environmental and Social Policy
ESS	Environmental and Social Standards
FSR	Feasibility Study Report
GAP	Gender Action Plan
GBV	Gender-Based Violence
GDP	Gross Domestic Product
GHG	Greenhouse Gas
GRM	Grievance Redress Mechanism
GZARG	Guangxi Zhuang Autonomous Region Government
HIV	Human Immunodeficiency Virus
IPP	Indigenous Peoples Plan
L _{Aeq}	Equivalent Continuous A-weighted Sound Pressure Level
LIEC	Loan Implementation Environmental Consultant
LISC	Loan Implementation Social Consultant
LMP	Labor Management Plan
LUDD	Land Use Due Diligence
LWC	Labor and working conditions
NELB	New Eurasian Land Bridge
NO _x	Nitrogen Oxides
NWLSC	New Western Land-Sea Corridor
O ₃	Ozone
ODP	Ozone Depletion Potential
OHS	Occupational Health and Safety

PCC	Project Coordination Committee
pH	pH Level
PIE	Project Implementing Entity
PIU	Project Implementation Unit
PM	Particulate Matter
PM ₁₀	Particulate Matter ≤10 µm
PM _{2.5}	Particulate Matter ≤2.5 µm
PMC	Project Management Consulting
PMO	Project Management Office
PPM	Project-Affected People's Mechanism
PRC	People's Republic of China
QDDRB	Qinbei District Development and Reform Bureau
QDG	Qinbei District Government
QHMG	Qinzhou Huangma Asset Management Group Co., Ltd
QMDRC	Qinzhou Municipal Development and Reform Commission
QMG	Qinzhou Municipal Government
RP	Resettlement Plan
SEA/SH	Sexual Exploitation and Abuse/Sexual Harassment
SEP	Stakeholder Engagement Plan
SO ₂	Sulfur Dioxide
SSRA	Social Stability Risk Assessment
STIs	Sexually transmitted infections
TSP	Total Suspended Particulates
WB	World Bank
WHO	World Health Organization
WRB	Water Resource Bureau

UNITS OF MEASUREMENT

cm	Centimeter
dB(A)	A-weighted Sound Level, measured in decibels
Ha	hectare
kg	Kilogram
km	Kilometer
kWh	Kilowatt-hour
m	Meter
m/s	Meters per Second
m ²	Square Meter
m ³	Cubic Meter
mg/l	Milligrams per Liter
mg/m ³	Milligrams per Cubic Meter
mu	Chinese Unit of Land Area (Mu)
µg/m ³	Micrograms per Cubic Meter
°C	Degrees Celsius
t/h	Ton per Hour

NOTE:

"\$" REPRESENTS US DOLLARS IN THIS REPORT

1 HECTARE (ha) = 15 mu.

1 US DOLLAR = 7.0000 CHINESE YUAN.

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Executive Summary

A. Project Overview

1. This Environmental and Social Impact Assessment (ESIA) report is prepared for the China-ASEAN Sea-Rail Multimodal Logistics Project, financed by the Asian Infrastructure Investment Bank (AIIB). According to the updated Feasibility Study Report (2025.10.31), the project will establish an multimodal transport hub that realizes the integration of "road-rail-river/sea" transport, and is expected to serve two major cross-border corridors: the New Western Land-Sea Corridor (NWLSC) and the New Eurasian Land Bridge (NELB). Upon completion, the project will enhance regional cargo collection, distribution, and transshipment capacity, improve multimodal transport efficiency, reduce logistics turnaround costs, promote local economic development, and create job opportunities for countries along the Belt and Road . The main construction components of the project include: ①Logistics and production facilities, including cross-border e-commerce logistics and warehousing center, agricultural materials logistics and warehousing center, commercial and trade logistics center, cross-border cold chain logistics center, logistics industry center, smart logistics service center, e-commerce live-streaming base, integrated warehousing center, freight yard, 17.7 MW rooftop distributed photovoltaic power generation system and smart logistics information management platform;②Intermodal freight yard, including cargo unloading and uploading yards and a dedicated rail line;③Supporting infrastructure, including a 9.75-km long Entrance Trunk Road and utilities connecting the logistics park to the surrounding road and utilities network, and 2) internal roads and utilities of the logistics park; ;④Capacity building, including research projects and training, project management, and consulting services.

2. In accordance with the criteria for identifying "Associated Facilities" outlined in the AIIB's Environmental and Social Framework (ESF), a screening was conducted on potential associated facilities, including the expansion and upgrade of Mahuang Station and the construction of the Pinglu Canal. It was determined that neither constitutes an Associated Facility essential for this Project. The Project can be constructed and operated as planned irrespective of the expansion or commissioning of these facilities, although their operation would enhance the Project's intermodal efficiency and accessibility. This Project involves new construction and does not include the expansion or upgrade of any existing facilities. Environmental and social due diligence has been conducted on relevant facilities essential for the Project's operation but falling outside the scope. The existing facilities (the Huangma Sewage Treatment Plant, Huangma Water Supply Plant, Hainuoer Municipal Waste Incineration Plant, Linhu Substation, Gas Supply Station of Guangxi Qinzhou Guangtou Gas Co., Ltd., and Yinyuan Construction Waste Disposal Site in Qinzhou) have all been verified to possess complete and valid permits. Their capacity and available surplus are sufficient to meet Project demands, land use is compliant, and there are no historical legacy issues. Overall, these facilities

can fully satisfy the requirements for the Project's construction and operation.

3. The construction output targets of the project are: (1) By enhancing regional cargo collection, distribution, and transshipment capacity in Guangxi, China, and improving the efficiency of multimodal transport, the project will promote connectivity in areas along the route. The project is characterized by an estimated annual freight volume of 2.1485 million tons in 2032, 8.6781 million tons in 2042, and 13.3641 million tons in 2052. (2) Through the construction of comprehensive demonstration logistics parks and infrastructure projects, it will build China-ASEAN important supply chain nodes and regional logistics hubs, improve the transportation efficiency of multimodal transportation and reduce the transportation cost of goods. Domestic (Chongqing to Qinzhou trunk line 1000km) bulk cargo railroad container transportation cost 0.45 yuan / ton kilometer, road heavy-duty trucks 1.2 yuan / ton kilometer, railroad loading and unloading costs 15.2 yuan / ton, the transport cost of public-rail intermodal transport than simply road heavy-duty trucks transport cost savings of about 735 yuan / ton, and with the increase in the transport distance continues to improve. Foreign trade (Chongqing to Ho Chi Minh City) bulk cargo rail transportation is 30% to 60% faster than sea transportation, and the cost of sea transportation is 35% to 50% lower than rail. Transit transportation (five Central Asian countries to ASEAN countries) bulk cargo sea-rail intermodal transport comprehensive benefits better than the traditional path, transport time efficiency than the traditional mode to improve more than 30%. (3) By installing distributed photovoltaic power generation systems on rooftops, the project supports the "Dual Carbon" goals (peak carbon emissions and carbon neutrality), achieving rooftop solar power generation of 17.7 MW.

B. Implementation Arrangements

4. The project will be led by the Project Coordination Committee (PCC) of the Qinzhou City and Qinbei District governments, managed by the Project Management Office (PMO) of the Qinzhou City and Qinbei District Development and Reform Bureau, and implemented by the Project Implementation Unit (PIU), Qinzhou Huangma Asset Management Group Co., Ltd. The PMO shall be staffed with at least one Environmental and Social Specialist, and the PIU shall be staffed with at least one Environmental Specialist and one Social Specialist. Both parties shall jointly be responsible for supervising and implementing special plans such as the Project's Environmental and Social Management Plan and Stakeholder Engagement Plan. To ensure the smooth implementation of all plans, a corresponding capacity building plan has been formulated simultaneously.

5. Based on the project's construction scope and actual progress, the planned construction period is five years, scheduled for implementation from December 2026 to November 2031.

C. Categories of Environmental and Social Risks

6. Due to the large-scale civil engineering activities involved, and in accordance with the environmental and social policies of the AIIB, this project is classified as an Environment and Social Category A project, which requires the preparation of an Environmental and Social Impact Assessment (ESIA), including an Environmental and Social Management Plan (ESMP), to systematically identify, evaluate, and manage the project's potential environmental and social risks and impacts.

7. This report is prepared in accordance with the AIIB's environmental and social policies, as well as the relevant national environmental and social laws and regulations. In compliance with AIIB's requirements, a separate "Biodiversity Survey and Assessment Report" has been prepared for this project. Based on the findings of the ESIA, a separate "Environmental and Social Management Plan" has been developed for the project.

8. According to China's regulatory requirements, the project needs to prepare a separate domestic environmental impact assessment (DEIA) document. The DEIA Report has been completed and covers all subprojects of this project. The DEIA report was approved by the Qinzhou Municipal Ecology and Environment Bureau in October 2024.

9. In accordance with China's regulatory requirements, this project requires the preparation of a separate Social Stability Risk Assessment (SSRA) document. A Social Stability Risk Assessment Report, which covers all subprojects, has been completed. The assessment results indicate that, based on the identification and analysis of potential social risks, the project's social stability risk was initially determined to be at a medium level. Following the implementation of effective prevention and mitigation measures, the risk level is reduced to low. Overall, the social risks are considered manageable. The report was approved by the People's Government of Qinbei District on December 3, 2024, and the project risk assessment record was filed with the Politics and Law Committee of Qinbei District People's Committee on December 12, 2024.

D. Assessment Purpose and Method

10. The purpose of the Environmental and Social Impact Assessment is to evaluate the potential environmental and social impacts and risks of the proposed project, assess alternative options, and design appropriate mitigation, management, and monitoring measures to eliminate, offset, or reduce adverse environmental and social impacts and enhance the positive benefits. In May 2023, Qinzhou Huangma Asset Management Group Co., Ltd. commissioned Beijing Zhonghuanruide Environmental Engineering Co., Ltd. and Borui Huachuang (Beijing) International Project Management Consulting Co., Ltd. (referred to as the consulting team) to carry out the evaluation work.

11. The Environmental and Social Impact Assessment work was conducted in the following steps:

(i) Review of project-related technical documents, preliminary engineering analysis, identification of key environmental and social impacts, and clarification of environmental and social protection objectives. The technical documents reviewed include:

- *China-ASEAN Sea-Rail Multimodal Logistics Project Feasibility Study Report (Preliminary Draft, May 2023);*

- *China-ASEAN Sea-Rail Multimodal Logistics Project Environmental Impact Report (October 2024);*

- *China-ASEAN Sea-Rail Multimodal Logistics Project Soil and Water Conservation Plan (October 2024).*

- *China-ASEAN Sea-Rail Multimodal Logistics Project Social Stability Risk Assessment Report" (December 2024);*

- *China-ASEAN Sea-Rail Multimodal Logistics Project Feasibility Study Report" (Revised Version, October 2025)*

(ii) From June 2023 to May 2024, the consulting team conducted a site survey to objectively understand the project site, including the selection of the project location, environmental conditions, land use, environmental and social sensitive points, impact factors, resident composition, and socio-economic living conditions of the affected population.

(iii) From May 6 to 22, 2024, the consulting team conducted on-site investigations at project locations: Building on existing data and field survey findings, the investigation focused on key areas including the rationality of the project site selection, environmental and land compliance, the distribution of sensitive points and potential impacts, the demographic structure and demand characteristics within the project area, the distribution, socioeconomic characteristics, and cultural conditions of ethnic minorities, and the socio-economic conditions of potentially affected groups. This work served to further refine and confirm the basis for the assessment. The specific activities carried out are as follows:

- **Institutional Interviews and Data Collection.** Interviews and meetings were conducted with relevant government functional departments and existing facility operators involved in the project. These included the Qinbei District Development and Reform Bureau; QHAMG; Qinbei District Land and Housing Expropriation Center; NRB; Bureau of Human Resources and Social Security; Women's Federation; Bureau of Civil Affairs; Ethnic and Religious Affairs Bureau; Bureau of Ecology and Environment; Transportation Bureau; and Health Commission. Relevant project documents and data were collected.

- **Key Informant Interviews.** A total of 45 Key Informant Interviews were conducted with individuals from relevant departments, townships/sub-districts,

and communities/villages in the project area. Of these interviewees, 15 were women, accounting for 33%.

- **Focus Group Discussions (FGDs).** A total of 16 FGDs were organized, with cumulative participation of 240 individuals. Among the participants: 84 were women (52.20%); 14 were ethnic minorities (5.83%); 27 were elderly persons (11.35%); and 21 were low-income individuals (8.75%).

- **Questionnaire Survey.** A total of 400 E&S Impact Assessment questionnaires were administered face-to-face within the project area. Statistical review confirmed 380¹ valid questionnaires, resulting in a validity rate of 95%. The sample demonstrated diversity in terms of age, education level, and occupation. The specific composition included: 176 women (46%); 204 men (54%); and 20 ethnic minority respondents (5% of the total sample).

(iv) The ESIA work was conducted based on engineering analysis, discussion meetings, field investigations, and data collection. Using technical methods such as mathematical modeling, analogical analysis, and professional judgment, the assessment evaluated the extent of the project's impacts on the surrounding environment and society, and proposed environmental and social mitigation measures and recommendations. The assessment focused on the scope and degree of ESIA during the construction and operational phases, while also demonstrating the project's compatibility with relevant plans. Building on this work, a preliminary draft of the "China-ASEAN Sea-Rail Multimodal Logistics Project Environmental and Social Impact Assessment Report" was completed in July 2024.

(v) Following the completion of the field surveys, the consultants continued subsequent assessments and public participation activities. They fully communicated and confirmed risk mitigation measures, plan optimization, and the sequencing of action implementation with the PIU to further refine the social impact assessment and the dynamic improvement of management measures. These activities included: In October 2024, an online meeting was held to discuss the relocation of the Tudimiao in Hengling Village. From March to April 2025, meetings were organized to discuss land acquisition compensation, support for vulnerable groups, and social security measures. In July 2025, an online meeting was held with the PMO and the Qinbei District Expropriation Center to verify the project's area of impact and physical assets. Discussions also covered compensation standards, resettlement plans, implementation schedules, and detailed revisions to the report. On September 15–16, 2025, online meetings were conducted with local potential photovoltaic enterprises to carry out due diligence on occupational health and labor management. On September 23, 2025, the AIIB mission, together with the PMO, the E&S team, and local government representatives, conducted a site visit. They interviewed villagers potentially affected by railway noise and vibration, inspected the current condition and proposed new site of the Tudimiao in Hengling Village, as

¹ Among a total of 380 valid questionnaires, 193 were completed by residents directly affected by LA and HD, accounting for 51% of the total. The remaining 187 questionnaires were from non-LA-and-HD residents within the project impact area, representing 49%.

well as the status of the resettlement community. Discussions were held on the resettlement plan and the relocation of the Tudimiao.

(vi) In February 2026, based on feedback from AIIB consulting experts, the project's E&S Advisor updated the ESIA, ESMP, SEP, GAP, and RP.

E. Environmental Baseline

12. The project is located in the Qinbei District, Qinzhou City, Guangxi Zhuang Autonomous Region, within a gently undulating hillland area. The regional vegetation is well-developed, with the slopes mostly covered by eucalyptus, pine trees, mixed woods, and grasses, while the valleys are mostly farmland and ponds. The project does not cross any rivers; the nearest river is the Qinjiang River.

13. To assess the environmental quality of the project site, a baseline survey was conducted by a professional testing organization on surface water, groundwater, soil, noise, and air quality. Sampling and analysis were performed at representative monitoring points on the project site, and the results showed the following:

- The surface water quality near the project site meets Class III standards in the "Environmental Quality Standards for Surface Water" (GB 3838-2002) of China.

- The groundwater quality near the project site meets Class III standards in the "Groundwater Quality Standards" (GB/T 14848-2017) of China.

- The environmental air quality and noise levels in the project area comply with relevant standards from both China and the World Bank.

- The land in the project area is predominantly in its natural state, with natural vegetation, farmland, and residential buildings. There are no industrial enterprises or suspected contaminated soil sites. The soil quality in the project area meets the requirements of China's "Soil Environmental Quality—Risk Screening Values for Soil Pollution Control in Construction Land" (GB 36600-2018), posing no risk to human health.

14. No national-level or Guangxi-level key protected wild plants were found in the project area. There are no plants listed in the CITES appendices or the IUCN Red List (2010). However, during field surveys, it was found that the national-level second-class protected plant, *Cibotium barometz*, used to be widely distributed in the area but has significantly decreased due to large-scale eucalyptus planting. Residents of multiple villages along the project route reported that *Cibotium barometz* has not been observed in recent years within the project area.

15. The area is home to relatively few animal species, and no large wild animals were found in the area. The local fauna mainly includes migratory birds, along with some amphibians, reptiles, and small mammals.

16. A total of 69 terrestrial wild animal species were identified in the project impact zone, including 37 protected species, with 18 national second-class protected species such as snake eagles, red falcons, and small cuckoos. The region is home to 19 species listed in the Guangxi Zhuang Autonomous Region's key protected wildlife list, and 1 species on the IUCN Red List (Zhejiang Cobra). There are 4 species listed in the CITES Appendices (with some species appearing in multiple lists). The protected species are primarily birds (29 species, or 78.4%), followed by mammals (1 species, 2.7%), reptiles (3 species, 8.1%), and amphibians (4 species, 10.8%).

F. Social Baseline

17. Located in Changtian Sub-district and Dadong Town, Qinbei District, Qinzhou City, Guangxi Zhuang Autonomous Region, the project is a crucial node within the China-ASEAN Free Trade Area and the "Belt and Road" NWLSC. This region exhibits a relatively high level of socio-economic development, features close urban-rural integration, and possesses well-established infrastructure. By the end of 2024, Qinbei District had achieved a Gross Regional Product of RMB 34.594 billion, with an average annual growth rate of 5.9%. The industrial structure was 26.0:22.5:51.4. The total population of Changtian Sub-district and Dadong Town is approximately 118,100. The local economy is diversified, primarily based on industry, transportation, commercial services, and traditional agriculture. Surveys indicate that the average annual household income for local residents is approximately RMB 18,000 to 40,000, with employment channels becoming increasingly diverse. Public service facilities in the project area's communities are relatively comprehensive, transportation is convenient, and water supply, power supply, telecommunications, education, and healthcare systems are well-developed.

18. With the assistance of the Qinbei District Ethnic and Religious Affairs Bureau and relevant township/village (community) cadres, the E&S consultants organized and conducted social surveys covering Changtian Sub-district and Dadong Town. Utilizing various methods such as household interviews, focus group discussions, and questionnaires, a total of 16 FGDs were completed, cumulatively involving 240 participants. Among these participants, 14 were ethnic minorities, accounting for 5.83%. A total of 380 valid questionnaires were collected, which included 20 ethnic minority respondents, representing 5% of the sample.

19. Based on the assessment of the Project's potential impacts on ethnic minorities, Guangxi had a total population of approximately 50.13 million in 2024, of which 18.95 million (about 37.8%) were ethnic minorities, with the Zhuang ethnic group representing the largest share. Qinzhou Municipality had a total population of 4.21 million, including approximately 477,000 ethnic

minority residents (11.3%), of whom the Zhuang ethnic group accounts for around 96%. The Project area covers five villages/communities: Huangma, Longwan, Chengbei, Jiangbiao and Hengling, which are located in the Changtian subdistrict and Dadong town. These villages are in the peri-urban area of Qinzhou City. There are no ethnic minority-concentrated communities within the Project area. Ethnic minority residents comprise around 60 individuals, all of whom are Zhuang, accounting for 0.05% of the Project area population. These households are scattered residents, primarily formed through marriage or migration, and based on key informant interviews and focus group discussions conducted during the Project Team's (PT's) September 2025 site visit, ethnic minority participants reported that they are able to communicate in Mandarin and have access to the same public services as the Han population. In terms of social welfare entitlements, legal rights and protections, no material differences were identified. While ethnic minority residents maintain their own cultural customs and living practices, these do not affect their access to services or participation in local socioeconomic activities.

20. Although some characteristics of the Zhuang are less pronounced within the project area due to their integration into the broader Han social and economic systems, the Zhuang are explicitly recognized as one of China's ethnic minorities and as an indigenous ethnic group of the GZAR under the Constitution of the PRC and the system of regional ethnic autonomy. The Zhuang residents in the project area, regardless of their population size, are entitled to the ethnic minority status conferred by the Constitution and laws. Consequently, ESS3 has been triggered.

21. In accordance with ESS3, meaningful, culturally appropriate, accessible, and gender-sensitive consultations were conducted with Zhuang individuals to ensure culturally appropriate benefits and to avoid or mitigate adverse impacts. Of the 60 Zhuang individuals in the Project area, 11 individuals (approximately 0.3% of Project-affected people) will be affected by land acquisition, with limited impacts as income loss is estimated at less than 5% of their agricultural income. Consultations indicate strong community support for the Project, particularly due to anticipated employment opportunities. Indigenous Peoples due diligence has been integrated into the ESIA/ESMP and RP, with culturally appropriate engagement, grievance redress, and monitoring measures reflected in the SEP and GRM.

22. Regarding the status of low-income populations, Qinzhou City had already achieved the full eradication of poverty among all registered impoverished households by 2020. The low-income population referred to in this document primarily consists of those who, following the poverty alleviation campaign, have been incorporated into a system for dynamic monitoring and categorized assistance. Within the project's area of influence in Changtian Sub-district and Dadong Town, there are 693 low-income individuals from 278 households, accounting for 0.59% of the total population. Local government utilizes policies such as subsidized loans, social assistance, medical insurance, and educational support to consolidate the achievements of poverty alleviation through multiple channels and enhance the living standards of low-income

groups. Moving forward, there is a continued need to innovate assistance methods to further stimulate the internal drive and sustainable development capacity of the low-income population.

23. Regarding gender composition and women's development status, the project's area of influence has a female population of approximately 53,100, accounting for 45% of the total population, indicating a generally balanced gender ratio. Qinbei District actively implements the "Women's Development Plan (2021-2030)," having made significant progress in areas such as women's health, education, economic participation, and social security. Through measures including skills training, entrepreneurship support, and employment assistance, the district continuously works to increase women's economic participation and social status, improve their quality of life, and promote regional gender equality and the comprehensive development of women.

24. Overall, the project's area of influence exhibits favorable socio-economic conditions, stable resident livelihoods, integrated ethnic cultures, and effective implementation of gender equality policies. The project construction is anticipated to further stimulate local economic growth and socially inclusive development through infrastructure improvements and the creation of new employment opportunities, thereby generating more benefits for women and low-income groups.

G. Environmental Impacts and Mitigation Measures

25. The environmental impact assessments for the project's pre-construction, construction, and operation phases were conducted separately. The evaluation results indicate that the impacts during the pre-construction phase are minimal, but it is essential to implement appropriate mitigation measures during the design phase.

26. The potential negative environmental impacts during the construction phase are temporary and localized, involving issues such as soil erosion, construction noise, dust, wastewater, and worker health and safety risks. Key construction activities include land leveling, excavation, building construction, cold storage facility construction, and the installation of equipment and municipal infrastructure. The main risks during the construction phase include:

- (i) Soil erosion during construction;
- (ii) Temporary noise disturbance to nearby residents and schools;
- (iii) Air pollution (mainly construction dust);
- (iv) Improper discharge of construction wastewater;
- (v) Improper disposal of solid waste (construction and household waste);

(vi) Occupational health and safety concerns.

27. These issues can be effectively mitigated through proper construction management and the implementation of health and safety measures.

28. During the operation and maintenance phase, potential impacts include noise, vibration, exhaust emissions, domestic wastewater, solid waste, and occupational health and safety risks. Key operational activities include the operation of cold storage facilities, the main access road, internal roads within the project area, dedicated railway lines, logistics and production facilities, and railway loading and unloading operations. These risks have been minimized through the use of environmentally friendly energy-efficient equipment, the installation of soundproof windows, implementation of work safety procedures, and regular health checks for workers.

H. Social Impacts and Mitigation Measures

29. The social impact of this project mainly includes two aspects: social benefits and social risks.

30. The social benefits are mainly reflected in the following: upon completion, the project will effectively enhance the logistics and distribution efficiency in the Qinzhou region, drive employment and economic growth, improve transportation conditions, and create more employment and income-generating opportunities for women and low-income groups, demonstrating significant positive social benefits. Based on the social survey results, the main social benefits include: (i) Increased employment opportunities and raised resident income levels; (ii) Improved regional transportation and travel conditions; and (iii) Promoted coordinated regional economic development.

31. Potential social risks during the project's construction and operation phases include:

(i) Land acquisition and housing demolition risks; Preliminary surveys indicate that the project's area of influence involves 2 townships/sub-districts (Changtian Sub-district, Dadong Town) and 5 villages/communities (Huangma Community, Chengbei Community, Longwan Community, Hengling Village, Jiangbiao Community). It will affect a total of 691 households (3,459 individuals; 1649 women) related to land acquisition and/or demolition, involving the demolition of 32,625 m² of structures and the acquisition of 1705.75 mu (approximately 113.72 hectares) of land (1641.40 mu of collective land and 64.35 mu of state-owned land). Specifically: (a) 584 households (2,909 individuals) are affected by land acquisition only; (b) 34 households (139 individuals) are affected by demolition only; and (c) 73 households (411 individuals) are affected by both land acquisition and demolition.

(ii) Impact on EMs; The land acquisition and demolition for this project will affect 5 villages and communities across 2 towns and subdistricts, impacting a

total of 691 households and 3,459 people. This includes 11 individuals from the ethnic minority (Zhuang), accounting for 0.3% of the total affected population. Some of their household-contracted land will be subject to acquisition. Other negative impacts and potential risks arising from project-related activities include: (i) Impacts from noise, dust, and solid waste generated during construction will temporarily affect the daily lives of residents (including women) in the project impact area, including the Zhuang. (ii) The influx of a non-local workforce may pose a risk of disease transmission. (iii) The movement of large vehicles may impact surrounding traffic and transportation safety. (iv) Contractors and non-local construction workers may lack sensitivity towards ethnic minority cultures. For instance, ethnic minority residents have suggested suspending construction during ethnic festivals such as "Sanyuesan²". (v) If there is insufficient participation of ethnic minorities, especially women, in key information disclosure and consultation processes related to land acquisition compensation, livelihood restoration, recruitment, and construction scheduling, they may face challenges in timely expressing their concerns, accessing employment opportunities, and benefiting from project gains.

(iii) Worker Working Conditions and Occupational Health and Safety (OHS) Risks. The project will involve project management and operational staff, as well as workers from contractors and suppliers during its construction and operation phases. Potential labor management risks include inadequate protection of workers' rights and occupational health and safety hazards. During construction, systems for labor contract signing, social insurance contributions, wage payment, and working hour management must be strictly implemented. Particular attention should be paid to preventing OHS risks associated with machinery operation, work at height, vehicle operation, noise, dust, and infectious diseases.

(iv) Community health and safety risks; including temporary construction noise interference to nearby residential areas and schools, vibration noise from railway dedicated lines, construction dust, inappropriate solid waste disposal, disease transmission risks, and transportation safety during the construction and operation period;

(v) Insufficient stakeholder participation; Vulnerable groups for this project are defined as low-income individuals, the elderly, women (especially female-headed households), and children. These groups are relatively vulnerable, and their interests and concerns warrant specific attention. Failure to adequately address their needs and implement targeted inclusive measures could exacerbate their vulnerability.

(vi) Gender equality and gender-based violence, etc.; Regarding gender equality, it is essential to ensure women enjoy equal rights in project participation, employment opportunities, and benefit sharing, avoiding unfair treatment based on gender. Simultaneously, measures should be taken to

² The Sanyuesan Festival (Third Day of the Third Lunar Month) is a traditional festival of the Zhuang people and one of the items listed on the National Intangible Cultural Heritage Inventory.

prevent sexual harassment in the workplace, gender discrimination, and other forms of GBV potentially induced by the project.

32. Based on the identified major social impacts, and integrating findings from social due diligence and feedback from stakeholder engagements, the following mitigation measures have been formulated and will be implemented in accordance with relevant environmental and social standards:

(i) **Minimizing LA and HD Impacts:** The project has prepared a RP to ensure project-affected people receive fair compensation, proper resettlement, and support for sustainable livelihood restoration. To minimize the negative impacts of LA and HD and systematically ensure the restoration and improvement of living standards for the project-affected people, the project has formulated a detailed livelihood restoration plan. To ensure the plan genuinely meets public needs and is practical, the PIU and the Qinbei District Land and Housing Expropriation will conduct comprehensive and in-depth consultations with the affected villages/communities and villagers before the formal implementation of LA and HD activities. The consultations will adhere to the principles of openness, participation, and inclusiveness. Discussions will focus on livelihood restoration support methods, including continuing land cultivation, skills training, priority employment in the industrial park, and pension security for farmers who have lost their land, to help the project-affected people restore and improve their livelihoods. By fully considering all opinions and jointly refining the livelihood restoration plan, it can be effectively ensured that the livelihoods and living standards of the project-affected people will reach or exceed pre-project levels.

(ii) **Inclusive Development Measures for EMs:** (i) Resettlement Restoration Plan: Ensure 100% participation of the 11 Zhuang residents affected by land acquisition in compensation consultations, and provide them with full and transparent compensation as well as livelihood restoration support. (ii) Public Participation and Information Disclosure: Ensure that the 60 Zhuang residents receive key project information in a timely manner and participate in decision-making through channels such as public bulletin boards and WeChat groups. (iii) Equal Employment: Under equal conditions, give priority to hiring local Zhuang and female labor. Collaborate with the Departments of Human Resources and Social Security and the Women's Federation to provide free skills training. (iv) OHS: Sign labor contracts and pay work-related injury insurance for all workers (including ethnic minorities). Conduct training on OHS and the prevention of GBV, and install gender-friendly facilities. (v) Community Safety, Health, and Cultural Respect: Strictly implement noise and dust reduction measures. Suspend construction during festivals such as "Sanyuesan". Provide cultural sensitivity training for construction personnel. (vi) GRM: Establish multi-level grievance channels and provide anonymous and confidential options. Proactively disclose the AIIB's PPM information to safeguard the right to an independent grievance. These measures are designed to ensure that Zhuang residents receive equitable and inclusive development benefits throughout the entire project lifecycle.

(iii) **Worker Labor Management:** The project will formulate and implement a Labor Management Procedure, clearly defining the responsibilities of contractors and subcontractors regarding labor contracts, wage payments, working hours, OHS, and GRM. All workers must sign written labor contracts and be enrolled in social insurance according to law. Safety production and OHS management will be strengthened through safety training, provision of necessary Personal Protective Equipment (PPE), establishment of dedicated safety officer positions, and a documented worker GRM. Regular inspections of working conditions will be conducted by supervisors and the PIU during construction to safeguard workers' rights.

(iv) **Community Health and Safety:** Project information will be disclosed promptly. Public participation and consultation with residents in the project area, especially those near sensitive points, will be enhanced to listen to their concerns and incorporate feedback into project implementation. Construction working hours will be reasonably scheduled, implementing noise reduction and dust suppression measures. Traffic management and speed limit controls will be enforced, with additional safety warnings and lighting installed. Construction personnel will receive traffic safety and public health training, with enhanced prevention and control of infectious diseases like AIDS. Construction sites will be under enclosed management. During operation, the management unit will establish a sound emergency response and fire safety system to ensure public safety.

(v) **Vulnerable Groups:** Priority will be given to hiring local residents, low-income individuals, and other vulnerable groups, providing skills training and employment support to promote their social integration and income generation. Safety awareness and warnings at the construction site and surrounding communities will be strengthened. Through public participation, ongoing monitoring, and inclusive policies, equal benefits for vulnerable groups will be ensured. In addition, special attention shall be paid by the PIU and relevant agencies to the potential unique impacts that project construction may have on vulnerable groups. They shall track the implementation of various subsidies and, through measures such as prioritizing the provision of temporary employment positions, minimize the adverse effects of the project to the greatest extent possible, and assist these groups in promptly restoring and enhancing their livelihood levels. The specific safeguard measures are as follows: (i) Implement a "case-by-case" special subsidy mechanism. (ii) Facilitate, through government coordination, the provision of homestead land for self-built housing, or assist with relocation and reconstruction at alternative sites. (iii) Should the project-affected people have no intention to rebuild, assist, through negotiation, with their placement in elderly care institutions. (iv) On a voluntary basis, prioritize the provision of suitable job positions for family members of affected vulnerable groups who possess labor capacity, during both the project construction and operation phases. (v) Based on the principle of voluntariness, prioritize organizing their participation in skills training and provide employment information matching services.

(vi) **Gender Equality:** Gender equality will be mainstreamed throughout

the project cycle. Women will be provided with equal employment opportunities, equal pay for equal work, and a safe and hygienic working environment, with a minimum female employment ratio set. Women's participation and voice in land acquisition, resettlement negotiations, and capacity building will be encouraged and safeguarded. Gender-sensitive awareness training will be conducted to enhance capabilities for preventing GBV. The project has formulated a GAP, which is integrated into the overall ESMP.

(vii) Public Participation and Grievance Redress: Public participation will be maintained throughout the project cycle. The opinions of affected groups, local governments, and other relevant stakeholders will be fully solicited through announcements, public meetings, workshops, and questionnaires. A project-level GRM will be established to ensure timely reception and response to complaints, guaranteeing transparent participation and smooth communication.

33. All mitigation measures have been incorporated into the ESMP and will be strictly implemented during both the construction and operation phases to effectively protect workers' rights, ensure community safety, and promote socially inclusive development. The effectiveness of these measures will be assessed through internal supervision and external monitoring, and they will be dynamically adjusted and continuously improved based on actual circumstances.

I. Stakeholder Engagement

34. The project's stakeholders are categorized into primary and secondary stakeholders. **Primary Stakeholders** refer to groups and individuals directly affected by the project, including: (1) Residents within the project's area of influence, specifically in Huangma Community, Chengbei Community, Longwan Community, Hengling Village, and Jiangbiao Community under Changtian Sub-district and Dadong Town, including ethnic minority groups; (2) Residents near environmental sensitive points and persons directly affected by land acquisition and house demolition; (3) Vulnerable groups requiring specific attention, such as the elderly, women, low-income families, female-headed households, and students; (4) Various workers involved during the project's construction and operation phases, including directly hired workers, contractor workers, and supplier workers. **Secondary Stakeholders** refer to institutions and organizations indirectly related to the project or responsible for management, coordination, and service provision, including: (i) The Qinbei District Development and Reform Bureau (PMO) and QHAMG (PIU); (ii) The Qinbei District Bureaus of Finance, Natural Resources, Land and Housing Expropriation Center, Human Resources and Social Security, Transportation, Ecology and Environment, Civil Affairs, Women's Federation, Health Commission, and Ethnic and Religious Affairs Bureau; (iii) Contractors, and design and consulting units (e.g., the feasibility study report preparer).

35. During the project preparation phase, the feasibility study unit and the E&S

consultant team conducted adequate informed consultation and public participation activities through various methods such as information disclosure, on-site notifications, institutional interviews, field surveys, FGDs, key informant interviews (KIIs), and household surveys. The investigation strictly adhered to the principle of "Free, Prior and Informed Consent (FPIC)" to affected Ethnic Zhuang. The investigation found that stakeholder needs primarily include: (i) Receiving full and fair compensation and resettlement, and seeking more development opportunities; (ii) Improving income levels and expanding employment channels; (iii) Developing scientific construction plans to effectively control impacts like noise and dust, and properly planning traffic management and safety protection; (iv) Obtaining project-related information in a timely and sufficient manner; (v) Having channels and opportunities to participate in project-related decision-making processes. In addition to the needs mentioned above, the Ethnic Zhuang individuals further expressed: (vi) The hope that during the construction process, full respect will be given to the cultural customs of ethnic minorities, such as reasonably arranging construction time or suspending work during traditional ethnic festivals like "Sanyuesan", thereby reflecting respect for and inclusion of local culture.

36. Based on the outcomes from surveys, discussion meetings, and KIIs, the project has formulated a Stakeholder Engagement Plan (SEP). The SEP defines the objectives, procedures, and GRMs for information disclosure and public consultation. It also outlines a detailed schedule of stakeholder engagement activities and monitoring mechanisms to promote effective stakeholder participation throughout the project cycle. For details, please refer to the project's SEP. The SEP is a dynamic document and will be updated periodically based on changes in the project's detailed design or actual circumstances during implementation (such as adjustments to the scope, methods of engagement, or content of major disclosures). Revised versions will be subject to renewed disclosure and consultation.

J. Environmental and Social Management Plan

37. As part of the Environmental and Social Impact Assessment (ESIA) report, we have developed an independent project Environmental and Social Management Plan (ESMP). This plan describes the requirements and methods for environmental and social mitigation measures, monitoring, reporting, roles and responsibilities, and budget. The Environmental and Social Management Plan will serve as the main guiding document for environmental issues during the construction and operation of the project.

K. Grievance Redress Mechanism

38. To ensure the timely identification and response to stakeholder concerns throughout the project's preparation, construction, and operation phases, safeguard residents' right to information, and promote broad community participation, the project will establish a systematic and transparent GRM to provide effective feedback and complaint channels. All grievance records and

corresponding resolution decisions will be meticulously maintained and regularly submitted to the AIIB through the ESMP Reports.

39. The grievance mechanisms for this project include:

- (i) The first mechanism is the project-level grievance mechanism, which provides a channel for grievances during the implementation and operation of the project for affected residents, social groups, and business establishments.
- (ii) The second mechanism is the grievance mechanism for project workers, including direct workers, contract workers, and employees responsible for the project.
- (iii) Additionally, the AIIB has set up a PPM. When project-affected people believes that the failure of an AIIB project to implement its Environmental and Social Policies (ESP) has or may have adverse impacts on them, and their concerns are not satisfactorily addressed through the project's GRM or the AIIB's management mechanisms, the PPM provides an independent, impartial review opportunity. Relevant information on PPM can be accessed via the following link: <https://www.aiib.org/en/about-aiib/who-we-are/project-affected-peoples-mechanism/how-we-assist-you/index.html>.

L. Conclusion

40. After completion, the project will increase regional cargo collection, distribution, and transshipment capacity, improve multimodal transport efficiency, and reduce logistics turnover costs, thereby promoting local economic development and providing employment opportunities for countries along the Belt and Road.

41. Based on the information provided in this Environmental and Social Impact Assessment report and assuming the comprehensive and effective implementation of the Environmental and Social Management Plan, along with training and capacity building, it is expected that potential adverse environmental and social impacts will be minimized and/or mitigated to acceptable levels.

I. Project Introduction

A. Project Overview

1. This report is the Environmental and Social Impact Assessment (ESIA) report for the China-ASEAN Sea-Rail Multimodal Logistics Project, financed by the Asian Infrastructure Investment Bank (AIIB). This report is accompanied by an Environmental and Social Management Plan (ESMP). The project is located in the Qinbei District of Qinzhou City, Guangxi Zhuang Autonomous Region, People's Republic of China.

2. The project will establish an multimodal transport hub that realizes the integration of "road-rail-river/sea" transport. It is expected to serve two major cross-border corridors: the New Western Land-Sea Corridor (NWLSC) and the New Eurasian Land Bridge (NELB). Upon completion, the Project will enhance the regional cargo collection, distribution, and transshipment capacity, improve multimodal transport efficiency, reduce logistics costs, promote local economic development, and provide job opportunities for countries along the Belt and Road . The main construction components include::The main construction components of the project include:①Logistics and production facilities, including cross-border e-commerce logistics and warehousing center, agricultural materials logistics and warehousing center, commercial and trade logistics center, cross-border cold chain logistics center, logistics industry center, smart logistics service center, e-commerce live-streaming base, integrated warehousing center, freight yard, 17.7 MW rooftop distributed photovoltaic power generation system and smart logistics information management platform;②Intermodal freight yard, including cargo unloading and uploading yards and a dedicated rail line;③Supporting infrastructure, including a 9.75-km long Entrance Trunk Road and utilities connecting the logistics park to the surrounding road and utilities network, and 2) internal roads and utilities of the logistics park; ;④Capacity building, including research projects and training, project management, and consulting services.

B. Implementation Arrangements

3. The project will be led by the Project Coordination Committee (PCC) jointly formed by Qinzhou Municipal Government (QMG) and Qinbei District Government (QDG), managed by the Project Management Office (PMO) jointly established by the Qinzhou Municipal Development and Reform Commission (QMDRC) and Qinbei District Development and Reform Bureau (QDDRB), and implemented by the Project Implementation Unit (PIU), which is the Qinzhou Huangma Asset Management Group Co., Ltd(QHAMG). The PMO shall be staffed with at least one Environmental and Social Specialist, and the PIU shall be staffed with at least one Environmental Specialist and one Social Specialist. Both parties shall jointly be responsible for supervising and implementing

special plans such as the Project's Environmental and Social Management Plan and Stakeholder Engagement Plan. To ensure the smooth implementation of all plans, a corresponding capacity building plan has been formulated simultaneously.

4. According to the requirements of the Asian Infrastructure Investment Bank (AIIB), The Qinzhou Huangma Asset Management Group Co., Ltd. shall submit regular reports on the implementation status of the project's Environmental and Social Management Plan (ESMP), Resettlement Plan (RP) and Stakeholder Engagement Plan (SEP), with such reports to be included in the quarterly project progress reports.

5. **Project Coordination Committee (PCC):** Formed by decision of the People's Government of the Guangxi Zhuang Autonomous Region (GZARG) the PCC integrates the Steering Committee of the Qinzhou Municipal Government (QMG) (led by a Vice Mayor) and the Steering Committee of the Qinbei District Government (QDG) (led by a Vice District Chief). The PCC is tasked with high-level coordination to resolve cross-jurisdictional collaboration issues between the municipal and district levels.

6. **Project Management Office (PMO):** Confirmed by the GZARG, the PMO is jointly led by the Director of the Qinzhou Municipal Development and Reform Commission (QMDRC) and the Director of the Qinbei District Development and Reform Bureau (QDDR). The PMO is tasked with the centralized management and coordination of all project phases, including preparation, implementation, monitoring, and evaluation. Furthermore, the PMO shall designate at least one Environmental and Social Focal Person to address environmental and social matters during project implementation.

7. **Project Implementation Unit (PIU):** The GZARG has designated Qinzhou Huangma Asset Management Group Co., Ltd (QHMG) as the PIU. The PIU is responsible for the Project's development, construction, ownership and operation. Its duties encompass procurement and contract management, as well as oversight of technical consultants, procurement agents, and construction supervision companies. Furthermore, the PIU shall designate at least one Environmental Focal Person and one Social Focal Person to address environmental and social matters during project implementation. QHMG invested in and established by Qinbei District Government (QDG). With a registered capital of 300 million CNY, it is a state-owned sole proprietorship with independent legal person status and a key enterprise directly under the Qinbei District Government..

8. **Project Implementation Entities (PIE):** In accordance with the the People's Government of the Guangxi Zhuang Autonomous Region (GZARG), the People's Government of Qinzhou City (QMG), the People's Government of Qinbei District (QDG), and Qinzhou Huangma Asset Management Group Co., Ltd. (QHMG) (or a joint venture).

9. Based on the Project's construction content and actual progress, the

planned the construction period of the project is five (5) years, from December 2026 to November 2031.

C. Assessment Purpose and Method

10. The purpose of the Environmental and Social Impact Assessment (ESIA) is to identify the potential environmental and social impacts and risks of the proposed project, evaluate alternative options, and design appropriate mitigation, management, and monitoring measures to avoid, offset, or minimize adverse environmental and social impacts, while enhancing and expanding the Project's positive benefits. Qinzhou Huangma Asset Management Group Co., Ltd. (QHMG) commissioned Beijing Zhonghuanruide Environmental Engineering Co., Ltd. and Borui Huachuang (Beijing) International Project Management Consulting Co., Ltd. (jointly referred to as the Consulting Team) to undertake the ESIA for this project in May 2023.

11. The Environmental and Social Impact Assessment (ESIA) work was conducted in accordance with the following steps:

(1) Review of Project-related technical documents, conduct a preliminary engineering analysis, identify key environmental and social impacts, and define the assessment focus along with environmental and social protection objectives. The technical documents reviewed include:

- *China-ASEAN Sea-Rail Multimodal Logistics Project Feasibility Study Report (Preliminary Draft, May 2023);*

- *China-ASEAN Sea-Rail Multimodal Logistics Project Environmental Impact Report (October 2024);*

- *China-ASEAN Sea-Rail Multimodal Logistics Project Soil and Water Conservation Plan (October 2024).*

- *China-ASEAN Sea-Rail Multimodal Logistics Project Social Stability Risk Assessment Report (December 2024).*

- *China-ASEAN Sea-Rail Multimodal Logistics Project Feasibility Study Report (Revised, October 2025)*

(2) From June 2023 to May 2024, the consulting team conducted a site survey to objectively understand the project site, including the selection of the project location, environmental conditions, land use, environmental and social sensitive points, impact factors, resident composition, and socio-economic living conditions of the affected population.

(3) From May 2024, the consulting team conducted on-site investigations at project locations: Building on existing data and field survey findings, the investigation focused on key areas including the rationality of the project site

selection, environmental and land compliance, the distribution of sensitive points and potential impacts, the demographic structure and demand characteristics within the project area, the distribution, socioeconomic characteristics, and cultural conditions of ethnic minorities, and the socio-economic conditions of potentially affected groups. This work served to further refine and confirm the basis for the assessment. The specific activities carried out are as follows:

- **Institutional Interviews and Data Collection.** Interviews and meetings were conducted with relevant government functional departments and existing facility operators involved in the project. These included the Qinbei District Development and Reform Bureau; QHAMG; Qinbei District Land and Housing Expropriation Center; NRB; Bureau of Human Resources and Social Security; Women's Federation; Bureau of Civil Affairs; Ethnic and Religious Affairs Bureau; Bureau of Ecology and Environment; Transportation Bureau; and Health Commission. Relevant project documents and data were collected.

- **Key Informant Interviews.** A total of 45 Key Informant Interviews were conducted with individuals from relevant departments, townships/sub-districts, and communities/villages in the project area. Of these interviewees, 15 were women, accounting for 33%.

- **Focus Group Discussions (FGDs).** A total of 16 Focus Group Discussions were organized, with cumulative participation of 240 individuals. Among the participants: 84 were women (52.20%); 14 were ethnic minorities (5.83%); 27 were elderly persons (11.35%); and 21 were low-income individuals (8.75%).

- **Questionnaire Survey.** A total of 400 Environmental and Social Impact Assessment questionnaires were administered face-to-face within the project area. Statistical review confirmed 380 valid questionnaires, resulting in a validity rate of 95%. The sample demonstrated diversity in terms of age, education level, and occupation. The specific composition included: 176 women (46%); 204 men (54%); and 20 ethnic minority respondents (5% of the total sample).

(iv) The ESIA was conducted based on engineering analysis, discussion meetings, field investigations, and data collection. Using technical methods such as mathematical modeling, analogical analysis, and professional judgment, the assessment evaluated the extent of the project's impacts on the surrounding environment and society, and proposed environmental and social mitigation measures and recommendations. The assessment focused on the scope and degree of ESIA during the construction and operational phases, while also demonstrating the project's compatibility with relevant plans. Building on this work, a preliminary draft of the "China-ASEAN Sea-Rail Multimodal Logistics Project Environmental and Social Impact Assessment Report" was completed in July 2024.

(v) Following the completion of the field surveys, the consultants continued subsequent assessments and public participation activities. They fully communicated and confirmed risk mitigation measures, plan optimization, and

the sequencing of action implementation with the PIU to further refine the social impact assessment and the dynamic improvement of management measures. These activities included: In October 2024, an online meeting was held to discuss the relocation of the Tudimiao in Hengling Village. From March to April 2025, meetings were organized to discuss land acquisition compensation, support for vulnerable groups, and social security measures. In July 2025, an online meeting was held with the PMO and the Qinbei District Expropriation Center to verify the project's area of impact and physical assets. Discussions also covered compensation standards, resettlement plans, implementation schedules, and detailed revisions to the report. On September 15–16, 2025, online meetings were conducted with local potential photovoltaic enterprises to carry out due diligence on occupational health and labor management. On September 23, 2025, the AIIB mission, together with the PMO, the E&S team, and local government representatives, conducted a site visit. They interviewed villagers potentially affected by railway noise and vibration, inspected the current condition and proposed new site of the Tudimiao in Hengling Village, as well as the status of the resettlement community. Discussions were held on the resettlement plan and the relocation of the Tudimiao. In February 2026, based on feedback from AIIB consulting experts, the project's E&S Advisor updated the ESIA, ESMP, SEP, GAP, and RP.

D. Report Structure

12. This report consists of an Executive Summary, ten chapters, and two appendixes. The structure of the report is as follows:

Executive Summary

Present the key facts, major findings, and recommended measures and actions.

I. Project Introduction

Introduces the basic project information, implementation arrangements, assessment objectives and methodology, and report structure.

II. Policy, Legal, and Administrative Framework

Discusses the legal and institutional framework for environmental and social assessment in China and under AIIB, the approval status of Domestic Environmental Impact Assessment (DEIA) reports, and the applicable environmental and social guidelines and standards.

III. Project Description

Describes the rationale, scope, components, location, and main features of the project, as well as implementation arrangements and schedule.

IV. Associated Facilities

Identifies and analyzes the associated facilities and investigates project-related facilities.

V. Alternatives Analysis

Analyzes alternative options for the project to determine the optimal solution that can achieve the project objectives while minimizing environmental and social impacts.

VI. Environmental and Social Baseline

Introduces relevant natural, ecological, and socio-economic conditions within the project area, as well as the results of environmental monitoring.

VII. Environmental Impact Analysis and Mitigation Measures

Describes the anticipated environmental impacts of project implementation and identifies required environmental impact mitigation measures.

VIII. Social Impact Analysis and Mitigation Measures

Elaborates on the subjects, scope, key issues, and methodology of the social impacts assessment; conducts the social impact analysis from the perspectives of both social benefits and social risks; analyzes the status of women's development, gender disparities, and the project's impacts on women in the project area; and incorporates the Gender Action Plan (GAP) into the Environmental and Social Management Action Plan.

IX. Information Disclosure and Public Participation

Describes the information disclosure and public participation activities conducted during the preparation of this report.

X. Grievance Redress Mechanism (GRM)

Introduces the Project's Grievance Redress Mechanism (GRM) for addressing complaints.

XI. Environmental and Social Management Plan

Presents the Environmental and Social Management Plan (ESMP), which includes the required mitigation measures for environmental and social impacts during design, construction, and operation phases, the environmental and social monitoring plan, reporting requirements, and capacity building.

XII. Conclusions and Recommendations

Provides the conclusions and recommendations for this project.

Appendix

Appendix 1: Table of the Gender Action Plan

Appendix 2: Biodiversity Survey and Evaluation

II. Policy, Legal, and Administrative Framework

A. Overview

13. This chapter outlines the applicable laws, regulations, and policies of the People's Republic of China (PRC), as well as the Asian Infrastructure Investment Bank's (AIIB) Environmental and Social Policies, relevant to the project. It provides an analysis of the environmental and social requirements from both Chinese and AIIB perspectives.

14. The Domestic Environmental Impact Assessment (DEIA) report for this project was prepared in accordance with the Environmental Impact Assessment Law of the People's Republic of China (revised on December 29, 2018), the Catalogue of Environmental Impact Assessment for Construction Projects (2021 edition, effective January 1, 2021), and the Measures for Public Participation in Environmental Impact Assessment (effective January 1, 2019). The project consists of four sub-projects, including three construction projects and one non-construction project. Based on the Catalogue of Environmental Impact Assessment for Construction Projects (2021 edition), an Environmental Impact Assessment Report has been prepared for this project, covering all sub-projects. The report was approved by the Qinzhou Municipal Bureau of Ecology and Environment in October 2024. Furthermore, a Social Stability Risk Assessment (SSRA) Report for the project was prepared and approved by the Qinbei District Government (QDG) of Qinzhou City, on December 3, 2024.

15. Pursuant to the "Guiding Opinions on Establishing and Improving the Risk Assessment Mechanism for Social Stability in Major Decision-Making (Trial)" (ZBF [2012] No. 2) issued by the General Office of the CPC Central Committee and the General Office of the State Council, and the "Implementation Opinions on Strengthening the Construction of the Risk Assessment Mechanism for Social Stability in Major Decision-Making under the New Situation" (GBF [2021] No. 17) issued by the General Office of the CPC Guangxi Zhuang Autonomous Regional Committee and the General Office of the People's Government of GZAR, social stability risk assessments must be conducted prior to decision-making by Party and government organs for all major decisions that directly affect the vital interests of the people, involve a wide scope, and are prone to triggering social stability concerns. This includes major engineering projects, major policy formulations, and other significant decisions with substantial potential impact on social stability, particularly those involving land acquisition and relocation, farmer burdens, restructuring of state-owned enterprises, environmental impacts, social security, and public welfare undertakings. As this project involves impacts such as land acquisition and relocation, directly relates to the vital interests of the people, and encompasses a broad scope, a social stability risk assessment is required. A Social Stability Risk Assessment Report, which covers all subprojects, has been completed. The assessment results

indicate that, based on the identification and analysis of potential social risks, the project's social stability risk was initially determined to be at a medium level. Following the implementation of effective prevention and mitigation measures, the risk level is reduced to low. Overall, the social risks are considered manageable. The report was approved by the People's Government of Qinbei District on December 3, 2024.

16. In accordance with AIIB's Environmental and Social Policies (ESP), the project has been classified as Category A project. This classification necessitates the preparation of a comprehensive Environmental and Social Impact Assessment (ESIA) report and the development of a corresponding Environmental and Social Management Plan (ESMP).

B. Environmental and Social Laws, Regulations, Guidelines, and Standards in China

17. China's environmental protection and management system has a clear hierarchy, consisting of environmental regulatory agencies, administrative agencies, and technical institutions. At the top level is the National People's Congress (NPC) and its Standing Committee, which hold the authority to enact and amend fundamental environmental protection laws. The Ministry of Ecology and Environment (MEE), under the leadership of the State Council, is responsible for promulgating national environmental regulations, and may issue national environmental standards independently or jointly with authorities such as the State Administration for Market Regulation (SAMR).. Provincial and local people's congresses and governments can also formulate provincial and local environmental regulations and guidelines that are consistent with but can be more stringent than the corresponding national standards. Additionally, national and local environmental protection five-year plans are integral components of the environmental governance framework.

18. Important environmental and social-related laws and regulations in China are listed in **Table II-1**. Local environmental and social-related laws and regulations are listed in Table II-2

Table II- 1Applicable Environmental and Social Laws, Regulations, Departmental Rules, and Policies in China

No.	Name	Date of Issue/Last Revision
1	Environmental Impact Assessment Law of the People's Republic of China	2018
2	Environmental Protection Law of the People's Republic of China	2015
3	Air Pollution Prevention and Control Law of the People's Republic of China	2018
4	Soil and Water Conservation Law of the People's Republic of China	2011

No.	Name	Date of Issue/Last Revision
5	Water Pollution Prevention and Control Law of the People's Republic of China	2017
6	Urban and Rural Planning Law of the People's Republic of China	2019
7	Solid Waste Pollution Prevention and Control Law of the People's Republic of China	2020
8	Cultural Relics Protection Law of the People's Republic of China	2017
9	Soil Pollution Prevention and Control Law of the People's Republic of China	2018
10	Noise Pollution Prevention and Control Law of the People's Republic of China	2021
11	Forest Law of the People's Republic of China	2019
12	Wild Animal Protection Law of the People's Republic of China	2018
13	Land Administration Law of the People's Republic of China (Revised)	2020
14	Law on the Protection of Women's Rights and Interests of the People's Republic of China	2023
15	Production Safety Law of the People's Republic of China	2021
16	Prevention and Control of Occupational Diseases Law of the People's Republic of China	2018
17	Regulations for the Implementation of the Land Administration Law of the People's Republic of China (Revised)	2021
18	Labor Law of the People's Republic of China	1995
19	Minor Protection Law of the People's Republic of China	2020
20	Law on the Protection of Disabled Persons of the People's Republic of China	2018
21	Social Insurance Law of the People's Republic of China	2018
22	Action Plan for Continuous Improvement of Air Quality	2023
23	Notice of the State Council on Printing and Distributing the Water Pollution Prevention and Control Action Plan	2015
24	Implementation Regulations on the Protection of Terrestrial Wild Animals of the People's Republic of China	2016
25	Regulations on the Protection of Wild Plants of the People's Republic of China	2017
26	Catalog of Classified Management of Environmental Impact Assessment for Construction Projects	2020
27	Measures for Public Participation in Environmental Impact Assessment	2019
28	Catalog of Classified Management of Environmental Impact Assessment for Construction Projects	2021
29	Notice on the Issuance of the "Guidelines for Government Information Disclosure on Environmental Impact Assessment of Construction Projects (Trial)"	2013

No.	Name	Date of Issue/Last Revision
30	Notice on Further Strengthening Environmental Impact Assessment Management to Prevent Environmental Risks	2012
31	Management Measures for Environmental Protection Complaint Hotline	2010
32	Interim Measures for Environmental Protection Acceptance of Completed Construction Projects	2017
33	Decision of the State Council on Deepening Reform and Strict Land Management	2004
34	Guiding Opinions on Improving the System of Land Expropriation Compensation and Resettlement	2004
35	Notice of the State Council on Strengthening Land Regulation	2006
36	Regulations on the Expropriation and Compensation of Houses on State-owned Land	2011
37	Notice from the Ministry of Natural Resources and the Ministry of Agriculture and Rural Affairs on Strict Control of Cultivated Land Use	2021
38	Regulations on Labor Protection in Workplaces with Toxic and Harmful Substances	2002
39	Implementation Regulations of the Labor Law	2018
40	Work-Related Injury Insurance Regulations	2011
41	Special Provisions on Labor Protection for Female Employees	2012
42	Regulations on Production Safety Management in Construction Projects	2023

19. The most comprehensive law regarding pollution prevention and control is the Environmental Protection Law (1989, revised in 2014, effective in 2015, see **Table II-1**, Item 2), which establishes the fundamental principles of China's pollution control system. The revised Environmental Protection Law further defines the enforcement and supervisory responsibilities of environmental protection authorities at all levels, imposes stricter penalties on enterprises and construction units for violations related to pollution prevention and control, and allows public interest litigation, including actions brought by non-governmental organizations (NGOs). The Environmental Impact Assessment Law (see **Table II-1**, Item 1) specifically outlines the procedures and requirements for the competent authorities to conduct technical review of environmental impact assessment reports.

20. China implements a classified management system for the environmental impact assessments of construction projects, based on the degree of their potential environmental impact. Projects that may cause significant environmental impacts are required to prepare an environmental impact report, which entails a comprehensive evaluation of the environmental impacts. Projects that may cause minor environmental impacts must prepare an Environmental Impact Report Form, involving analysis or specialized assessment of environmental impacts. Projects with minimal environmental impacts, which do not require environmental impact assessments, shall

complete an Environmental Impact Registration Form. The "Catalog of Classified Management of Environmental Impact Assessment for Construction Projects" (2020 Edition, effective 2021, see **Table II-1**, Item 26) serves as the basis for determining whether a project requires a report, form, or registration. If a project type is not listed in the Catalog, it is generally exempt from environmental impact assessment procedures. The Catalog is formulated and promulgated by the competent environmental authority under the State Council.

21. Environmental Protection Acceptance for Completed construction Projects. In 2017, the former Ministry of Environmental Protection promulgated the "Interim Measures for the Environmental Protection Acceptance of Completed Construction Projects" (Guo Huan Gui Huan Ping [2017] No. 4, see **Table II-1**, Item 32). According to this regulation, construction units can carry out the environmental protection acceptance process independently, while also and the regulation also stipulate the procedures and standards for environmental protection acceptance.

22. The provisions on public participation and environmental information disclosure represent the most significant changes introduced in the amended Environmental Protection Law. These changes are further reinforced by the "Measures for Public Participation in Environmental Impact Assessment" (MEE Order No. 4, Item II 1, Item 27), which mandates the preparation of an environmental impact assessment summary for public disclosure. To facilitate complaints, a nationwide hotline (12369) was established in March 2011 under the "Measures for the Operation and Management of Environmental Complaints Hotlines" (Order No. 15 of the former Ministry of Environmental Protection, 2010) for receiving and resolving environmental complaints. In accordance with "Guiding Opinions on Further Optimizing Local Government Service Convenience Hotlines" issued by the General Office of the State Council (Guo Ban Fa [2020] No. 53), the Ministry of Ecology and Environment has completely discontinued the "12369" short number. The "12369 Environmental Report" WeChat Official account has been renamed to "Ecology and Environment WeChat Complaints and Reports" and remains operational. To ensure smooth access for complaints and reports, the Department of Ecology and Environment of the Guangxi Zhuang Autonomous Region has consolidated its channels to the following: telephone reports (0771-12345), online reporting (via the Department's official website), WeChat reporting (through the "Guangxi Ecology and Environment" official Wechat account), and reporting by mail or in-person visit.

23. The Chinese government has relevant social risk management regulations for major investment projects. The National Development and Reform Commission's "Interim Measures for Social Stability Risk Assessment of Major Fixed Asset Investment Projects" requires project units to conduct surveys and analyses of social stability risks when organizing major project preparatory work. Subsequently, the local people's government or designated evaluation entities will conduct assessments of the social stability risk analyses provided by the project units, utilizing various methods to gather opinions, analyze and determine risk levels, and evaluate the legality, rationality, feasibility, and

controllability of the project construction implementation, potential social stability risks

24. The People's Republic of China has also enacted laws and regulations to safeguard community and occupational health and safety, including the "Labor Law" (2018 Amendment), the "Occupational Disease Prevention and Control Law" (2018), the "Production Safety Law of the People's Republic of China", the "Regulations on Safety Production Management in Construction Projects", and environmental and health standards for construction sites.

25. China has established a comprehensive legal and regulatory system concerning labor management. As a member of the International Labour Organization (ILO), China has ratified 28 conventions covering issues such as equal pay for equal work, discrimination, minimum age, child labor, occupational health and safety, forced labor, employment policy, consultation, and the right to associate. Laws and regulations in China and the Guangxi Zhuang Autonomous Region stipulate standards for wages, working hours, labor protection, and labor disputes, prohibit forced labor and/or child labor, and implement special labor protections for female workers and minors. These are in line with the relevant requirements of the Asian Infrastructure Investment Bank's (AIIB) Environmental and Social Framework (ESF).

26. China's legal system includes comprehensive regulations on child labor, discrimination, forced labor, working hours, minimum wages, and labor safety and health. For example, employers are prohibited from hiring minors under 16 years of age; special protections are implemented for female workers and minors (16-18 years old); workers' employment is not to be discriminated against based on ethnicity, race, gender, or religion; women enjoy equal employment rights to men; forced labor is prohibited; employers must establish and improve labor safety and health systems to reduce occupational hazards, etc. The Guangxi Zhuang Autonomous Region, as well as Qinzhou City and Qinbei District, have developed and implemented relevant systems and measures according to national laws and regulations.

27. The Chinese government has also developed a series of laws, regulations, and industry standards to protect workers' occupational health and safety, including national laws and administrative regulations, local laws and regulations, and industry safety and health standards. A multi-level legal system has now been established to ensure occupational health.

28. There are specific legal protections for women's labor rights, including the prohibition of sexual harassment. Particularly, Qinzhou City and Qinbei District have developed special action plans to promote the construction of model healthy enterprises and prevent and control occupational disease hazards. Specific measures include: comprehensive promotion of the "Occupational Disease Prevention and Control Law" to enhance employers' awareness of providing occupational health protection for workers; strengthening supervision and inspection to ensure employers fulfill their responsibility in occupational disease prevention; reinforcing the "three simultaneities" management of

occupational disease protection facilities in construction projects; enhancing workers' health monitoring; reinforcing occupational disease hazard project reporting; improving the detection, monitoring, and evaluation of occupational disease risk factors; regulating labor management; and expanding coverage of workers' compensation insurance.

29. Community health and safety requirements cover areas such as production safety, infectious disease prevention, and road traffic safety. Currently, China has established comprehensive system regulations regarding safety production, road traffic safety, infectious disease prevention, and emergency management of production accidents to ensure the safety of people's lives and property.

30. Land Expropriation and Involuntary Resettlement: For land expropriation, house demolition, resettlement, and compensation, China has established a complete legal framework and policy system, including the "Land Management Law of the People's Republic of China" (third amendment, August 26, 2019). Under the national legal and policy framework, local governments at various levels have issued and implemented relevant laws and policies that are tailored to local conditions to manage and guide land expropriation, house demolition, resettlement, and compensation work.

31. Information Disclosure and Public Participation: Regarding information disclosure, public participation, and complaint mechanisms, the laws and regulations of China, the Guangxi Zhuang Autonomous Region, and Qinzhou City and Qinbei District provide comprehensive and strict requirements for the disclosure of information regarding major construction project approvals and implementation processes, land expropriation and compensation plans, government resource allocation, and other matters. They also ensure that channels for public participation are smooth and accessible.

32. China and the Guangxi Zhuang Autonomous Region have established a systematic petition mechanism. Citizens, legal persons, or other organizations can reflect situations, make suggestions, express opinions, or submit complaints to governments at all levels or to government departments above the county level through various methods, including letters, emails, faxes, phone calls, and visits. These complaints are handled by relevant administrative authorities according to the law.

Table II-2 Local Laws, Regulations, and Standards

No.	Laws and Regulations	Year
1	Regulations on Environmental Protection of Guangxi Zhuang Autonomous Region	2019
2	Regulations on the Management of Forests and Wildlife Type Nature Reserves in Guangxi Zhuang Autonomous Region	2010
3	Regulations on the Protection and Management of Terrestrial Wild Animals in Guangxi Zhuang Autonomous Region	2012
4	Measures for the Protection of Wild Plants in Guangxi Zhuang Autonomous Region	2009

5	Regulations on the Protection of Ancient Trees and Famous Trees in Guangxi Zhuang Autonomous Region	2017
6	Regulations on the Protection of Drinking Water Source in Guangxi Zhuang Autonomous Region	2017
7	Regulations on the Prevention and Control of Water Pollution in Guangxi Zhuang Autonomous Region	2020
8	Regulations on the Prevention and Control of Air Pollution in Guangxi Zhuang Autonomous Region	2018
9	Regulations on the Prevention and Control of Soil Pollution in Guangxi Zhuang Autonomous Region	2021
10	Measures for the Management of Water Functional Zones in Guangxi Zhuang Autonomous Region	2002
11	Water Functional Zone Planning of Qinzhou City	2012
12	Measures for the Assessment of Guaranteeing Wage Payment to Migrant Workers in Guangxi	2023
13	Notice of the General Office of the People's Government of Guangxi Zhuang Autonomous Region on Printing and Distributing the 2011 Investment and Project Construction Implementation Plan	2011
14	Notice on Issuing the Interim Measures for Social Stability Risk Assessment of Fixed Asset Investment Projects by the Guangxi Zhuang Autonomous Region Development and Reform Commission	2013
15	Notice on Issuing the Interim Measures for Risk Assessment of Documents from the Department of Agriculture and Rural Affairs of the Autonomous Region	2023
16	Opinions of the General Office of the People's Government of Guangxi Zhuang Autonomous Region on Further Strengthening and Regulating Land Acquisition Management	2021
17	Notice of the General Office of the People's Government of Guangxi Zhuang Autonomous Region on the Implementation of a New Round of Land Acquisition and Regional Comprehensive Land Price Work	2023
18	Measures for the Implementation of the 'Land Management Law of the People's Republic of China' in Guangxi Zhuang Autonomous Region	2001
19	Measures for Minimum Living Guarantee in Guangxi Zhuang Autonomous Region	2019
20	Notice on Several Measures to Further Promote Full Employment and Enhance Market Vitality	2023
21	Notice of the General Office of the People's Government of Guangxi Zhuang Autonomous Region on the Implementation of Regional Comprehensive Land Price for Land Acquisition	2020
22	Notice from the People's Government of Guangxi Zhuang Autonomous Region on the Support for Land Acquisition and Demolition for Major Infrastructure Projects	2008
23	Notice from the People's Government of Guangxi Zhuang Autonomous	2010

	Region on the Implementation of Land Acquisition and Demolition for Major Railway Infrastructure Projects	
24	Notice from the General Office of the People's Government of Guangxi Zhuang Autonomous Region on the Pilot Measures for Social Security for Land-expropriated Farmers in Guangxi	2008
25	Notice on the Implementation of the Guidance on the Participation of Land-expropriated Farmers in the Basic Pension Insurance System in Guangxi Zhuang Autonomous Region	2016
26	Notice on the Implementation Rules for Land-expropriated Farmers' Participation in the Basic Pension Insurance System in Guangxi Zhuang Autonomous Region	2017
27	Notice from the Department of Human Resources and Social Security of Guangxi Zhuang Autonomous Region on the Pre-payment of Basic Pension Insurance Benefits for 2020	2020
28	Notice from the Department of Natural Resources, Department of Agriculture and Rural Affairs, and Department of Housing and Urban-Rural Development of Guangxi Zhuang Autonomous Region on Standardizing the Approval and Management of Rural Residential Land	2020
29	Notice from the People's Government of Guangxi Zhuang Autonomous Region on Printing and Distributing the Women's Development Plan and Children's Development Plan of Guangxi	2021
30	Notice from the People's Government of Guangxi Zhuang Autonomous Region on Solving the Housing Problems of Low-Income Urban Families	2007
31	Regulations on Religious Affairs in Guangxi Zhuang Autonomous Region	2020
32	Measures for the Implementation of the 'Law on the Protection of Women's Rights and Interests of the People's Republic of China' in Guangxi Zhuang Autonomous Region (Revised)	2024
33	Special Provisions on Labor Protection for Female Employees in Guangxi Zhuang Autonomous Region (Revised)	2012
34	Notice from the Office of the People's Government of Qinbei District, Qinzhou City on the Implementation of Seedling and Ground Attachment Compensation Standards in Qinbei District	2023
35	Notice from the People's Government of Qinzhou City on the Publication and Implementation of the New Round of Comprehensive Land Price Standards for Land Acquisition	2023
36	Interim Measures for the Management of Land Acquisition and Housing Relocation Compensation and Resettlement in Qinbei District	2020
37	Qinbei District Women and Children Development Plan (2021–2030)	2022

33. The Ministry of Environmental Protection has issued a series of technical guidelines for preparing environmental impact assessments (EIA). These include guidelines on the overall implementation and principles of EIA, air quality, noise, surface water, groundwater, ecology.

Table II- 3 EIA Guidelines

No.	Name	Standard No.
1	Technical Guideline for Environmental Impact Assessment of Construction Project-General Program	HJ/T 2.1-2016
2	Technical Guidelines for Environmental Impact Assessment- Atmospheric Environment	HJ 2.2-2018
3	Technical Guidelines for Environmental Impact Assessment- Surface Water Environment	HJ/T 2.3-2018
4	Technical Guidelines for Environmental Impact Assessment - Acoustic Environment	HJ 2.4-2021
5	Technical Guidelines for Environmental Impact Assessment - Ecological Impact	HJ 19-2022
6	Technical Guidelines for Environmental Impact Assessment – Groundwater Environment	HJ610-2016
7	Technical Guideline for Environmental Impact Assessment - Soil Environment	HJ964-2018
8	Technical Guidelines for Environmental Impact Assessment of Electricpower Transmission and Distribution	HJ24-2020
9	Technical Guidelines for Environmental Impact Assessment of Highway Construction Projects	HJ 1358-2024
10	Technical Guidelines for Environmental Risk Assessment on Projects	HJ169-2018
11	Technical Guidelines of Biodiversity Impact Assessment	DB45/T1577-2017
12	Technical Guidelines for Environmental Noise and Vibration Control Engineering	HJ2034-2014

34. Pollutant emission standards and environmental quality standards together form an essential framework for environmental protection. Environmental quality standards set restrictive limits on harmful substances and factors in the environment, reflecting the target requirements of environmental protection and serving as the basis for determining pollutant discharge controls. Pollutant emission standards, on the other hand, impose restrictive limits on pollutants or harmful factors discharged from pollution sources into the environment to meet environmental quality requirements. These standards represent the means and measures for pollution control to achieve environmental quality goals. The applicable environmental quality standards and pollutant emission standards for this project are detailed in the table below.

Table II-4 Applicable Environmental Quality Standards

No.	Name	Standard No.
1	Environmental Quality Standards for Surface Water	GB3838-2002
2	Environmental Quality Standards for Noise	GB3096-2008
3	Ambient Air Quality Standards	GB3095-2012
4	Standard for Groundwater Quality	GB/T14848-2017

5	Standard of Environmental vibration in urban area	GB10070-88
6	Standard for Pollution Control on the Non-hazardous Industrial Solid Waste Storage and Landfill	GB18599-2020
7	Standard for Pollution Control on Hazardous Waste Storage	GB18597-2023
8	Intergrated Emission Standard of Air Pollutants	GB16297-1996
9	Intergrated Wastewater Discharge Standard	GB8978-1996
10	Emission Standard of Environmental Noise for boundary of Construction Site	GB12523-2011
11	Emission Standard for Industrial Enterprises Noise at boundary	GB12348-2008
12	Railway Boundary Noise Limits and Measurement Methods	GB12525-90
13	Soil Environmental Quality—Risk Control Standard for soil contamination of agriculture land	GB15618-2018
14	Soil Environmental Quality—Risk Control Standard for soil contamination of development land	GB36600-2018

C. AIIB Environmental and Social Requirements

35. Since this project receives investment from the Asian Infrastructure Investment Bank (AIIB), the AIIB's Environmental and Social Framework (ESF, 2024) will apply to this project. The key elements are as follows:

36. The Environmental and Social Policy (ESP), Environmental and Social Standards (ESSs), and Environmental and Social Exclusion List (ESEL) outline the requirements for identifying, assessing, and managing environmental and social risks and impacts of projects supported by AIIB. The ESP defines the core environmental and social requirements applicable to all projects. The ESSs specify additional environmental and social requirements that clients must fulfill based on the project's nature, including: Environmental and Social Assessment and Management (ESS1), Land Acquisition and Involuntary Resettlement (ESS2), and Indigenous Peoples (ESS3). The ESEL stipulates the activities and projects that AIIB is prohibited from financing and for which it must exclude clients. AIIB requires each client to manage environmental and social risks and impacts related to their project in accordance with the ESP, applicable ESSs, ESEL, and the requisite documentation outlined therein.

37. This project involves the construction of a multimodal transfer center. Its activities do not touch upon any contents listed in the ESEL. The ESS outline more detailed mandatory environmental and social requirements, as described below:

ESS 1: Environmental and Social Assessment and Management (ESS 1). ESS 1 is designed to ensure the project's robustness and sustainability in environmental and social terms and to support the integration of environmental and social factors into project decision-making and implementation. ESS 1 is applicable if a project is likely to have adverse environmental risks and impacts, social risks and impacts, or both. The scope of environmental and social

assessment and management measures is proportionate to the project's risks and impacts. Through effective mitigation and monitoring measures during project implementation, ESS 1 provides for high-quality environmental and social assessment and management of these risks and impacts. ESS 1 defines the detailed requirements for the environmental and social assessment that any project funded by the AIIB must undergo.

Land Acquisition and Involuntary Resettlement (ESS 2). ESS 2 is applicable if the project screening process indicates that the project involves involuntary resettlement, including recent or foreseeable involuntary resettlement directly related to the project. Involuntary resettlement encompasses both physical displacement (relocation, loss of residential land, or loss of housing) and economic displacement (loss of land or access to land and natural resources; loss of assets or access to assets, sources of income, or means of livelihood) resulting from: (a) involuntary acquisition of land; or (b) involuntary restrictions on land use, or involuntary access to legally designated parks and protected areas. It covers displacement regardless of whether the loss or restriction is total or partial, permanent or temporary. ESS 2 defines the detailed requirements for the resettlement plan of projects involving involuntary resettlement.

Indigenous Peoples (ESS 3). ESS 3 is applicable if there are Indigenous Peoples (Ethnic Minorities) in or with collective attachment to the project's proposed area, who are likely to be affected by the project. The term "Indigenous Peoples (Ethnic Minorities)" is used in a generic sense to refer to distinct and vulnerable social and cultural groups that, to varying degrees, possess the following characteristics: (a) self-identification as members of a distinct indigenous cultural group and recognition of this identity by others; (b) collective attachment to geographically distinct habitats or ancestral territories within the project area and to the natural resources therein; (c) customary cultural, economic, social, or political institutions separate from those of the dominant society or culture; and (d) a distinct language, often different from the official language(s) of the country or region. In identifying these characteristics, consideration may be given to national legislation, customary law, and any international conventions to which the country is a party. Groups that have lost their collective attachment to geographically distinct habitats or ancestral territories in the project area due to forced severance remain eligible for coverage under ESS 3. If Indigenous Peoples (Ethnic Minorities) are present in the project area and are likely to be affected, ESS 3 defines the detailed requirements for the formulation of an Indigenous Peoples Plan (IPP).

38. During the project preparation phase, the environmental and social consultants conducted screening (to determine which standards should apply) and categorization (based on project type, nature, location, sensitivity, and scope) for this project. This process aimed to define the nature and level of environmental and social assessment, information disclosure, and stakeholder engagement required from the client, ensuring that the client's assessment is commensurate with the significance of the project's potential environmental and social risks and impacts.

39. Through various methods, including literature review, data collection, site visits, stakeholder focus group discussions, interviews, and questionnaire survey, conducted by the environmental and social consultants, a detailed identification and screening of the project's potential environmental and social risk factors was carried out. The results of the screening and classification are as follows:

40. The applicable AIIB ESP for this project includes "ESS 1 (Environmental and Social Assessment and Management)", "ESS 2 (Land Acquisition and Involuntary Resettlement)" and "ESS 3 (Indigenous Peoples)".

41. The Project is classified as a Category A project. It will cause social risks and impacts such as land acquisition and relocation, as well as environmental impacts like noise, vibration, and dust. Therefore, in accordance with the AIIB's environmental and social categorization and the requirements of ESS 1 (Environmental and Social Assessment and Management), an independent Environmental and Social Impact Assessment (ESIA) report will be prepared. This report will include an Environmental and Social Management Plan (ESMP). Furthermore, due to AIIB's emphasis on the importance of gender equality, it supports the client in identifying potential gender-specific opportunities and adverse gender-related risks and impacts within the project, and in developing mitigation measures to avoid or minimize such risks and impacts. These measures should include the timely identification and addressing of risks related to Gender-Based Violence (GBV), the preparation of a Gender Action Plan (GAP), and the inclusion of these elements in the ESIA report.

42. The construction of the project will inevitably involve permanent land acquisition and demolition activities. The affected area covers 2 townships/sub-districts (Changtian Street and Dadong Town), and 5 villages/communities (Huangma community, Chengbei community, Longwan community, Hengling Village, Jiangbiao community). The construction activities of this project will inevitably lead to permanent LA and HD. The project's impact area covers 2 townships and sub-districts (Changtian Sub-district and Dadong Town), affecting 5 villages/communities (Huangma Community, Chengbei Community, Longwan Community, Hengling Village, and Jiangbiao Community). A total of 691 Affected HHs comprising 3,459 project-affected people will be impacted, of whom approximately 1,694 are female, and 11 of whom are Ethnic Zhuang. The area of housing demolition involves 32,625 m², all of which are rural residential houses; no commercial shops or enterprises are subject to demolition. A total of 1,705.75 mu of land will be acquired (including 1,641.40 mu of collective land and 64.35 mu of state-owned land). Specifically: (a) 584 HHs (2,909 project-affected people) are impacted by land acquisition only; (b) 34 HHs (139 project-affected people) are impacted by housing demolition only; (c) 73 HHs (411 project-affected people) are impacted by both LA and HD.

43. The project proposes to permanently acquire 1,705.75 mu of land, of which 1,641.40 mu is collective land, affecting 657 households comprising 3,320 people. The breakdown of the acquired land is as follows: (1) forest land 840.53 mu; (2) agricultural land 524.78 mu; (3) water surface 63.80 mu; (4)

construction land 212.29 mu. Additionally, the project will permanently occupy 64.35 mu of state-owned land. Furthermore, the project involves the demolition of rural residential houses affecting 107 households (550 people), with a total demolition area of 32,625 square meters. Among these, 73 households are affected by both land acquisition and house demolition. According to the survey, the project does not involve the demolition of commercial shops/business premises, enterprises and public institutions, or non-tilted structures. Therefore, in accordance with the AIIB's ESS 2: Land Acquisition and Involuntary Resettlement, and considering the potential impacts of significant land acquisition activities, the project is classified as Category A, and a Resettlement Plan (RP) has been prepared.

44. Based on the assessment of the Project's potential impacts on ethnic minorities, Guangxi had a total population of approximately 50.13 million in 2024, of which 18.95 million (about 37.8%) were ethnic minorities, with the Zhuang ethnic group representing the largest share. Qinzhou Municipality had a total population of 4.21 million, including approximately 477,000 ethnic minority residents (11.3%), of whom the Zhuang ethnic group accounts for around 96%. The Project area covers five villages/communities: Huangma, Longwan, Chengbei, Jiangbiao and Hengling, which are located in the Changtian subdistrict and Dadong town. These villages are in the peri-urban area of Qinzhou City. There are no ethnic minority-concentrated communities within the Project area. Ethnic minority residents comprise around 60 individuals, all of whom are Zhuang, accounting for 0.05% of the Project area population. These households are scattered residents, primarily formed through marriage or migration, and based on key informant interviews and focus group discussions conducted during the Project Team's (PT's) September 2025 site visit, ethnic minority participants reported that they are able to communicate in Mandarin and have access to the same public services as the Han population. In terms of social welfare entitlements, legal rights and protections, no material differences were identified. While ethnic minority residents maintain their own cultural customs and living practices, these do not affect their access to services or participation in local socioeconomic activities.

45. In accordance with ESS3, meaningful, culturally appropriate, accessible, and gender-sensitive consultations were conducted with Zhuang individuals to ensure culturally appropriate benefits and to avoid or mitigate adverse impacts. Of the 60 Zhuang individuals in the Project area, 11 individuals (approximately 0.3% of Project-affected persons) will be affected by land acquisition, with limited impacts as income loss is estimated at less than 5% of their agricultural income. Consultations indicate strong community support for the Project, particularly due to anticipated employment opportunities. Indigenous Peoples due diligence has been integrated into the ESIA/ESMP and RP, with culturally appropriate engagement, grievance redress, and monitoring measures reflected in the SEP and GRM.

46. Therefore, the environmental and social documents required for this project include: (1) Environmental and Social Impact Assessment (ESIA); (2) Environmental and Social Management Plan (ESMP); (3) Resettlement Plan

(RP) and; (4) Stakeholder Engagement Plan (SEP). This document is the Environmental and Social Impact Assessment (ESIA) Report.

Table II-5 Applicable Environmental and Social Standards for This Project

Environmental and Social Standards		Applicability	Remarks
ESS 1	Environmental and Social Assessment and Management	ESS 1 applies if the project may have adverse environmental and/or social risks and impacts.	Triggered. As the project may cause negative environmental and social impacts, this Environmental and Social Impact Assessment (ESIA) Report has been prepared in accordance with ESS 1.
ESS 2	Involuntary Resettlement	ESS 2 applies if the project is likely to cause involuntary resettlement impacts.	Triggered. A Resettlement Plan (RP) has been prepared for this project in accordance with ESS 2.
ESS 3	Indigenous Peoples (Ethnic Minorities)	ESS3 applies if the project may cause impacts on ethnic minorities.	Triggered. In accordance with the Constitution and the system of regional ethnic autonomy, the Zhuang are a legally recognized ethnic minority and an indigenous ethnic group of GZAR. All Zhuang residents within the project area legally possess this minority status. To safeguard their rights and interests, the project has systematically identified the distribution characteristics of ethnic minorities and potential impacts, and has formulated culturally appropriate, gender-sensitive, and inclusive measures to avoid or mitigate adverse effects. Relevant actions and measures have been integrated into the ESIA, ESMP, RP, and SEP.

47. Table II-6 provides a comparison between national environmental legislation and the AIIB's ESP and ESSs. This project is required to comply with both sets of requirements. In the event of any conflicts between them, the more stringent requirement shall prevail.

Table II-6 Comparative Analysis of Environmental and Social Requirements between China and the AIIB

Project	AIIB Requirements	Chinese Requirements	Comparative Analysis
Environmental and Social Policies and Regulations	The AIIB requires the adoption of the AIIB's environmental and social framework, and projects applying for AIIB loans must adopt environmental and social policies and environmental and social standards.	China has a series of complete general environmental laws and policies. Construction projects should carry out environmental impact assessments and Environmental protection measures shall comply with environmental quality standards, and at the same time must meet local environmental laws and regulations and relevant requirements. This chapter details applicable domestic environmental laws and regulations. In China, social stability risk assessments are only required for major investment projects. According to the Guiding Opinions on Establishing a Sound Mechanism for Social Stability Risk Assessment of Major Decisions (Trial) issued by the General Office of the CPC Central Committee and the General Office of the State Council	China's environmental and social policies and regulations share many similarities with those of the Asian Infrastructure Investment Bank (AIIB). However, there are also significant differences: domestic policies typically focus separately on either the environmental impacts of a project or its social stability risks, whereas the AIIB emphasizes a more integrated assessment of both environmental and social effects. Projects should comply with both domestic and AIIB requirements and adopt the more stringent standards where applicable.

		(Zhongbanfa [2012] No. 2), any major decision that is closely related to the vital interests of the people, has a wide scope of influence, and may easily trigger social instability—such as major construction projects and policy decisions involving land acquisition and relocation, burdens on farmers, restructuring of state-owned enterprises, environmental impacts, social security, and public welfare—must undergo a social stability risk assessment before a decision is made by the relevant Party and government authorities.	
Environmental And Social Category	AIIB conducts project screening and classification at the earliest stages of project preparation when sufficient information is available. If AIIB and national classification requirements differ, the stricter requirements apply. This is mainly the case for identifying Category C subprojects—small-scale activities, including various construction works, are not covered under national EIA legislation. In this case, the client will adopt AIIB standards.	The "Construction Project Environmental Impact Assessment Classification Management Catalog (2021 Edition)" is based on the characteristics of construction projects and the environmental sensitivity of the area where it is located, and comprehensively considers the possible impact of construction projects on the environment. The impact	This project has been classified as Category A in accordance with the Environmental and Social Framework (ESF) of the Asian Infrastructure Investment Bank (AIIB). In accordance with China's domestic environmental impact assessment (EIA) regulations, the project is required to prepare a full Environmental Impact Assessment

		assessment is classified into three categories: (1) preparation of environmental impact report (2) preparation of environmental impact report form (3) preparation of environmental impact registration form. According to the Guiding Opinions on Establishing a Sound Mechanism for Social Stability Risk Assessment of Major Decisions (Trial) issued by the General Office of the CPC Central Committee and the General Office of the State Council (Zhongbanfa [2012] No. 2), any major decision that directly affects the vital interests of the people, has a broad scope of influence, and is likely to trigger social instability—such as major construction projects or policy decisions involving land acquisition and relocation, burdens on farmers, restructuring of state-owned enterprises, environmental impacts, social security, public welfare, and other matters with significant implications for social stability—must undergo a social	(EIA) Report. Additionally, under Chinese domestic policy, the project involves impacts such as land acquisition and resettlement, which directly affect the vital interests of the public and have a broad scope of influence. Therefore, a Social Stability Risk Assessment (SSRA) is also required.
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		stability risk assessment before a decision is made by Party and government authorities.	
Preparation of environmental and social impact assessment report	According to environmental and social policies, category A projects need to prepare environmental and social impact assessment reports, Environmental and social management plans, and resettlement plans. The environmental and social impact assessment report includes: (1) Project description, including the map of the project area; (2) Policy, legal and administrative framework, including the domestic and international legal framework applicable to the project; (3) Project scope, including stakeholders Identification and consultation plan; (4) analysis of alternatives; (5) baseline environmental and social data; (6) evaluation of environmental and social risks and impacts; (7) analysis of risks and impacts related to climate change; (8) public consultation and information disclosure; (9) development of mitigation, monitoring and management measures and actions in the form of environmental management plans or	According to the "Category of Management Directory of Environmental Impact Assessment of Construction Projects (2021 Edition)", the Project needs to prepare an environmental impact report . In accordance with Chinese domestic policy requirements, the construction of this project involves impacts such as land acquisition and resettlement, which directly affect the vital interests of the public and have a wide scope of influence. Therefore, a Social Stability Risk Assessment (SSRA) must be conducted. The Social Stability Risk Analysis Report shall include: Social impact analysis, Stakeholder analysis, Social compatibility analysis, Social risk analysis, and Project sustainability analysis. In addition, it must propose risk mitigation measures and	The environmental and social impact assessment prepared by the AIIB for Category A projects not only evaluates the potential environmental and social risks and positive and negative impacts of the project, but also compares and analyzes feasible alternatives, and recommends any necessary measures to avoid, minimize, reduce, offset or compensate for adverse impacts and improve the environmental and social performance of the project. Building upon the requirements of domestic Environmental Impact Assessment (EIA) and Social Stability Risk Assessment (SSRA), the project will also adopt the more stringent standards of the Asian Infrastructure Investment Bank (AIIB). An Environmental and Social Impact Assessment (ESIA) report will be

	environmental impact assessments. In addition, the AIIB Environmental and Social Framework requires that environmental and social risks and impacts of associated facilities 4 be identified and assessed in an environmental and social assessment.	emergency response plans, and give special attention to vulnerable groups, including those affected by poverty, gender inequality, ethnic minority status, and involuntary resettlement.	prepared in accordance with AIIB's Environmental and Social Framework. The scope of the assessment will cover not only the project facilities themselves, but also any identified associated facilities.
Environmental and Social Management Plan	The AIIB requires Category A projects to prepare the ESMP, which must propose plans to manage and mitigate environmental and social risks and impacts, including: (1) Mitigation measures (2) Environmental and social monitoring and reporting requirements (3) institutional arrangements.	No need to prepare a separate environmental management plan or any other environmental documents. According to the "Land Administration Law of the People's Republic of China" and the "Regulations on Compensation for Acquisition of Houses on State-Owned Land", if the acquisition of land and houses is involved, it is necessary to prepare a compensation and resettlement plan for land Acquisition.	Both China and the Asian Infrastructure Investment Bank (AIIB) place great importance on the environmental and social impacts of projects, with particular emphasis on the protection of ethnic minority rights, gender equality, resettlement of involuntary migrants, and assistance to vulnerable groups. However, under the current management model in China, environmental and social management requirements are proposed separately by different government departments, lacking a systematic and integrated approach. Moreover, dedicated plans such as a Gender Action Plan (GAP) or Ethnic Minority Development Plan (EMDP)

			have not yet been formulated. For this project, the more rigorous requirements of the AIIB will be adopted, and the Environmental and Social Management Plan (ESMP) will be incorporated into the Environmental and Social Impact Assessment (ESIA) report.
Public Consultation	The AIIB requires at least one meaningful consultation for all Category A, B, and C projects. The opinions of project-affected people and stakeholders will be solicited at all stages of project development. During the design, preparation and Implementation of projects, comments received during project preparation and implementation shall be considered. Constant consultation mechanisms are required throughout the whole project lifecycle to disclose information and seek feedback. The results of the public consultation shall be recorded in the ES documents.	According to domestic regulations, projects that require the preparation of an Environmental Impact Report (EIR) must conduct public consultation. However, projects that require only an Environmental Impact Report Form or an Environmental Impact Registration Form are not required to carry out public consultation. In practice, domestic policies and regulations primarily focus on stakeholder participation during the initial stages of project development. There is limited emphasis on public participation during the policy planning stage, and there is no clear requirement for stakeholder	According to the requirements of the AIIB and domestic policies and regulations, public consultations have been carried out with stakeholders and affected groups, and the feedback obtained from the public consultations is finally reflected in the ESIA.

		engagement throughout the full lifecycle of the project or decision-making process.	
Grievance Redress Mechanism	The AIIB requires the establishment of a Grievance Redress Mechanism (GRM) for receiving, evaluating and facilitating for addressing arrangements caused concerns, complaints and grievances of project-affected people regarding the social and environmental performance of borrowers /clients in projects. GRM is important for development projects where adverse impacts or risks are occurring or expected. It also includes information on the AIIB 's Project-Affected People's Mechanism (PPM), including how to access it, which must be included in project and subproject Environmental and social documents and disseminated by the GRM.	The Interim Measures for Public Consultation on Environmental Impact Assessment (Ministry of Environmental Protection, 2006) clearly requires project proponents to provide a GRM for stakeholders to raise their concerns, comments or complaints during project preparation. During the project implementation phase, the National Construction Management Standard (Construction Safety Inspection Standard - JGJ59-2011) clearly requires the contractor to disclose the GRM at the project site, so that stakeholders affected by the project can raise complaints or concerns to the contractor. In addition to project-specific GRM, China has established a formal environmental petition system through which any citizen, legal person, or organization can lodge a petition with	This project will establish a Grievance Redress Mechanism (GRM) in accordance with AIIB requirements. The related provisions are included in Chapter X of this report.

		environmental departments at all levels through letters, emails, faxes, telephone calls, and personal visits. Domestic guidelines point out that the project shall set up a special mechanism for accepting and handling grievances and complaints, and promptly publish the results of grievances and complaints. A grievance application can be submitted to the PIU, community organization, government department and other responsible agencies and project implementation and management personnel in non-written form, or a formal written grievance application can be submitted to the relevant responsible agency or department. According to the "Guiding Opinions on Further Optimizing Local Government Service Convenience Hotlines" issued by the General Office of the State Council, all localities have established a 12345 hotline social supervision mechanism to accept	
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		various inquiries, help, complaints, reports, and suggestions from enterprises and the public.	
Information Disclosure	The AIIB requires disclosure of project information to allow stakeholders to understand project risks and impacts, as well as potential opportunities. The client to post the draft ESIAs, ESMPs, ESMPFs, resettlement plans, RPFs, Indigenous Peoples plans and IPPFs, or other approved forms of documentation, through its website, for Category A project 60 days and for Category B project 30 days, prior to Bank's approval.	Domestically, domestic environmental impact assessments are required to be disclosed on the website of the local Ecological Environment Bureau within a limited period of time. According to the Regulations on the Disclosure of Government Information of the People's Republic of China, the administration institution shall actively publicize the approval and implementation of major construction projects, as well as government information that involves the adjustment of public interests, needs to be widely awareness by the public, or requires public engagement in decision-making. In addition, the administration institution shall actively disclose government information related to municipal construction, public services, land acquisition, house acquisition, public security	The project's environmental and social documents will be disclosed on the AIIB website, the Qinbei District government website, and the developer's website in accordance with the required timelines. Additionally, during the project implementation phase, environmental and social monitoring results, as well as other updates related to the project's environmental and social impacts and management, will be made publicly available.

		management, etc. The disclosure approaches include government bulletins, government websites or other Internet government media, press conferences, newspapers, radio, television, and other channels. The domestic guideline points out that during the project implementation process, the project design plan, resettlement plan, environmental assessment report, and social assessment report should be published on government information disclosure platforms (radio, television, website, etc.) to accept public supervision.	
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D. International Agreements

48. China is a signatory to a series of major international environmental and social agreements. The agreements relevant to this project are listed in the table II-7, covering biodiversity, wetland conservation, climate change, gender equality, and core labor rights.

Table II-7 Applicable International Agreements

Convention/Agreement	Year	Related Content
Ramsar Convention on Wetlands of International Importance	1975	Prevention of current and future encroachment and loss of wetlands (the project includes reservoirs)
Convention on Biological Diversity	1993	Protection and sustainable use of biodiversity (the project includes afforestation)
United Nations Framework Convention on Climate Change	1994	Stabilization of atmospheric greenhouse gas (GHG) concentrations (the project involves GHG reduction)
Kyoto Protocol to the United Nations Framework Convention on Climate Change	2005	Further reduction of greenhouse gas emissions (as mentioned above)
Montreal Protocol on Substances that Deplete the Ozone Layer	2016 (amended)	Protection of the ozone layer
United Nations Convention to Combat Desertification	1996	Prevention of desertification and mitigation of the effects of drought (the project involves soil erosion control)
Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal	1992	Control of transboundary movement of hazardous waste
Paris Agreement	2015	Addressing greenhouse gas reduction, adaptation, and financing issues starting in 2020
International Covenant on Economic, Social and Cultural Rights	1966	Ensuring the right to an adequate standard of living, health, education, and decent work for all; requiring non-discrimination and progressive realization of rights; relating to minimum labor standards, access to health and community services, compensation for relocation, and participation rights in the project.

Convention on the Elimination of All Forms of Discrimination against Women (CEDAW)	1979	Guaranteeing equal opportunities in employment, education, health, and participation in decision-making; requiring implementation of gender equality, equal pay for work of equal value, maternity protection, and prevention of sexual harassment at the project level.
ILO conventions on core labor standards	1999 (amended)	Protecting fundamental labor rights: freedom of association and collective bargaining, elimination of forced labor and child labor, equal remuneration, non-discrimination, and minimum working age; serving as the baseline for labor compliance for the project and its supply chain

E. Project Evaluation Standards

49. The Asian Infrastructure Investment Bank (AIIB) "Environmental and Social Framework" (revised in 2024) requires that projects adopt internationally recognized pollution prevention technologies and practices that represent Good International Industry Practice (GIIP), such as the World Bank Group's "Environmental Health and Safety (EHS) Guidelines." Consequently, the project adheres to the more stringent of either the internationally recognized standards or the applicable domestic standards. The specific applicable standard values are as follows:

a. Surface Water Quality

50. The World Bank's EHS Guidelines provide guidance on wastewater quality standards but do not establish environmental water quality objectives. Therefore, this project will adhere to the "Environmental Quality Standards for Surface Water" (GB3838-2002) of the People's Republic of China.

51. Based on the environmental functions and protection objectives of surface water, it is classified into five categories: Class I waters are primarily applicable to source water bodies and national nature reserves; Class II waters are mainly designated for first-grade protection zones of surface water sources for centralized drinking water supply, habitats for rare aquatic species, and the spawning and feeding grounds of fish and shrimp, including larval and juvenile fish; Class III waters are generally allocated to second-grade protection zones of such drinking water sources, as well as to wintering grounds and migratory pathways for fish and shrimp, aquaculture areas, and swimming zones; Class IV waters are primarily suited for general industrial water use and recreational purposes without direct human contact; and Class V waters are mainly

applicable to agricultural water use and water bodies with general landscape requirements.

52. For surface water bodies whose designated functions do not correspond to the aforementioned five categories, the standard values for the basic items in the Surface Water Environmental Quality Standards are nevertheless classified into five categories. Different functional categories shall implement the corresponding standard values. The standard values for higher functional categories are more stringent than those for lower categories. Where a single water body serves multiple functions, the standard value corresponding to the highest functional category shall be applied. Achieving the water body's designated function and meeting the standard for its functional category are considered equivalent

53. This project does not cross any rivers. The main surface water in the project area is the Qinjiang River, located 245 meters to the east. The surface water quality is required to comply with the Class III standards specified in the "Surface Water Environmental Quality Standards" (GB 3838-2002).

Table II- 8 Surface Water Environmental Quality Standards at Project Location

(Unit: mg/L, except pH)

Pollutant	Class III	Standard
pH	6~9	Standard Limit for Class III water bodies in "Environmental Quality Standards for Surface Water" (GB3838-2002)
COD	≤20	
BOD ₅	≤4	
NH ₃ -N	≤1.0	
TP	≤0.2	
TN	≤1.0	
DO	≥5	
Petroleum	≤0.05	

b. Ambient Air Quality

54. China's "Ambient Air Quality Standards" (GB 3095-2012) classify ambient air quality into two categories. Category 1 standards apply to special protect areas such as nature reserves scenic spots, and other zones requiring special protection. Category 2 standards apply to all other areas, including residential, commercial, cultural, industrial, urban zones. The project site falls within the Category 2 ambient air quality functional area.

55. The World Bank Group's "Environmental Health and Safety (EHS) Guidelines" recommends adhering to standards mandated by national legislation. In the absence of such national standards, the latest World Health Organization (WHO) "Global Air Quality Guidelines" (AQG) or other internationally recognized benchmarks should be applied. The previous version of the WHO AQG was published in 2005. These guidelines cover numerous air

pollutants including PM_{2.5} and O₃, and facilitate global air quality management by establishing interim target levels that provide optional, progressive milestones for risk reduction. Based on a comprehensive review of environmental health research over the past 15 years, WHO revised the AQG in 2021.

56. Table II-9 compares THE Category 2 standard limits specified in China's "Ambient Air Quality Standards" (GB 3095-2012) with the interim target values and guideline value of the WHO AQG. The Chinese standard includes a 24-hour limit for Total Suspended Particulates (TSP), which the WHO AQG does not specify. The 24-hour SO₂ limit (0.15 mg/m³) under the Chinese Category 2 standard is less stringent than the AQG interim target-1 (0.125 mg/m³). In comparison, the 24-hour limits for PM₁₀ (0.15 mg/m³) and PM_{2.5} (0.075 mg/m³), as well as the annual average limits for NO₂ (0.04 mg/m³) and PM_{2.5} (0.035 mg/m³), are equivalent to their respective AQG interim target-1 value. Overall, the Chinese standard limits are largely equivalent to the AQG interim target-1 levels. Consequently, this report will apply the more stringent standard on a case-by-case basis.

Table II-9 Comparison of China's Current Ambient Air Quality Standards (GB 3095-2012) with WHO "Global Air Quality Guidelines" (2021 Edition) (Units: mg/m³)

No.	Item	Average Period	GB 3095-2012 Category 2 Standard	WHO "Global Air Quality Guidelines" (2021)		Implementation Standard of the Project
				Interim Target 1	Guideline Value	
1	SO ₂	1 year	0.06	Not applicable	Not applicable	0.06
2		24 hours	0.15	0.05-0.125	0.04	0.125
3		1 hour	0.50	Not applicable	Not applicable	0.50
4	PM ₁₀	1 year	0.07	0.02-0.07	0.015	0.07
5		24 hours	0.15	0.05-0.15	0.04	0.15
6	PM _{2.5}	1 year	0.035	0.01-0.035	0.005	0.035
7		24 hours	0.075	0.025-0.075	0.015	0.075
8		1 hour	Not applicable	Not applicable	Not applicable	Not applicable
9	NO ₂	1 year	0.04	0.02-0.04	0.010	0.04
10		24 hours	0.08	0.05-0.12	0.025	0.08
11		1 hour	0.20	Not applicable	Not applicable	0.20
12	CO	24 hours	4.0	7.0	4.0	4.0
13		1 hour average	10.0	Not applicable	Not applicable	10.0
14	O ₃	Daily maximum	0.16	0.12-0.16	0.10	0.16

		8-hour average				
15		1 hour average	0.20	Not applicable	Not applicable	0.20
16	TSP	24 hours average	0.30	Not applicable	Not applicable	0.30
17		Annual average	0.20	Not applicable	Not applicable	0.20

c. Acoustic Environment Quality

57. China's *Environmental Quality Standard for Noise (GB 3096-2008)* classifies acoustic environmental zones into five categories based on the area's functional characteristics and environmental quality requirements. Class 0 acoustic environment function area refers to rehabilitation and convalescence zones and other areas that require extreme quietness. Class 1 refers to areas where the primary functions are residential, medical, cultural, educational, scientific research and administrative, office, necessitating the maintenance of a quiet environment. Class 2 refers to areas where the primary functions are commercial and financial or market trade, or where residence, commerce and industry are mixed, requiring the preservation of residential quiet. Class 3 refers to areas where the primary functions are industrial production, storage/logistics, requiring the prevention of significant industrial noise impacts on the surrounding environment. Class 4 refers to areas within a certain distance on both sides of traffic arteries, where the serious impact of traffic noise on the surrounding environment must be prevented. This includes two types: Class 4a and Class 4b. Class 4a pertains to areas on both sides of expressways, Class I highways, Class II highways, urban expressways, urban trunk roads, urban secondary trunk roads, urban rail transit (ground section) and inland waterways; Class 4b pertains to areas on both sides of the railway trunk lines.

58. The World Bank Group's EHS Guidelines classify noise level guideline values based on the type of receptor: residential, office and cultural/educational institutions and industrial and commercial facilities. The guideline values for residential, office, and cultural/educational areas are the same as noise standard those in Class 1 areas according to China's *Environmental Quality Standard for Noise (GB 3096-2008)*.

59. Compared to the World Bank's standard classification, China's noise standard system employs a more detailed classification scheme tailored to different types of acoustic environment functional zones. These zones are formally delineated by the local governments, taking into comprehensive consideration the primary land use purpose and the actual ambient background noise level. Operating under this zoning management framework, the stipulated noise standards are applied uniformly to the entire zone rather than being tailored to individual receptors. In contrast, the World Bank's standards primarily focus on the receptor point of view without adequately incorporating

the project's ambient background acoustic environment into the assessment. This approach can lead to technical and financial impracticalities when conducting noise impact assessments for transportation infrastructure such as railways or highways. Consequently, for this project, the national domestic standards will be generally adopted for evaluating ground-level noise environmental quality.

60. The project site is not within the area designated by the “Qinzhou Central Urban Area Acoustic Environmental Function Zoning” (QZBG [2023] No. 11). Therefore, Consequently, the acoustic environmental function zones for the project shall be delineated in accordance with the *Technical Specifications for Acoustic Environmental Function Zoning (GB/T 15190-2014)* and *Environmental Quality Standard for Noise (GB 3096-2008)*. The principles for zoning within the project's area of influence are as follows: Rural villages and contiguous residential areas in the countryside shall comply with the Class 1 acoustic environmental function zone standards. Areas within a certain distance from the boundaries of traffic arteries (including railways [excluding dedicated railway lines], expressways, Class I and II highways, urban expressways, urban trunk roads, urban secondary trunk roads, ground section of urban rail transit lines, and inland waterways) shall be designated as Class 4 acoustic environmental function zones. Areas outside of Class 4 zones shall comply with Class 2 acoustic environmental function zone standards. Given that the primary function of the park area is industrial production and storage/logistics, it is classified as a Class 3 acoustic environmental function zone.

61. The classification of acoustic environmental function zones within the project's area of influence will also undergo changes upon the completion. For example: After the construction of logistics and production facilities, the surrounding area of the park will transition from its current state of contiguous rural residential land to mixed-use area of industry and residence;; consequently, its noise function zoning will change from Class 1 to Class 2. Upon completion of the entrance trunk road, the areas currently consisting of contiguous rural residences will be developed into either a Class I highways or urban trunk roads. Within a certain distance on both sides of the road, the zoning will change from Class 1 to Class 4a, and the adjacent areas will change from Class 1 to Class 2.

62. Based on the above, the acoustic environmental assessment standards for this project are as follows:

(1) Current Status Evaluation

(i) The existing railway along the project route is the Mahuang Station Shunting Line. Since this line comprises multiple railway projects constructed and operated at different times, the noise-sensitive buildings located within 65 meters from the outer rail centerline of the existing railway shall comply with the Class 4b noise limits specified in the *Environmental Quality Standard for Noise (GB 3096-2008)*. Other areas in close proximity to the existing railway line shall comply with the Class 2 standards specified in the *Environmental Quality*

Standard for Noise (GB 3096-2008).

(ii) The terminal area of the entrance trunk road is adjacent to the existing G325 National Highway and Yongbei railway line. Consequently, the current status of the acoustic environment for sensitive points distributed along these existing traffic arteries shall be evaluated as follow: In areas where buildings of three stories or higher predominate along the road, the zone extending from the building façade facing the traffic artery to the boundary of the traffic artery shall comply with Class 4a standards of GB 3096-2008, and the remaining areas shall comply with the Class 2 standards of GB 3096-2008.

(iii) In areas where buildings along the road are predominately less than three stories high (including= open land), areas within 35 meters from the highway boundary line shall apply Class 4a standards specified in the Environmental Quality Standards for Noise(GB 3096-2008).The area beyond 35 meters from the highway boundary line shall implement Class 2 standards.

(iv) In accordance with the “Notice on Issues Concerning Environmental Noise in Environmental Impact Assessments for Highway, Railway (Including Light Rail) Construction Projects” (Huan Fa [2003] No. 94), for special noise-sensitive buildings such as schools, hospitals (including sanatoriums and homes for the elderly)located within Class 4 acoustic environmental function zones, the allowable outdoor acoustic environment noise level are 60 dB(A) during the daytime and 50 dB(A) at night.

(v)In accordance with the “Qinzhou Central Urban Area Acoustic Environmental Function Zoning” (Qin Zheng Ban Gui [2023] No. 11), specifically item (VI) "Notes on Acoustic Environment Management in Rural Areas", which stipulates that “villages and contiguous residential areas in rural zones are, in principle, classified as Class 1 acoustic environmental function zones; villages with significant industrial activities or traversed by traffic arteries may be partially or fully designated as Class 2.” the following applies to the project area: rural areas traversed by traffic arteries shall implement the Class 2 standards, while rural areas not traversed by traffic arteries shall implement the Class 1 standards, as per the Environmental Quality Standards for Noise(GB 3096-2008).

(2) Predictive Impact Assessment

i)Areas within 35 meters on both sides of the proposed access road shall apply Class 4a standards in GB 3096-2008; areas beyond that follow Class 2 standards. The interior of the industrial park and its plant boundary apply Class 3 standards. For the road network within the park:Areas within 35 meters north of Hengwu Road, south of Hengjiu Road, and east of Zonger Road shall apply Class 4a standards;Other internal road zones within 20 meters of the road boundary also apply Class 4a standards.

ii)For sensitive sites along the proposed access road:If buildings are three stories or higher, the first row of façades facing the road applies Class 4a standards; the rest apply Class 2 standards.If buildings are less than three

stories tall or the area is open, sensitive sites within 35 meters of the road boundary apply Class 4a standards, while areas beyond 35 meters apply Class 2 standards. As most buildings along both sides of the access road are two-story, sensitive points beyond 35 meters from the road shall apply Class 2 standards.

iii) Since the west side of the intermodal freight yard is close to Huangwa Station, noise-sensitive buildings within 65 meters of the existing railway centerline shall follow Class 4b limits; sensitive receptors between the freight yard and Huangwa Station shall follow Class 2 standards. Sensitive sites on the east, south, and north sides of the logistics park also follow Class 2 standards.

iv) Sensitive sites around the project's dedicated railway line shall follow Class 2 standards. According to GB/T 15190-2014, dedicated railway lines are not classified as major traffic lines, thus Class 4 standards do not apply on either side.

v) Since the industrial park is primarily used for warehousing and logistics, the plant boundary applies Class 3 standards.

63. The specific standard limits are as follows:

Table II-7 Acoustic Environment Quality Standards: dB(A)

Classification Zone	Area	GB 3096-2008		World Bank EHS Guidelines		Project Implementation Standards	
		Daytime (06:00-22:00)	Nighttime (22:00-06:00)	Daytime (07:00-22:00)	Nighttime (22:00-07:00)	Daytime	Nighttime
0	Rehabilitation Areas	50	40	55	45	50	40
1	Residential, Healthcare, Cultural, Educational, etc.	55	45			55	45
2	Mixed Residential, Commercial, Industrial Areas	60	50	70*	70*	60	50
3	Industrial Areas	65	55			65	55

4a	Areas Adjacent to Roads	70	55	none	none	70	55
4b	Areas Adjacent to Railways	70	60	none	none	70	60

*Excluding residential areas within industrial and commercial facilities

64. In addition to the standard limit values listed in the above table, the World Bank's *General Guidelines for Environment, Health and Safety* also require that noise impacts should result in an increase of less than 3 dB in the background noise at the nearest receiving point outside the site.

d. Groundwater Quality

65. According to the "Standard for Groundwater Quality" (GB/T14848-2017), groundwater in China is classified into five categories. Categories III and above are suitable for drinking water. Category IV can only be used for drinking water after treatment. The WHO drinking water quality guidelines also have corresponding standards, and groundwater that exceeds these guidelines can lead to health issues. The national Category III standards are stricter than the WHO standards; therefore, the groundwater quality in the project area must meet the Category III standards.

Table II-8 Standard for Groundwater Quality

Standard	Class I	Class II	Class III	Class IV	Class V	WHO Drinking Water Guidelines (2017)
pH	6.5-8.5			5.5-6.5, 8.5-9	<5.5, >9	6.5-8.5
Ammonia Nitrogen (mg/L)	≤0.02	≤0.10	≤0.50	≤1.5	>1.5	NA
Chloride (mg/L)	≤50	≤150	≤250	≤350	>350	≤250
Sulfate (mg/L)	≤50	≤150	≤250	≤350	>350	NA
Nitrate (N) (mg/L)	≤2	≤5	≤20	≤30	>30	≤50
Nitrite (N) (mg/L)	≤0.01	≤0.10	≤1.00	≤4.80	>4.80	≤3
Fluoride (mg/L)	≤1	≤1	≤1	≤2	>2	≤1.5
Zinc (mg/L)	≤0.05	≤0.5	≤1	≤5	>5	≤3
Copper (mg/L)	≤0.01	≤0.05	≤1	≤1.5	>1.5	≤2
Manganese (mg/L)	≤0.05	≤0.05	≤0.1	≤1.5	>1.5	NA
Iron (mg/L)	≤0.1	≤0.2	≤0.3	≤2.0	>2.0	NA
Total Dissolved Solids (mg/L)	≤300	≤500	≤1000	≤2000	>2000	≤1000
Total Hardness (mg/L)	≤150	≤300	≤450	≤650	>650	-
Permanganate Index (mg/L)	≤1	≤2	≤3	≤10	>10	-

Mercury (mg/L)	≤0.0001	≤0.0001	≤0.001	≤0.002	>0.002	≤0.006
Hexavalent Chromium (mg/L)	≤0.005	≤0.01	≤0.05	≤0.1	>0.1	≤0.05
Arsenic (mg/L)	≤0.001	≤0.001	≤0.01	≤0.05	>0.05	≤0.01
Lead (mg/L)	≤0.005	≤0.005	≤0.01	≤0.1	>0.1	≤0.01
Cadmium (mg/L)	≤0.0001	≤0.001	≤0.005	≤0.01	>0.01	≤0.003
Cyanide (mg/L)	≤0.001	≤0.01	≤0.05	≤0.1	>0.1	≤0.07
Volatile Phenols (mg/L)	≤0.001	≤0.001	≤0.002	≤0.01	>0.01	≤0.002
Benzene (μg/L)	≤0.5	≤1	≤10	≤120	>120	≤10
Toluene (μg/L)	≤0.5	≤140	≤700	≤1400	>1400	≤700
Xylene (μg/L)	≤0.5	≤100	≤500	≤1000	>1000	≤500
Nickel (mg/L)	≤0.002	≤0.002	≤0.02	≤0.1	>0.1	≤0.02

e. Soil Quality

66. In 2018, the Ministry of Ecology and Environment released two standards for soil pollution risk management: "*Soil Environmental Quality—Risk Control Standard for soil contamination of agriculture land*" (GB 15618-2018) and "*Soil Environmental Quality—Risk Control Standard for soil contamination of development land*" (GB 36600-2018).

67. The "*Soil Environmental Quality—Risk Control Standard for soil contamination of agriculture land*" (GB 15618-2018) establishes thresholds for agricultural land. If the concentration of pollutants in the soil is equal to or lower than the soil pollution risk screening values, the risk to agricultural product quality, crop growth, or the soil ecological environment is low and can generally be ignored. If it exceeds this value, there may be risks to agricultural product quality, crop growth, or the soil ecological environment, and soil environmental monitoring should be strengthened.

68. The "*Soil Environmental Quality—Risk Control Standard for soil contamination of development land*" (GB 36600-2018) sets thresholds for development land. The soil pollution risk screening value indicates that if the concentration of pollutants in the soil is equal to or lower than this value, the risk to human health can be ignored. If it exceeds this value, there may be risks to human health, and further detailed investigations and risk assessments should be conducted to determine the specific pollution range and risk level. Class I land refers to residential land within urban development land, while Class II land refers to industrial land within urban development land.

69. The World Bank Guidelines do not have EHS standards regarding soil quality. The following table lists the soil pollution risk control standards for agricultural land and development land from GB 15618-2018.

Table II-9 Soil Environmental Quality Standards

Indicator	Unit	Risk Screening Values			
		"Soil Environmental Quality—Risk Control Standard for soil contamination of agriculture land" (GB 15618-2018)		"Soil Environmental Quality—Risk Control Standard for soil contamination of development land" (GB36600-2018)	
				Class I Land	Class II Land
pH	-	>7.5	6.5<pH≤7.5	/	/
Cadmium	mg/kg	0.6	0.3	20	65
Mercury	mg/kg	3.4	2.4	8	38
Arsenic	mg/kg	25	30	20a	60a
Lead	mg/kg	170	120	400	800
Chromium	mg/kg	250	200	3.0 (Cr ⁶⁺)	5.7 (Cr ⁶⁺)
Copper	mg/kg	100	100	2000	18000
Nickel	mg/kg	190	100	150	900
Zinc	mg/kg	300	250	/	/

f. Wastewater Discharge Standards

70. The discharge of wastewater from construction sites in China is regulated by the " *Integrated Wastewater Discharge Standard* " (GB 8978-1996). The first-class standard applies to discharges into Class III water bodies as defined by GB 3838-2002. The second-class standard applies to discharges into Class IV and V water bodies. The third-class standard is for municipal sewage that has undergone secondary treatment before entering municipal wastewater treatment stations (WWTS).

71. The World Bank Group does not have EHS standards regarding wastewater discharge from construction sites, so the Chinese standards apply to this project. In this project, wastewater will be discharged into the municipal sewage pipeline, and the third-class standard of GB 8978-1996 will be adopted. The Chinese wastewater discharge standards include 56 parameters, most of which are discharge factors for industrial wastewater. Since the current project does not involve industrial development or existing industrial sites, only 7 selected parameters relevant to construction and domestic wastewater management are sampled.

Table II-10 Comprehensive Wastewater Discharge Standards (Unit: mg/L, except pH)

Item	pH Value	COD	BOD ₅	NH ₃ -N	SS	Petroleum	Animal and Plant Oils
Third-class Standard	6~9	≤500	≤300	—	≤400	≤30	≤100

g. Air Pollutant Emission Standards

72. The "Integrated Emission Standard of Air Pollutants" (GB16297-1996) of the People's Republic of China regulates the emission of particulates into the air, setting the maximum allowable concentration at the source to 120 mg/m³. For short-term emissions, the maximum concentration beyond the site boundary is set at 1.0 mg/m³. The World Bank Group does not have similar standards, so Chinese standards are used.

73. During the construction phase, the emissions of dust, nitrogen oxides, and asphalt smoke particulate matter from the site must comply with the corresponding standards in GB 16297-1996, as shown in Table II-15. During the operational phase, the emissions of cooking fumes from the hotel canteens in the intermodal freight yard and logistics and production facilities will follow the corresponding standards in the "Emission Standard for Cooking Fume (Trial) (GB18483-2001)," with the standard limits shown in Table II-16. The odor emissions from the Garbage Transfer Station during operation will comply with the "Emission Standards for Odor Pollutants" (GB14554-93), with the detailed values in Table II-17. The particulate matter emissions from the Garbage Transfer Station will comply with the corresponding standards in the "Integrated Emission Standards of Air Pollutants" (GB16297-1996), as shown in Table II-18.

Table II- 11 Air Pollutant Emission Standards (GB 16297-1996)

Pollutant	Maximum Allowable Emission Concentration (mg/m ³)	Unorganized Emission Monitoring Concentration Limit Point (mg/m ³)
particulate matter	/	Maximum point outside the boundary 1.0
Nitrogen Oxides	/	Maximum point outside the boundary 0.12
Asphalt Smoke (Construction Mixing)	75	Production equipment must not have obvious unorganized emissions

Table II-16 Emission Standard for Cooking Fume (GB18483-2001)

Pollutant	Scale	Baseline Number of Stoves	Maximum Allowable Emission Concentration (mg/m ³)	Minimum Purification Equipment Removal Efficiency (%)
Cooking Fume	Small	≥1, <3	2.0	60
	Medium	≥3, <6	2.0	75
	Large	≥6	2.0	85

Table II-17 Odor Pollutants Discharge Standard (GB14554-93) Level II Standard

Pollutant	Organized Emission Standard Value		F Boundary Standard Value	
	Exhaust Duct	Emission Rate	Unit	Standard Limit

	Height (m)	(kg/h)		
NH ₃	15	4.9	mg/m ³	1.5
H ₂ S	15	0.33	mg/m ³	0.06
Odor Concentration	15	2000	--	20

Table II-18 Integrated Emission Standards of Air Pollutants (GB16297-1996) Level II

Standard

Pollutant	Maximum Allowable Emission Concentration (mg/m ³)	Maximum Allowable Emission Rate (kg/h)		Unorganized Emission Monitoring Concentration Limit (mg/m ³)
		Exhaust Duct (m)	Level II (Strict 50%)	
Particulate Matter	120	15	1.75	1.0

h.Noise Emission Standards

74. Noise emissions from construction activities at the boundary of projects in China must comply with the " *Emission Standard of Environmental Noise for boundary of Construction Site* " (GB 12523-2011). Noise emissions from industrial enterprises during the operation period must comply with the " *Emission Standards for Industrial Enterprises Noise at boundary* " (GB 12348-2008).

75. The World Bank's EHS guidelines do not have specific regulations for boundary emissions, but it is required that noise impacts should not exceed the corresponding noise indicators for building functions (one type for residential, office, educational, and cultural facilities, and another for industrial and commercial facilities), or that the background noise at the nearest reception point outside the site should not increase by more than 3 dB.

76. This report will adopt stricter standards. First, the Chinese boundary emission standards will be implemented, and the quality of the acoustic environment at sensitive points and the increase in noise levels will be checked against the EHS guidelines, as shown in Table II-19.

Table II- 19 Overview of Noise Pollution Emission Standards

No.	Boundary, Plant (Site) Noise	Standard Limit	Unit	Standard Name and Level (Class)
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1	Daytime	≤70	dB(A)	" Emission Standard of Environmental Noise for boundary of Construction Site " (GB 12523-2011)
2	Nighttime	≤55		
3	Daytime	≤55	dB(A)	" Emission Standards for Industrial Enterprises Noise at boundary " (GB 12348-2008) Class 1, 2
4	Nighttime	≤45		
5	Daytime	≤60	dB(A)	
6	Nighttime	≤50		

i. Vibration Standards

77. The " *Standard of Environmental vibration in urban area* " (GB 10070-88) of the People's Republic of China classifies areas into six categories based on vibration tolerance: ① special residential areas, ② residential and educational areas, ③ mixed-use and commercial center areas, ④ industrial concentration areas, ⑤ along major transportation roads, and ⑥ along railway lines. The vertical Z vibration levels for each category must meet different standard values.

78. The World Bank does not have vibration standards; therefore, the Chinese vibration standard limits will be implemented for this project.

Table II-20 Vertical (Z) Vibration Standard Values for Various Urban Areas (Unit: dB)

No.	Standard Category	Vertical Z Vibration Level (dB)	
		Daytime	Nighttime
1	Special Residential Areas	65	65
2	Residential and Educational Areas	70	67
3	Mixed-Use and Commercial Centers	75	72
4	Industrial Concentration Areas	75	72
5	Along Major Transportation Roads	75	72
6	Along Railway Lines	80	80

j. Solid Waste

79. In China, general industrial solid waste is subject to the " *Standard for Pollution Control on the Non-hazardous Industrial Solid Waste Storage and Landfill* " (GB 18599-2020). Hazardous waste is governed by the " *Standard for Pollution Control on Hazardous Waste Storage* " (GB 18597-2023).

80. The World Bank EHS guidelines also have provisions for general waste and hazardous waste, such as developing waste management plans, preventing or minimizing waste generation, addressing hazards associated with waste generation, and significantly reducing the total waste volume through recycling

programs. The final waste treatment methods should be chosen based on the characteristics of the waste and local regulations.

81. This report will combine the provisions of both the Chinese standards and the World Bank EHS guidelines to propose requirements for solid waste management in the project.

III. Project Description

A. Project Background

82. The Association of Southeast Asian Nations (ASEAN) was established on August 8, 1967, in Bangkok, Thailand, with its Secretariat located in Jakarta, the capital of Indonesia. As of 2019, ASEAN has 10 member countries: Brunei, Cambodia, Indonesia, Laos, Malaysia, the Philippines, Singapore, Thailand, Myanmar, and Vietnam. The total area of the member countries is approximately 4.49 million square kilometers, with a population of 660 million. ASEAN has established free trade zones with China, South Korea, Japan, and four other countries. ASEAN is the third-largest economy in Asia and the sixth-largest economy in the world. In 2017, ASEAN's economic growth was 5.2%, with a total economic volume exceeding \$2.7 trillion. In July 1991, China became a dialogue partner of ASEAN, with the trade volume between China and ASEAN reaching \$7.96 billion. China and ASEAN are each other's largest trading partners. In 2022, the trade volume between China and ASEAN was \$975.34 billion.

83. The New Western Land-Sea Corridor (NWLSC) is located in the western region of China, connecting the Silk Road Economic Belt in the north and the 21st Century Maritime Silk Road in the south. In August 2019, the "Overall Plan for the New Western Land-Sea Corridor" was approved by the government and became an important national strategy of China. The main corridor of the NWLSC includes three routes: from Chongqing through Guiyang, Nanning to the Beibu Gulf port (Beibu Gulf Port, Yangpu Port); from Chongqing through Huaihua, Liuzhou to the Beibu Gulf port; from Chengdu through Luzhou (Yibin), Baise to the Beibu Gulf port. Qinzhou is located in the main passage of the NWLSC, with geographical advantages for river-to-sea transportation and the ability to fully utilize water transport's green and low-carbon features.

84. The Pinglu Canal is a key project of the NWLSC, starting from the Xijin Reservoir in Hengzhou, Nanning, and passing through Lingnan Town in Lingshan County, Qinzhou City, and entering the Beibu Gulf. The canal has a total length of 134.2 km and a designed annual one-way capacity of 89 million tons. It is built to the Grade I inland waterway standard and can accommodate 5,000-ton ships. The primary focus is on the development of navigation, combined with water supply, irrigation, flood control, and environmental improvement. The construction of the Pinglu Canal officially began on August 28, 2022. After completion, the canal will significantly shorten the inland shipping distance from the southwest region to the sea, reducing the journey by about 560 km compared to Guangzhou, and facilitating sea transportation for goods from the southwest region.

85. The sea-rail multimodal trains of the NMLSC exceeded 8,800 trips in 2022, a 44% increase year-on-year, with an average of about 24 departures per day.

By the end of 2022, the corridor's train services covered 17 provinces, 60 cities, and 113 stations, with 21 new stations added compared to 2021, and achieving full coverage in 12 western provinces. The corridor now reaches 338 ports in 113 countries and regions, with the number of transport categories increasing to over 640.

86. In 2019, the State Council approved the establishment of the China (Guangxi) Free Trade Pilot Zone. The Qinzhou Port area covers 58.19 hm² and focuses on the development of port and shipping logistics. Qinzhou Port will become the gateway port for the international land-sea trade new corridor and an industrial cluster area for the coastal economy, facilitating the development of trade and logistics between Southeast Asia, South America, Africa, Europe, and other countries/regions.

B. Project Rationale

87. Qinzhou is located in the southern coastal region of Guangxi, with administrative divisions including Lingshan, Pubei, Qinbei, and Qin Nan districts. It is connected to Beihai and Yulin cities in the east, faces the Beibu Gulf in the south, borders Fangchenggang in the west, and is adjacent to Nanning in the north. It is a key city in the Beibu Gulf urban cluster and an important part of the China-ASEAN Free Trade Area. It serves as one of the most convenient sea routes for southwest and central-south China.

88. Due to factors such as outdated railway transport and the lack of supporting logistics parks for cargo collection and distribution, freight transport in southwestern and central-southern regions has mainly relied on the Yangtze River and Shanghai's seaports, which has led to high transportation costs and restricted the development of global commodity trade. By using Qinzhou Port, the domestic section of the railway transport from Chongqing to Singapore can be shortened from 14 days by inland waterway to just 2 days. Sea transportation from Qinzhou Port to Singapore takes about 6 days, reducing the logistics cost of importing large containers by approximately 2,600 yuan per unit. The number of rail-sea multimodal trains operating on the MWLSC increased from 178 trains in 2017 to 8,800 trains in 2022, a 48-fold increase. The corridor saves about 10 days compared to traditional routes through the eastern part of China, greatly improving transportation efficiency. This project is located at a key transfer point of the NWLSC and, with the use of efficient railways, will greatly improve cargo transportation speed and reduce costs.

89. In recent years, as freight traffic on the NWLSC has increased, storage and logistics sites at the three terminal cities (Beihai, Qinzhou, and Fangchenggang) have become increasingly scarce. Currently, the total warehouse area at the ports of these three cities is 294,000 m², with a yard area of 634,000 m², and the comprehensive cargo throughput capacity is 397 million tons per year, which is sufficient to meet the requirements of Beibu Gulf Port. Based on the statistics of cargo throughput at these ports in recent years, the average annual growth of cargo throughput at these ports over the past decade has been 8.85%, with the total throughput expected to reach 50 million tons by 2025 and 80

million tons by 2030. By then, the existing storage logistics facilities and equipment at these ports will be insufficient to meet the huge demand for commodity logistics.

90. This project, based on multimodal transport using road, rail, and sea transport, will streamline the flow of goods, funds, people, and information between the various ports in Guangxi, fully leveraging the advantages of multimodal transport. Multimodal transport using containers as the unit will improve transportation efficiency, reduce handling and the risks of cargo damage, and enhance transportation quality.

91. The construction of logistics and processing facilities in this project will increase the storage and logistics capacity of the existing logistics infrastructure in Qinzhou, Beihai, and Fangchenggang by more than 100%. The direct beneficiaries of the project include ASEAN countries, especially coastal countries such as Vietnam, the Philippines, Brunei, Thailand, Singapore, Malaysia, Indonesia, Cambodia, Myanmar, as well as inland regions in China, such as Guizhou, Chongqing, Chengdu, and Hunan. Non-coastal cities in Guangxi will also benefit from effective logistics support for trade exports.

92. This project is located opposite the Mahuang Classification Yard in Qinzhou. The existing classification yard has low logistics transfer efficiency, and cargo wagons are often occupied on the existing tracks for long periods (at least 5 hours). After the project is completed, freight trains passing through Mahuang Station will be able to quickly store cargo in the logistics warehouse of the park, reducing the stopover time to less than 0.5 hours. Railway transport consumes less energy and has lower pollutant emissions than road transport.

93. The project is located near Mahuang Station, the largest railway classification yard in coastal Guangxi, close to the Pinglu Canal Longwan operation area and near Qinzhou Port. It has a favorable geographical location, connecting southwestern and northwestern China, and extending trade routes to Southeast Asia and Central Asia. The completion of the Pinglu Canal Longwan operation area in 2026 will further help the project radiate to inland China.

C. Project Content

a. Project Construction Scope

94. According to the Feasibility Study Report for the China-ASEAN Sea-Rail Multimodal Logistics Project (Revised Edition, October 2025), this project will establish a comprehensive service logistics park focusing on business, financial information services, cold chain, warehousing, and trade logistics, integrating business offices, bonded customs services, cross-border e-commerce, cold chain logistics, warehousing and processing, intermodal freight yards, and other functions. It aims to create an integrated "road-rail-river/sea" multimodal transport hub. The main construction components of the project

include:①Logistics and production facilities, including cross-border e-commerce logistics and warehousing center, agricultural materials logistics and warehousing center, commercial and trade logistics center, cross-border cold chain logistics center, logistics industry center, smart logistics service center, e-commerce live-streaming base, integrated warehousing center, freight yard, 17.7 MW rooftop distributed photovoltaic power generation system and smart logistics information management platform;②Intermodal freight yard, including cargo unloading and uploading yards and a dedicated rail line;③Supporting infrastructure, including a 9.75-km long Entrance Trunk Road and utilities connecting the logistics park to the surrounding road and utilities network, and 2) internal roads and utilities of the logistics park; ;④Capacity building, including research projects and training, project management, and consulting services.

95. The construction output targets of the project are: (1) By enhancing regional cargo collection, distribution, and transshipment capacity in Guangxi, China, and improving the efficiency of multimodal transport, the project will promote connectivity in areas along the route. The project is characterized by an estimated annual freight volume of 2.1485 million tons in 2032, 8.6781 million tons in 2042, and 13.3641 million tons in 2052. (2) Through the construction of comprehensive demonstration logistics parks and infrastructure projects, it will build China-ASEAN important supply chain nodes and regional logistics hubs, improve the transportation efficiency of multimodal transportation and reduce the transportation cost of goods. Domestic (Chongqing to Qinzhou trunk line 1000km) bulk cargo railroad container transportation cost 0.45 yuan / ton kilometer, road heavy-duty trucks 1.2 yuan / ton kilometer, railroad loading and unloading costs 15.2 yuan / ton, the transport cost of public-rail intermodal transport than simply road heavy-duty trucks transport cost savings of about 735 yuan / ton, and with the increase in the transport distance continues to improve. Foreign trade (Chongqing to Ho Chi Minh City) bulk cargo rail transportation is 30% to 60% faster than sea transportation, and the cost of sea transportation is 35% to 50% lower than rail. Transit transportation (five Central Asian countries to ASEAN countries) bulk cargo sea-rail intermodal transport comprehensive benefits better than the traditional path, transport time efficiency than the traditional mode to improve more than 30%. (3) By installing distributed photovoltaic power generation systems on rooftops, the project supports the "Dual Carbon" goals (peak carbon emissions and carbon neutrality), achieving rooftop solar power generation of 17.7 MW.

96. Upon completion, this project will promote regional and cross-border trade in Qinzhou, Guangxi, and contribute to Green Connectivity. For more detailed construction content, please refer to Table III-1.

Table III-1 Project Content

No.	Sub-project Name	Construction Content
1	Logistics and Production Facilities	(1) Cross-border E-commerce Logistics and Storage Center, (2) Agricultural Materials Logistics and Storage Center, (3) Trade and Logistics Center, (4) Cross-border Cold Chain Logistics Center, (5) Logistics Industry Center, (6) Smart Logistics Service Center, (7) e-commerce live-streaming base, (8) Comprehensive Storage Center, (9) Freight Yard, (10) 17.7 MW Rooftop Distributed Photovoltaic Power Generation System, Smart Logistics Information Management Platform, etc. Planned site area: ~606.13 mu. Total floor area: 309,997.38 m². Total building footprint: 95,860.145 m². Cross-border E-commerce Logistics and Storage Center (40,841 m²), Agricultural Materials Logistics and Storage Center (48,650.12 m²), Trade and Logistics Center (43,029.5 m²), Cross-border Cold Chain Logistics Center (77,039.76 m²), Logistics Industry Center (20,420.5 m²), Comprehensive Storage Center (17,294 m²), Smart Logistics Service Center (19,291.33 m²), e-commerce live-streaming base (19,291.33 m²). Supporting facilities: Underground equipment rooms, civil air defense facilities, garage (9,869.84 m²). The logistics park will primarily handle storage, sorting, and transshipment of goods including fresh agricultural products, grains and oils, seafood, Chinese herbal medicines, agricultural materials and machinery, and cold chain products. It does not involve processing or hazardous/chemical materials. The transshipment center will provide container return, repair, and cleaning services, enabling shippers to complete all international transport procedures locally. A waste transfer station with 50 t/d capacity will be built south of the freight yard, with a temporary hazardous waste storage room nearby.
2	Intermodal Freight Yard	Dedicated rail line and loading/unloading operation yard. The intermodal freight yard covers an area of approximately 259.86 mu, with a total floor area of 13,910 m² and a building footprint area of 13,020 m². The dedicated rail line branches from the northern shunting lead of Mahuang Station, turns southeast to form the railway operation yard, which is arranged parallel to the Mahuang Station yard. The main line length is 1.581 km. The loading/unloading yard comprises a container handling area and a breakbulk cargo handling area. The container handling area is equipped with one gantry crane track (with 2 lines) utilizing a 35m span gantry crane; the effective loading/unloading length for each line is 780m, meeting full-train handling conditions. Initially, one loading/unloading track with an effective length of 400m will be implemented, meeting half-train handling conditions. A platform and a warehouse (400m long × 30m wide) are provided on the left side of the track, with the warehouse located on

		the platform. Auxiliary container areas, including unpacking/packing area, container stacking area, empty container area, intermodal container area, and refrigerated container area, are set up south of the warehouse. A loading/unloading machinery maintenance workshop (200 m²) is established, responsible for the maintenance and temporary minor repairs of the loading/unloading machinery. The primary maintenance facilities include a forklift parking shed and a loading/unloading machinery maintenance workshop. Additionally, there are a truck scale control room (55 m²), an electric forklift garage (150 m²), a rail weighbridge control room (20 m²), and an AEI control room (15 m²).
3	Supporting Infrastructure	Supporting Infrastructure includes: the entrance trunk road, the park road network, and the supporting pipeline network. The entrance trunk road connects the park to the external road network. The total route length is 9.754 km, starting near Hengling Village on S313 and ending at G325. The Entrance Trunk Road is implemented in two sections: a highway section and a municipal road section. The highway section is 4.531 km long, built to Class I highway standards with a design speed of 60 km/h and a roadbed width of 24.5 m. The municipal road section is 5.223 km long, built to urban arterial road standards with a design speed of 60 km/h and a red line width of 36 m. The park road network and supporting pipeline network connect the plots to the Entrance Trunk Road and to the park's associated facilities, including water supply, drainage, electrical (power and lighting), gas, and communication systems. The total length of the park road network is 5.402 km, with a red line width ranging from 12 m to 36 m.
4	Capacity Building	Capacity building includes thematic research and training, project management, and consulting services. (1) Thematic research and training includes: the project plans to sign targeted training agreements with universities or research institutions, whereby these institutions will provide technical training on implementation technology and management for logistics enterprises, to enhance the logistics management capabilities of the project implementation agency and other relevant unit managers; in response to the practical issue of the gap between China's logistics costs and international logistics costs, initiate thematic research on reducing sea-rail intermodal logistics costs in the Pan-Beibu Gulf Economic Zone. (2) Project management and consulting services.

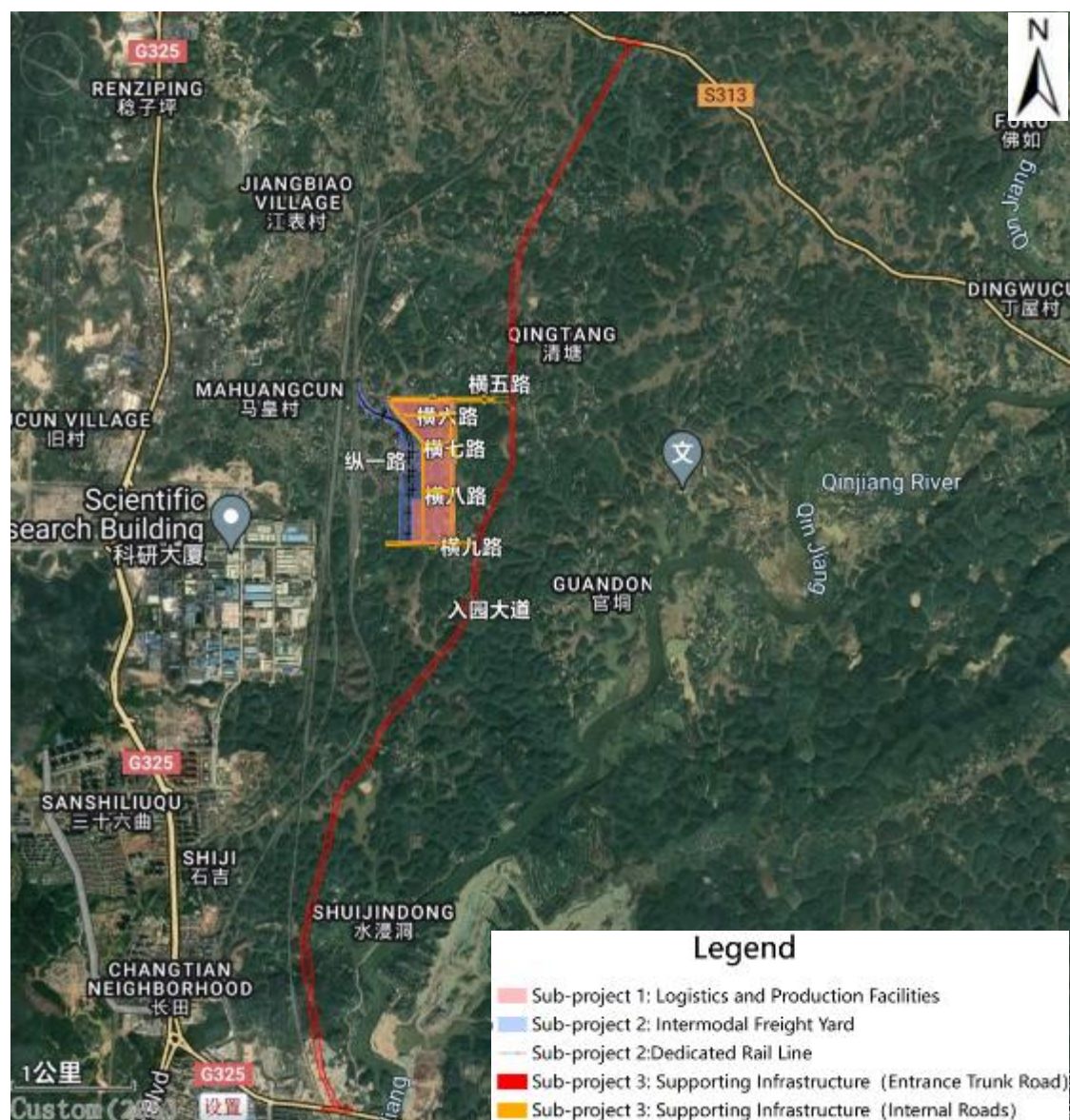


Figure III-1: Project Construction Layout Diagram

b. Logistics Service Functions

97. Centering on four core industries—electronic information components, green petrochemical new materials, new energy equipment and key parts, and agricultural and sideline product processing—the project will build an integrated logistics industrial system for the transit center and provide differentiated, high-value-added logistics services.

(1) Basic Logistics Park Services.

Provide basic logistics services including warehousing, container and bulk cargo handling, logistics equipment leasing, and logistics information services, focusing on currently high-demand cargo categories such as timber, stone, and grain. Meanwhile, lay out potential cargo categories such as cold chain goods,

new energy-related products, and prefabricated building materials, expand the transportation of relevant goods relying on highway-canal intermodal transport, leverage the advantages of Qinzhou's vehicle import port to develop Ro-Ro transportation services for new energy vehicles, and advance the construction of a vehicle import and export network.

(2) Differentiated, High-Value-Added Logistics Services

Fill the gap in regional cold chain facilities, expand the ASEAN-Central Asia overseas intermodal transport market, and meet professional demands such as agricultural product and cross-border cold chain logistics.

(3) Container Bulk-to-Container Conversion and Supporting Container Return Management Services.

Set up container return points relying on the linkage of two ports, provide empty container storage, access and allocation, container repair and cleaning, and bulk-to-container conversion services, connect multimodal transport to form a closed logistics loop, and improve the utilization rate of empty containers.

(4) High-Value General Cargo Consolidation and Supporting Professional Services.

Conduct international transshipment and consolidation business for high-value manufactured goods (food, light industrial products, mechanical equipment, etc.) to attract characteristic products to gather at Beibu Gulf Port.

(5) High-Value, Small-Scale Customs Bonded and Innovative Customs Clearance Services for the Electronic Information Industry.

Innovate the "one warehouse for multi-country distribution" supervision model, undertake the import and export demand for precision components, and provide one-stop services for international procurement and regional distribution by virtue of RCEP tariff preferences.

(6) Full-Link Empowering Cross-Border E-Commerce Supporting Services for Domestic and Foreign Trade Industries.

Build incubation and agglomeration platforms, simplify customs clearance procedures, set up an ASEAN regional central warehouse, provide integrated services for emergency allocation of spare parts and return and recycling of used parts, and link with mainstream cross-border e-commerce platforms to empower the entire industrial chain.

(7) Expand Full-Industrial-Chain Freight Forwarding and Financial Services for Carriers, Regional Distributors and Multimodal Transport Operators.

Provide "single document system" and "door-to-door" services, cover the entire

multimodal transport process with a single contract and document, and act as an agent for the whole-process businesses such as customs declaration, space booking and container management.

c. Cargo Types

98. The project mainly undertakes sea-rail intermodal transport volume for short-sea and short-haul shipping between China and Southeast Asian countries such as Vietnam, Thailand and Indonesia, as well as that for domestic trade routes; cargo exchanges of Qinbei, Lingshan, Pubei and other regions with external areas; and industrial cargo transport for surrounding areas.

(1) Containers.

The main container cargo arriving at the port is characteristic products such as rubber from Southeast Asia; the main cargo to be dispatched is auto parts, electronic products, mechanical products and daily necessities exported from the southwest China to Southeast Asia. Domestic railway container cargo flow is mainly between Qinzhou and central and western Guangxi, Yunnan, Sichuan, southwest Guizhou and other places.

(2) Ore Raw Materials.

The supply of metal ores is equally focused on both inside and outside Guangxi Zhuang Autonomous Region. Ore raw materials are mainly imported from ASEAN countries by sea. In cargo exchanges with southwest provinces (municipalities), the largest cargo flow is to Guangxi and Guizhou, followed by Yunnan, Sichuan and Chongqing.

(3) Chemical Products (Excluding Hazardous Chemicals).

The planned Pingji Port-vicinity Industrial Park will mainly undertake the industrial extension of Qinzhou Port Free Trade Zone, focus on building large-scale production bases for chemicals, textiles, plastic products, elastomer products, chemical fiber products and photovoltaic glass, and provide important support for the development of bulk commodity application industries in Qinzhou City.

(4) New Energy Materials and Products.

Based on enterprises such as Essokai and Menghua in Qinbei District, leading enterprise projects such as CNGR Northern Base and Xiangtan Electrochemical Technology will be introduced to optimize the product structure, increase technological innovation, and build a national agglomeration area for battery-grade manganese-based new material products. In the future, it is planned to introduce new energy-related projects such as new energy vehicles, ships and photovoltaics.

(5) Mechanical and Electrical Products.

Based on the existing industrial foundation, Qinzhou City will actively introduce leading enterprises in high-end intelligent terminal industry and new electronic component industry from the Guangdong-Hong Kong-Macao Greater Bay Area, accelerate the development of new display, digital TV, smart home, automotive electronics, intelligent terminal and other industries, foster the development of computer complete machines and peripherals, smart phones, Beidou satellite navigation and other industries, and speed up the expansion of the electronic information industry cluster focusing on new display and intelligent terminals.

(6) Textile Raw Materials and Products.

After the commissioning of leading chemical fiber projects in Qinzhou City (such as Hengyi and Tongkun), the annual production capacity of chemical fiber raw materials such as PTA and polyamide will reach millions of tons, requiring the import of benzene-based petrochemical raw materials from Brunei, ASEAN and other countries. The forest pulp and paper industry (such as Guangxi Jingui Pulp & Paper Co., Ltd.) imports wood pulp and wood chips from Indonesia, Vietnam and other countries. Chemical fiber products (polyester/nylon) are sold to ASEAN and central and western China via sea-rail intermodal transport.

(7) Timber and Processed Timber Products.

Making full use of imported timber and local forest resources, Qinzhou City is actively developing a forest processing industrial cluster focusing on furniture manufacturing and woodworking machinery. Qinzhou is rich in timber resources and has formed a certain scale of timber and furniture processing zones. The port-vicinity industrial planning will introduce leading timber processing enterprises to form a pillar industry and boost the economic development of Qinbei District. Among them, raw materials for forest processing mainly rely on timber imports from Southeast Asia, and primary and deep-processed products can be transported to all parts of the country by railway.

(8) Grain.

Qinzhou Port undertakes a large number of imports of grain and oil raw materials (such as Malaysian palm oil and Brazilian soybeans). At the same time, local products in Qinzhou such as rapeseed oil and rice are sold to domestic cities such as Shanghai and Chongqing via sea-rail intermodal transport.

(9) Fruits and Vegetables.

Qinzhou has a marine monsoon climate transitioning from subtropical to tropical, with abundant agricultural and marine resources, and is a major base for commercial and export-oriented agriculture in Guangxi. Qinbei District is rich in characteristic fruits and vegetables, and the completion of this project will help

the construction of the cold chain supply industrial chain for fruits and vegetables.

(10) Meat and Seafood.

There is a strong cold chain demand for imported meat and seafood. Leveraging the hub advantages of Qinzhou Port, a large number of imported meat (such as Brazilian beef and Indonesian fish meat) and seafood enter the domestic market through sea-rail intermodal trains. In addition, Qinzhou has a developed fishery industry with a large-scale fish fillet processing industry.

(11) Other Cargo.

Cargo not belonging to the above 10 categories is classified as other cargo, including but not limited to daily necessities, experimental materials, non-standard industrial parts, special handicrafts, exhibition props and waste materials. With the growth of foreign import and export trade and the social and economic development of Qinzhou City, the demand for other cargo will increase significantly in the future.

D. Design Plan

d. Sub-project 1: Logistics and Production Facilities

1. Logistics Park

99. The industrial layout guidance for the China-ASEAN Sea-Rail Multimodal Logistics Project is divided into four clusters. Based on existing land use and transportation infrastructure, emphasizing regional synergy and industrial linkages, the following facilities are arranged from south to north: freight yard, logistics industry center, cross-border cold chain logistics center, cross-border e-commerce logistics and warehousing center, agricultural materials logistics and storage center, smart logistics service center, comprehensive storage center, and cross-border e-commerce live-streaming base

(1) Freight Yard: A facility provides functions including cargo storage, transportation, distribution, loading, and unloading, primarily located on open outdoor sites.

(2) Cross-border E-commerce Logistics and Warehousing Center: This center will provide functions for storing, transporting, distributing, loading/unloading, and processing foreign goods. In the early stages, the focus will be on urban logistics industries, with a focus on e-commerce warehousing, sorting, and distribution.

(3) Logistics Industry Center: The center will focus on the logistics of bulk raw materials, building materials, chemicals and food industries. It will support the circulation, processing, exhibition, sales, distribution, and e-commerce of industrial goods.

(4) Cross-border Cold Chain Logistics Center: This center will create an integrated logistics service model combining "Internet + E-commerce + Cold Chain Logistics" for cross-border trade, promoting the deep integration of internet and logistics technologies, and driving the transformation and upgrading of the cross-border cold chain logistics industry. It will encourage key cold chain logistics companies to integrate low-temperature processing, refrigeration, transportation, and distribution functions while expanding networked distribution and integrated services.

(5) Agricultural Materials Logistics and Warehousing Center: This center will manage agricultural materials, agricultural machinery, and deep-processed agricultural products. The goal is to create a centralized management and large-scale operation platform for agricultural materials logistics. The center will also promote the advantages of e-commerce platforms for agricultural materials, such as convenience and fast service, and strengthen the development of agricultural materials e-commerce.

(6) integrated warehousing center: The focuses will be on exhibition, storage, and processing of general products.

(7) Smart Logistics Service Center: This center will provide one-stop logistics services, e-commerce incubation, smart logistics platforms, and business office services.

(8) Trade Logistics Storage Center: Engages in exhibition, sales, distribution, and e-commerce for urban logistics-related products

(9) Cross-border e-commerce live-streaming base: This center will be a platform centered around product transactions and supported by information networks. It will offer various functions such as advertising, consulting, online ordering, service delivery, feedback collection, and transaction management.

100. The project consists of two main areas: the operation area and the office area. The office area is primarily for business, hotel reception, and office use, while the operation area will focus on processing and logistics warehousing.

101. The project's planned site area: Approx. 606.13 mu; total floor area: 309,997.38 m²; total building footprint: 95,860.145 m². Individual building areas: Cross-border E-commerce Logistics and Storage Center 40,841 m², Agricultural Materials Logistics and Storage Center 48,650.12 m², Trade Logistics Center 43,029.5 m², Cross-border Cold Chain Logistics Center 77,039.76 m², Logistics Industry Center 20,420.5 m², Comprehensive Storage Center 17,294 m², Smart Logistics Service Center 19,291.33 m², e-commerce

live-streaming base 19,291.33 m². Supporting underground equipment rooms, civil air defense facilities, garage 9,869.84 m².

102. The project's workshops are multi-story buildings with floor heights of 5–6 meters; the Comprehensive Storage Center is a two-story warehouse with floor heights of 6.0–7.9 meters; public buildings like the Smart Logistics Service Center have a first-floor height of 4.5 meters, second and third floors at 4.2 meters, and remaining floors at 3.6 meters

103. The overall layout of the project is shown in the diagram below, Figure III-2.

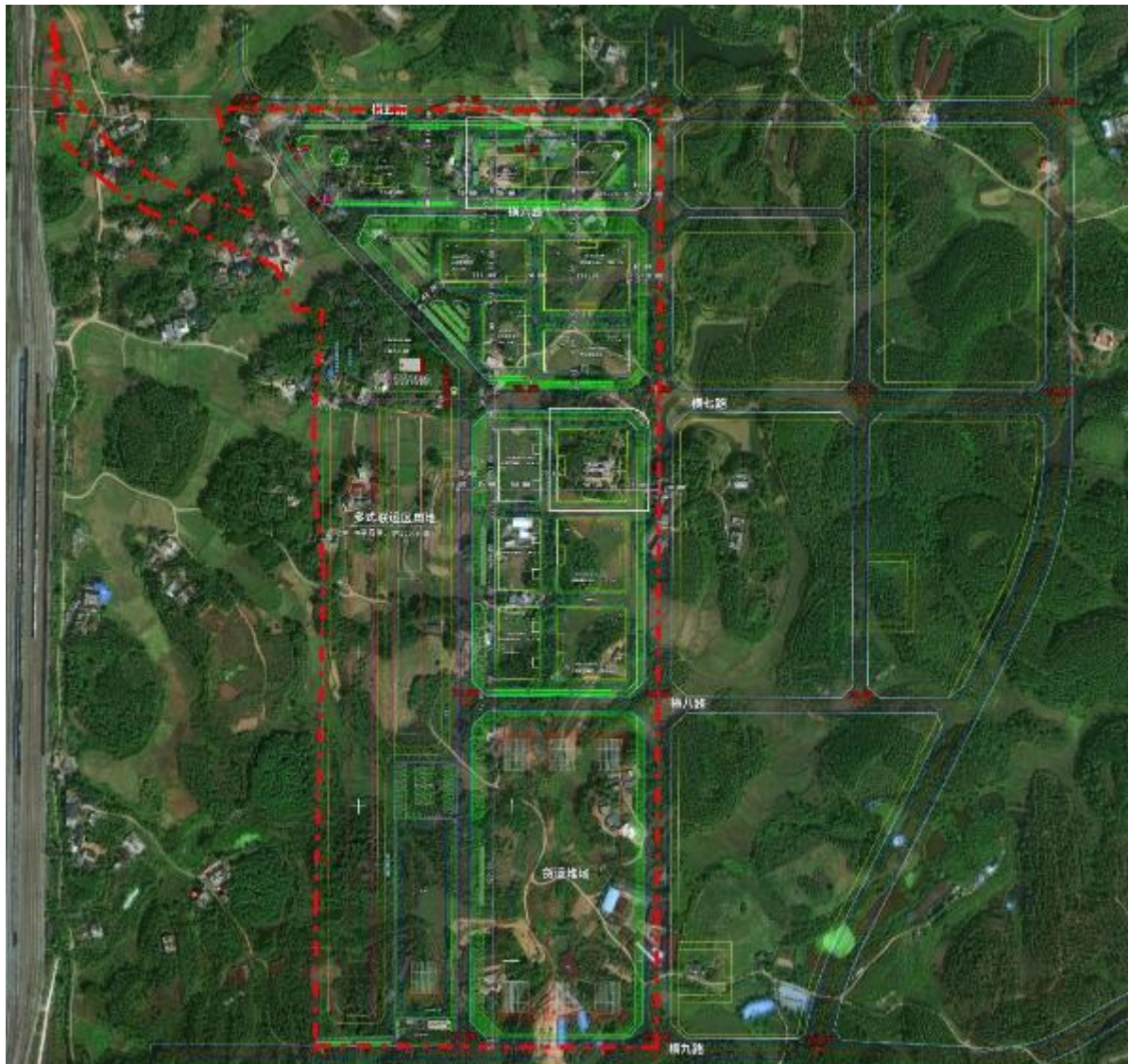


Figure III-2: General Layout Diagram of Subproject 1

2. Photovoltaic Power Generation Project

104. Solar photovoltaic power generation systems will be installed on the roofs of the following areas: the e-commerce live-streaming base, smart

logistics service center, comprehensive storage center, agricultural materials logistics and storage center, commercial trade logistics center, cross-border e-commerce logistics and storage center, and the intermodal freight yard warehouses. The photovoltaic panels will be installed entirely on the rooftops of various areas within the logistics park, with no additional land use required.

105. The solar power generation system primarily consists of: solar cell modules (arrays), controllers, DC combiner boxes, grid-tied inverters, AC distribution cabinets, and user-level lighting loads. Among these, the solar cell modules serve as the power supply system; the controllers and inverters function as the control and protection system; and the loads act as the system terminals.

106. The direct current output from each monocrystalline silicon photovoltaic module is first consolidated through the combiner boxes, then routed to the DC distribution panel, and subsequently fed into the photovoltaic inverters for conversion. The inverters convert the DC electricity generated by the solar cells into three-phase AC electricity (50 Hz, 230/400 V), which is paralleled with the low-voltage side (230/400 V) of the transformer in the substation to supply power to the loads. The grid-tied solar power generation system operates in parallel with the utility grid, prioritizing the use of solar-generated electricity. When solar irradiation is insufficient during daytime hours and the photovoltaic system cannot meet the load demand, the shortfall is supplemented by the municipal grid. The entire operation involves stepless adjustment between the two systems without any impact on the load.

107. The photovoltaic power generation system for this project is selected based on conventional monocrystalline silicon cell module specifications. Considering variations in panel dimensions and installed capacity among manufacturers, a temporary capacity of 200 Wp/m² is used for calculation. The total photovoltaic area for the project is 88,519.36 m², with a planned total installed capacity of 17.7 MW.

108. The annual power generation of the solar photovoltaic system in this project is approximately 17.3887 million kWh, resulting in an average annual reduction of standard coal consumption by about 2,137 tons. Details regarding photovoltaic power generation are provided in Table III-2.

Table III-2 Photovoltaic Power Generation Details

Total Photovoltaic Area (m²)	88519.36
Installed Capacity per Unit Area (Wp/m ²)	200
Total Installed Capacity (MWp)	17.70
Annual Power Generation per MWp (10,000 kWh/MWp) (Simulation Result)	98.2
Total Annual Power Generation (10,000 kWh)	1738.87
Proportion of Park Electricity Consumption (Excluding Logistics Processes) (%)	31.9%
Energy Storage Demand (MWh)	62.48

e. Sub-project 2: Intermodal Freight Yard

109. The project plans to set up an intermodal area on the opposite side of Mahuang Station, covering approximately 260 mu (about 17.32 hectares). The construction content includes a dedicated rail line and a cargo unloading and loading yard. This project connects to Mahuang Station. Mahuang Station is a marshalling yard primarily handling train disassembly and formation but not passenger or freight transport. The station currently has 12 arrival-departure tracks (including 2 main tracks) and 2 pull-out tracks.

1.Dedicated Rail Line

110. The line extends from the north pull-out track of Mahuang Station and turns southeast to the cargo unloading and loading yard, which is laid out parallel to the Mahuang Station yard. The total length of the main line is 1.569 km, single track, with a design speed of 40 km/h. The line includes one gantry crane loading and unloading line with 2 parallel tracks and one platform loading and unloading line. The effective loading lengths are 780m and 400m, respectively. The dedicated line uses diesel traction. This line primarily serves the industrial freight volume of the port industry park and adopts a freight-only train operation model.

Dedicated Rail Line Subgrade Engineering: The subgrade adopts a triangular cross-slope or single-sided slope design, with a 2% transverse drainage gradient. The embankment shoulder width is no less than 0.6m, while the cutting shoulder width is no less than 0.4m. The part below the shoulder construction elevation, up to 1.2m, is considered the subgrade bed. The bed is divided into an upper layer and a bottom layer. For the main line, the upper layer is 0.5m thick, and the bottom layer is 0.7m thick. For the station line, the upper layer is 0.3m thick, and the bottom layer is 0.9m thick.

Dedicated Rail Line Embankment Slope Protection: For embankment slopes with heights $\leq 12\text{m}$, levels are set at 8m intervals. The upper slope has a gradient of 1:1.5, while the lower slope has a gradient of 1:1.75, with a 2.0m wide platform at each level. For embankment slopes $\leq 3\text{m}$, grass seeding is used for slope protection. For slopes $> 3\text{m}$, C25 concrete water interception frames are used for slope protection. In paddy fields and economic crop areas, C30 concrete retaining walls are set at the slope toes. Where land is insufficient, C30 gravity retaining walls are used for slope reduction.

Dedicated Rail Line Bridge and Culvert Engineering: The project includes 2 culverts. At CIK0+224, there is a drainage ditch approximately 2m wide with perennial water flow; therefore, a box culvert is installed with a length of 28m and a top area of 84m^2 for flood discharge. At CIK0+250, a box culvert is installed to cross an existing village road, with a length of 14m and a top area of 86.8m^2 , ensuring traffic passage.



Figure III-3: Dedicated Rail Line Layout Diagram

2.Cargo Unloading and Loading Yard

111. The cargo unloading and loading yard consists of a container cargo unloading area and a general cargo unloading area. The container cargo unloading area uses a 35-meter span gantry crane for operations, while the general cargo unloading area includes a platform and a warehouse (400m × 30m). The warehouse is located above the platform. To the north of the unloading and loading area, a comprehensive building (1 underground floor and 3 above-ground floors) and a maintenance room will be constructed. To the south of the warehouse, auxiliary areas such as a container unpacking and stacking area, empty container area, intermodal container area, and refrigerated container area will be established. The layout of the cargo unloading and loading yard for this project is shown in the diagram below, Figure III-4: Cargo Unloading and Loading Yard Layout. The total new building area for the intermodal freight yard project is 13,910 square meters, as detailed in Table III-3. The newly added mechanical equipment is listed in Table III-4, and the unloading vehicle operations volume is shown in Table III-5. According to the functional positioning and division of labor for this project, the primary

railway freight volume will come from the Qinbei Economic Development Zone and the Pingji Industrial Park within its radiation area, as well as a portion of the Sea-Rail Multimodal Freight Volume from the Pinglu Canal Longwan Operations Area. The annual freight volume forecast is shown in Table III-6.



Table III-3 Summary of Newly Added Building Area for the Intermodal Freight Yard Project

Building Name	Building Area (m ²)	Floors	Remarks
Warehouse	12,000	1	2 buildings, Class C2, frame structure, floor height 7.2m
Track Scale Control Room	20	1	Brick-concrete structure, floor height 3.6m
Truck Scale Control Room	55	1	Brick-concrete structure, floor height 3.6m
Electric Forklift Garage	150	1	Class D, frame structure, floor height 6.5m
Unloading Equipment Maintenance Room	200	1	Class E, frame structure, floor height 11m, with a 5-ton overhead crane
AEI Control Room	15	1	Brick-concrete structure, floor height 3.6m
Overload Control Room	20	1	Brick-concrete structure, floor height 3.6m
Guardhouse	20	1	2 buildings, brick-concrete structure, floor height 3.6m
Comprehensive Building (including offices, dining hall, break rooms, information computer room, fire pump room, fire water tank, substation)	1,450	3	Frame structure, floor height 3.6m (1 underground floor, fire pump room 200m ² , fire water tank 480m ² , depth 4.5m)
Total	13,930	/	/

Table III-4 List of Newly Added Mechanical Equipment

No.	Equipment Name	Model/Specification	Unit	Quantity	Remarks
1	Container Gantry Crane	Gn=40.5t, S=35m, H=13.5m	Units	2	/
2	Electric Forklift	5 tons	Units	4	Includes chargers
3	100-ton Beamless Dynamic Track Scale	/	Units	1	/
4	AEI Replay Equipment	/	Set	1	/
5	AEI Equipment	/	Set	1	/
6	CPS Equipment	/	Set	1	/
7	150-ton Pitless Digital Truck Scale	/	Units	1	/
8	Spare Parts Storage Rack	1200*600*2000	Units	3	/
9	Maintenance Tool Cart	/	Units	1	/
10	Mobile Air Compressor	2V-1/10, Exhaust Volume: 1m ³ /min	Units	1	/

No.	Equipment Name	Model/Specification	Unit	Quantity	Remarks
11	Toolbox	/	Set	1	/
12	Bench Drill Machine	Z512-2	Units	1	/
13	Double Workbench	2400×800×800	Units	1	/
14	Electric Overhead Crane	Gn=5 tons, H=8m	Units	1	In the unloading equipment maintenance room
15	Fixed Hydraulic Ramp	/	Units	27	/
16	AC arc welding machine	BX3 -300	Units	1	/
17	Carbon dioxide protection welding machine	NBC-500	Units	1	/
18	Dust removal grinder	MC3025	Units	1	/

Table III-5 Unloading Vehicle Operations (Unit: Vehicles/day)

Cargo Type	Initial (2030)			Near-term (2035)			Long-term (2045)		
	Loading	Unloading	Total	Loading	Unloading	Total	Loading	Unloading	Total
Containers	101	12	113	223	25	248	245	28	273
General Cargo	16	2	18	36	4	40	61	7	68
Subtotal	117	14	131	259	29	288	306	35	341

Table III-6 Railway Freight Volume for the Research Year (Unit: 10,000 tons)

Category	Initial			Near-term			Long-term		
	Sending	Arriving	Total	Sending	Arriving	Total	Sending	Arriving	Total
Sea-Rail Multimodal Volume	16	134	150	36	311	347	50	385	435
Port Industrial Volume	51	5	56	59	5	64	68	5	73
Total	67	139	206	95	316	411	118	390	508
Of which to ASEAN	34	67	100	41	190	231	50	254	305
To Other Directions	33	72	106	54	126	180	68	136	203
Proportion to ASEAN	50.2%	48.1%	48.8%	43.0%	60.1%	56.1%	42.8%	65.2%	60.0%

f. Subproject 3: Supporting Infrastructure

1. Entrance Trunk Road

112. The total length of the Entrance Trunk Road is 9.754km, starting near Hengling Village on S313 and ending at G325. The Road is divided into two sections: the highway section (4.531 km) and the urban road section (5.223 km). The highway section is constructed to Class I road standards with a design speed of 60 km/h and a roadbed width of 24.5 m. The urban road section follows urban arterial road standards, with a design speed of 60 km/h and a right-of-way width of 36 m. The construction of the Road is planned to start in December 2026, with a construction period of 1 years, and is expected to be completed in December 2027.

(i) Cross-section of the Highway Section: The planned cross-section width is 24.5 m, with a dual-lane, four-lane road. The lane allocation is as follows: 0.75 m (earth shoulder) + 2.5 m (hard shoulder) + 8 m (carriageway) + 2 m (median) + 8 m (carriageway) + 2.5 m (hard shoulder) + 0.75 m (earth shoulder) = 24.5 m.

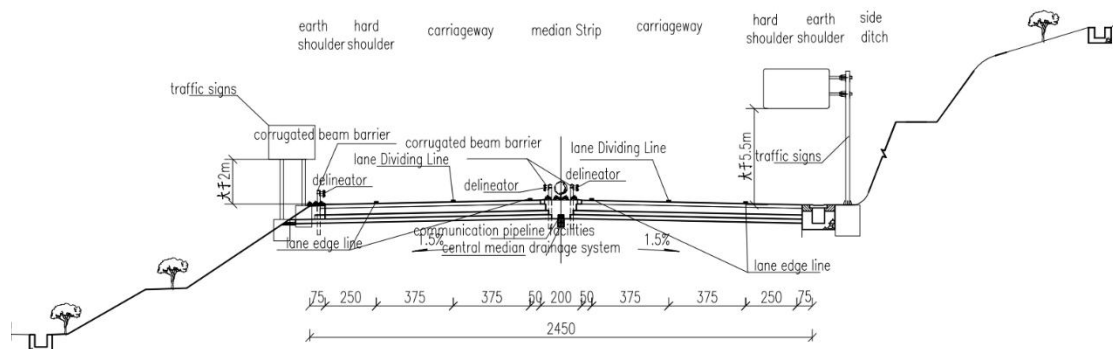


Figure III-5: Standard Cross-section Diagram of the Highway Section

(ii) Cross-section of the Urban Road Section: The planned cross-section width is 36 m, with a three-lane, six-lane dual-direction road. The lane allocation is as follows: 2 m (sidewalk) + 3 m (non-motorized vehicle lane) + 2 m (side median) + 22 m (carriageway) + 2 m (side median) + 3 m (non-motorized vehicle lane) + 2 m (sidewalk) = 36 m.

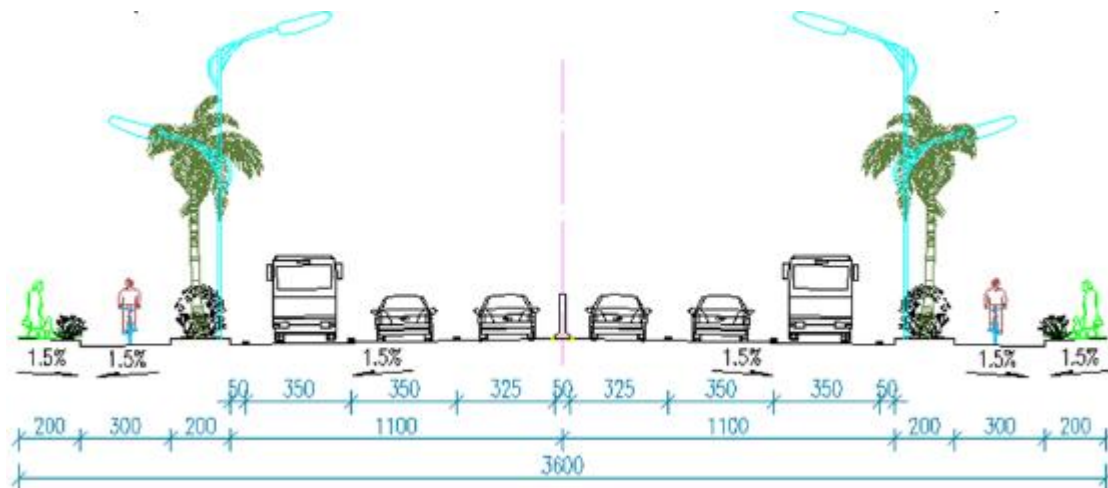


Figure III-6: Standard Cross-section Diagram of the Urban Road Section

(iii) **Pavement Structure Type:** The pavement design for the Entrance Trunk Road adopts a standard load of 100 kN for the dual-wheel axle weight (BZZ-100), with allowable deflection and allowable tensile stress control. Considering the availability of stone materials in the Qinzhou area, the surface layer is made of asphalt concrete, with an axle load of BZZ-100. The sub-base is selected as a cement-stabilized layer with a short curing period to expedite construction and ensure the project timeline. The pavement structure for the carriageway is shown in Table III-7.

Table III-7 Pavement Structure for Arterial and Highway Carriageways

No.	Layer	Material	Thickness (cm)
1	Upper Surface Layer	Modified Rubber Asphalt Concrete (AR-AC-13C)	4
2	Adhesive Layer	Emulsified Asphalt Adhesive Layer	-
3	Middle Surface Layer	Medium-Particle Asphalt Concrete (AC-20)	6
4	Adhesive Layer	Emulsified Asphalt Adhesive Layer	-
5	Lower Surface Layer	Coarse-Particle Asphalt Concrete (AC-25)	8
6	Slurry Seal Layer	Emulsified Asphalt Seal, Permeable Layer	0.6
7	Upper Base Layer	5% Cement-Stabilized Crushed Stone	20
8	Lower Base Layer	4% Cement-Stabilized Crushed Stone	20
9	Cushion Layer	Graded Crushed Stone	20

(iv) **Subgrade Protection:** This project does not involve high fill or deep excavation sections.① Embankment Slope: This section alternates between fill and excavation. When the embankment slope height $H \leq 4.0\text{m}$, soil slopes will be fully covered with turf for protection. When the embankment slope height $H > 4.0\text{m}$, the soil slopes will be protected with a herringbone framework. For embankment slopes near waterlogged areas, masonry stone will be used for slope protection.② Cut Slope: When the excavation slope height is less than 4 m for soil cut slopes, turf protection will be used. When the excavation slope height $H > 4.0\text{m}$, the soil slopes will be protected with a herringbone framework.

(v) Subgrade and Pavement Drainage:① General Fill Subgrade: Every 8 meters will be a primary section, with the first-level slope at 1:1.5, the second-level slope at 1:1.75, and the third-level slope at 1:2, with a 2.0 m wide platform between the two slopes. When surface water collects at the foot of the slope, a drainage ditch will be set up 3 m outside the slope foot, near the boundary line. During subgrade filling, surface layers will be constructed with a 2–4% cross slope, with attention to longitudinal drainage, site leveling, and cleaning of scattered soil for temporary surface drainage. After filling the subgrade, if the water collection area forms a “V” shape with the original ground, the foot of the slope in the water accumulation area should be filled to create a 2% slope towards the drainage ditch to facilitate drainage.② General Excavation Subgrade: When the excavation slope is a soil slope, the slope ratio will be 1:1. If it is a rock slope, the slope ratio will be 1:0.75. For slopes higher than 8 m, stepped slopes will be used, with each step being 8 m high and a 2.0 m wide platform between two steps. If water collects at the top of the slope, a drainage ditch will be set 5 m outside the slope top, guiding the water through a drop or rapid flow channel into a culvert to discharge outside the subgrade area.③ Zero Fill and Zero Excavation Subgrade: When the fill and excavation height is less than 1.5 m, it is treated as a zero-fill and zero-excavation subgrade. When the roadbed consists of soil layers or when the soil is too wet to compact, special treatment of the subgrade below the pavement structure will be required. If the minimum strength CBR of the soil layer meets the standard requirements and the moisture content is appropriate, it will be treated by excavation and compaction; if the moisture content is high or the soil's minimum CBR does not meet the standards, gravel or crushed stone will be used for replacement.

(vi) Culverts: The Entrance Trunk Road does not involve bridge construction but includes six culverts. These include: One 1–3 m × 3 m slab culvert, length 40 m; Two 2.0 m diameter circular pipe culverts, length 40 m each; Three 1.5 m diameter circular pipe culverts, length 40 m each.

(vii) Route Intersections: The following table lists the roads intersecting with the Entrance Trunk Road, including 2 existing roads and 2 roads designed simultaneously with the Avenue for the logistics center park. All intersections will be at-grade crossings. The noise environment protection targets within the impact range of the intersections with S313 and G325 are listed in Table III-8.

Table III-8 Roads Intersecting with the Entrance Trunk Road

No.	Intersecting Road	Milepost	Intersection Type	Design Stage
1	S313	RY K0+000	At-grade Crossing	Existing Road
2	Hengwu Road	RY K3+251.632	At-grade Crossing	Simultaneous Design
3	Hengjiu Road	RY K4+039.992	At-grade Crossing	Simultaneous Design
4	G325 Highway	RY K9+778.849	At-grade Crossing	Existing Road

(viii) Traffic Volume Forecast: The first, seventh, and fifteenth years after the operation are selected as representative years for short-term, mid-term, and long-term operation. The traffic volume forecast for each year is shown in the table below.

Table III-9 Traffic Volume Forecast Results (Unit: pcu/day)

Road Section	2028	2034	2042
Entrance Trunk Road (Highway Section: RYK0+000 ~ RYK4+530.639)	17,519	23,727	30,093
Entrance Trunk Road (Urban Arterial Section: RYK4+530.639 ~ RYK9+778.849)	18,546	24,264	31,095

2. Internal roads within the logistics park

113. The Internal roads including 5 transverse roads and 2 longitudinal roads, with a total length of 6.26 km. Due to intersections between the roads, the effective length of the project is approximately 6.079 km.

Table III-10 Overview of the Internal roads

Road	Hengwu Road	Hengliu Road	Hengqi Road	Hengba Road	Hengjiu Road	Zongyi Road	Zonger Road
Length (m)	1041.791	455.795	781.752	656.765	772.162	1337.694	1218.457
Road Class	Urban Arterial Road	Urban Branch Road	Urban Secondary Trunk Road	Urban Branch Road	Urban Arterial Road	Urban Branch Road	Urban Arterial Road
Right-of-Way Width (m)	30	12	30	20	30	18	36
Design Speed (km/h)	50	30	40	30	50	30	50
Cross-section Type	Three-lane road, dual-direction four lanes	Single-lane road, dual-direction two lanes	Three-lane road, dual-direction four lanes	Single-lane road, dual-direction two lanes	Three-lane road, dual-direction four lanes	Single-lane road, dual-direction two lanes	Three-lane road, dual-direction six lanes



Figure III-7: Park Road Network Map

(i)Cross-section of Hengwu Road: Urban arterial road with a planned standard cross-section width of 30 m. The lane distribution is as follows: 3 m (sidewalk) + 2.5 m (non-motorized vehicle lane) + 2 m (side median) + 15 m (carriageway) + 2 m (side median) + 2.5 m (non-motorized vehicle lane) + 3 m (sidewalk) = 30 m.

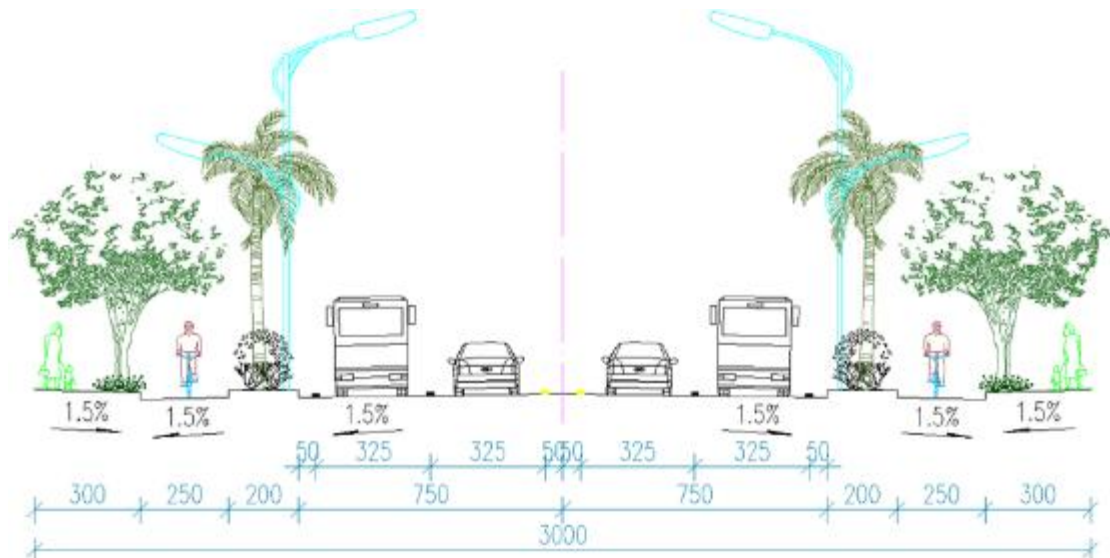


Figure III-8: Standard Cross-section of Hengwu Road

(ii)**Cross-section of Hengliu Road:** Urban branch road with a planned standard cross-section width of 12 m. The lane distribution is as follows: 2 m (sidewalk) + 8 m (carriageway) + 2 m (sidewalk) = 12 m.

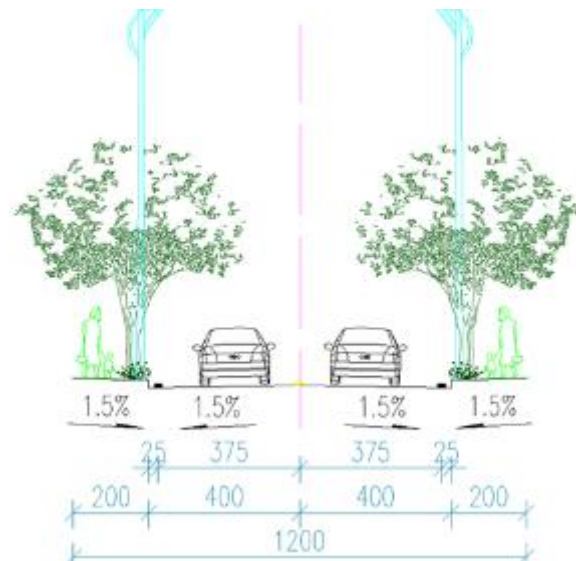


Figure III-9: Standard Cross-section of Hengliu Road

(iii)**Cross-section Design of Hengqi Road:** Urban secondary arterial road with a planned standard cross-section width of 30 m. The lane distribution is as follows: 3 m (sidewalk) + 2.5 m (non-motorized vehicle lane) + 2 m (side median) + 15 m (carriageway) + 2 m (side median) + 2.5 m (non-motorized vehicle lane) + 3 m (sidewalk) = 30 m.

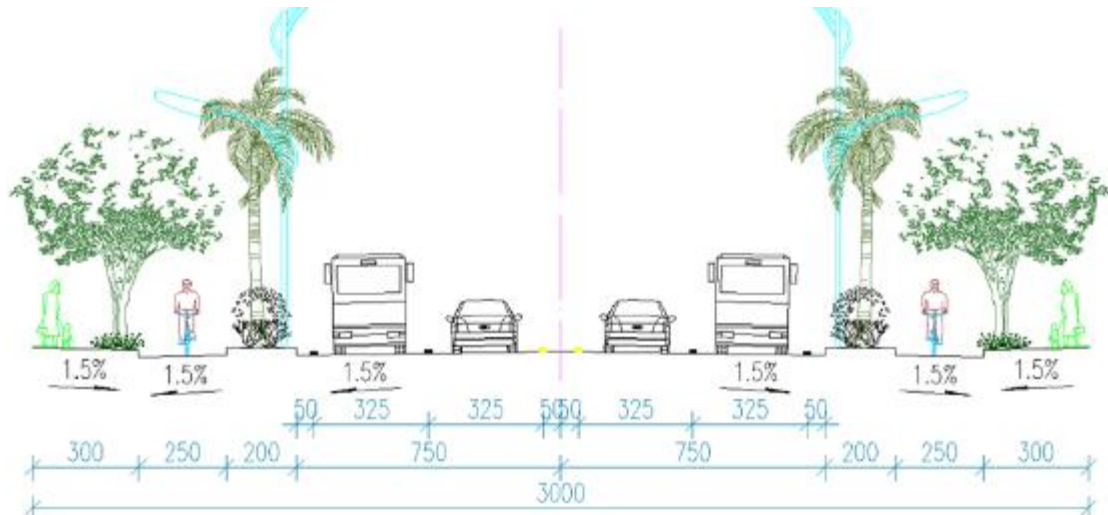


Figure III-10: Standard Cross-section of Hengqi Road

(iv) Cross-section of Hengba Road: Urban branch road with a planned standard cross-section width of 20 m. The lane distribution is as follows: 3 m (sidewalk) + 14 m (carriageway) + 3 m (sidewalk) = 20 m.

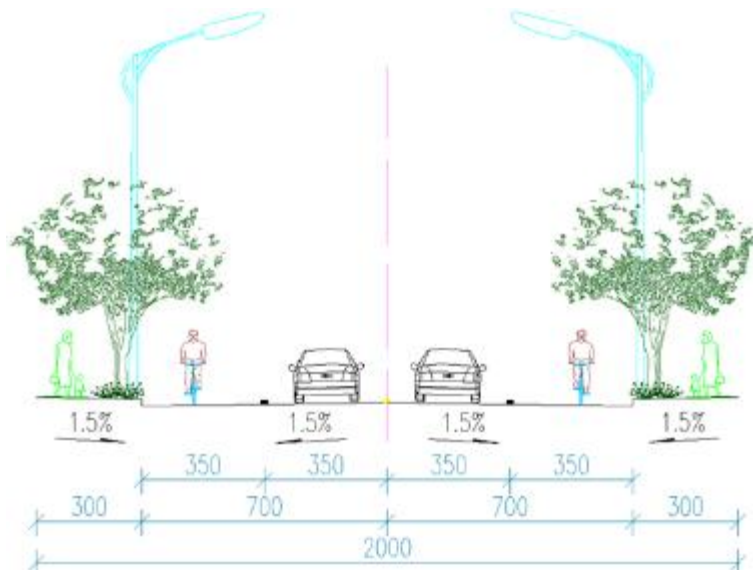


Figure III-11: Standard Cross-section of Hengba Road

(v) Cross-section of Hengjiu Road: Urban arterial road with a planned standard cross-section width of 30 m. The lane distribution is as follows: 3 m (sidewalk) + 2.5 m (non-motorized vehicle lane) + 2 m (side median) + 15 m (carriageway) + 2 m (side median) + 2.5 m (non-motorized vehicle lane) + 3 m (sidewalk) = 30 m.

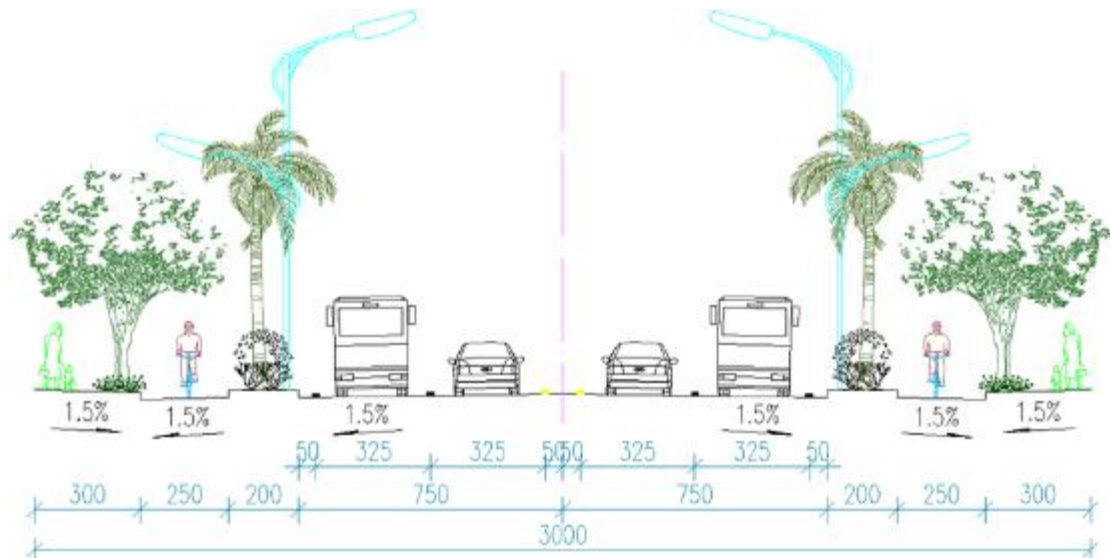


Figure III-12: Standard Cross-section of Hengjiu Road

(vi) **Cross-section of Zongyi Road:** Urban branch road with a planned standard cross-section width of 18 m. The lane distribution is as follows: 3 m (sidewalk) + 12 m (carriageway) + 3 m (sidewalk) = 18 m.

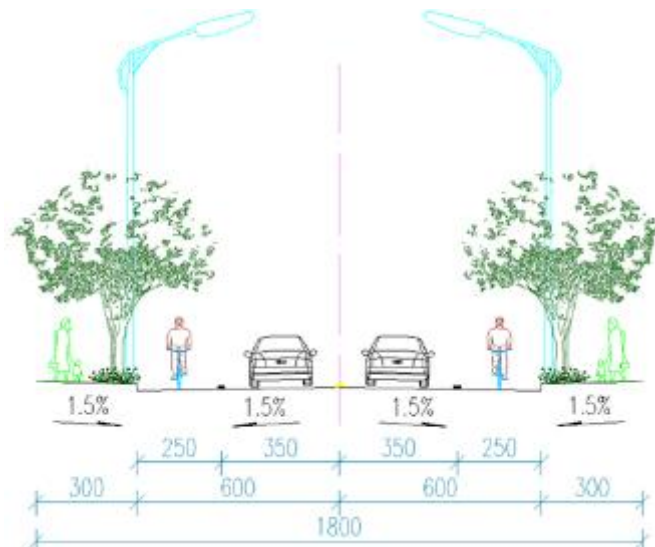


Figure III-13: Standard Cross-section of Zongyi Road

(vii) **Cross-section of Zonger Road:** Urban arterial road with a planned standard cross-section width of 36 m. The lane distribution is as follows: 2 m (sidewalk) + 3 m (non-motorized vehicle lane) + 2 m (side median) + 22 m (carriageway) + 2 m (side median) + 3 m (non-motorized vehicle lane) + 2 m (sidewalk) = 36 m.

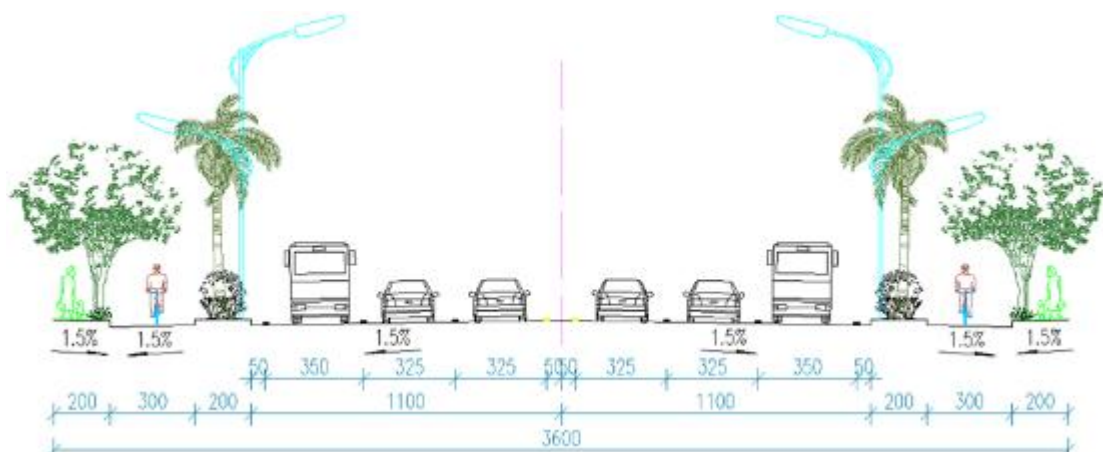


Figure III-14: Standard Cross-section of Zonger Road

(viii) Pavement Engineering: The pavement design adopts a standard load of 100 kN for the dual-wheel axle weight (BZZ-100), with allowable deflection and allowable tensile stress control. Given the rich availability of stone in the Qinzhou area, the surface layer is made of asphalt concrete, with an axle load of BZZ-100. For faster progress and to ensure the project schedule, the sub-base uses a cement-stabilized layer with a short curing period. The pavement structure for the carriageway is shown in the table below:

Table III-11 Pavement Structure for Arterial and Highway Carriageways

No.	Layer	Material	Thickness (cm)
1	Upper Surface Layer	Modified Rubber Asphalt Concrete (AR-AC-13C)	4
2	Adhesive Layer	Emulsified Asphalt Adhesive Layer	-
3	Middle Surface Layer	Medium-Particle Asphalt Concrete (AC-20)	6
4	Adhesive Layer	Emulsified Asphalt Adhesive Layer	-
5	Lower Surface Layer	Coarse-Particle Asphalt Concrete (AC-25)	8
6	Slurry Seal Layer	Emulsified Asphalt Seal, Permeable Layer	0.6
7	Upper Base Layer	5% Cement-Stabilized Crushed Stone	20
8	Lower Base Layer	4% Cement-Stabilized Crushed Stone	20
9	Cushion Layer	Graded Crushed Stone	20

Table III-12 Pavement Structure for Secondary Arterial and Branch Roads

No.	Layer	Material	Thickness (cm)
1	Upper Surface Layer	Modified Rubber Asphalt Concrete (AR-AC-13C)	4
2	Adhesive Layer	Emulsified Asphalt Adhesive Layer	-
3	Lower Surface Layer	Coarse-Particle Asphalt Concrete (AC-25)	8
4	Slurry Seal Layer	Emulsified Asphalt Seal, Permeable Layer	0.6

No.	Layer	Material	Thickness (cm)
5	Upper Base Layer	5% Cement-Stabilized Crushed Stone	18
6	Lower Base Layer	4% Cement-Stabilized Crushed Stone	17
7	Cushion Layer	Graded Crushed Stone	20

(ix)General Fill Subgrade: Every 8 meters will be a primary section, The general fill roadbed has a first-level slope of 1:1.5, a second-level slope of 1:1.75, and a third-level slope of 1:2. A 2.0-meter wide platform is left between the first and second levels of the slope. If surface water from the outside drains toward the roadbed, a drainage ditch will be set 3 meters outside the slope foot, close to the occupied land boundary.

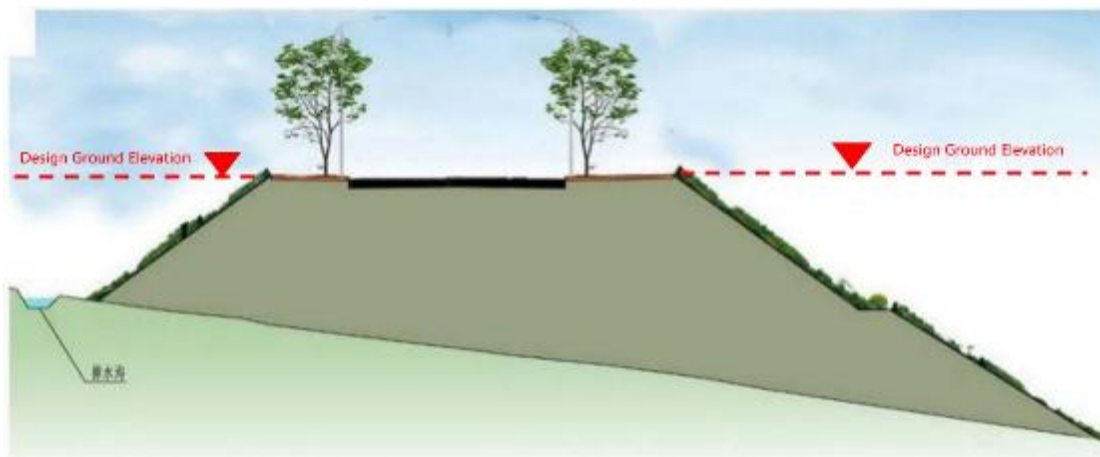


Figure III-15: General Fill Roadbed Diagram

(x)General Cut Roadbed: When the cut slope is a soil slope, the slope ratio is 1:1; when the slope is rocky, the slope ratio is 1:0.75. Slopes higher than 8 meters will be stepped, with the first level being 8 meters, and subsequent steps also 8 meters each, with a 2.0-meter wide platform between each step. When water gathers at the top of the slope, a water interception ditch will be set 5 meters outside the slope top, leading the water through a drop shaft or a rapid flow channel into a culvert to drain from the roadbed area.

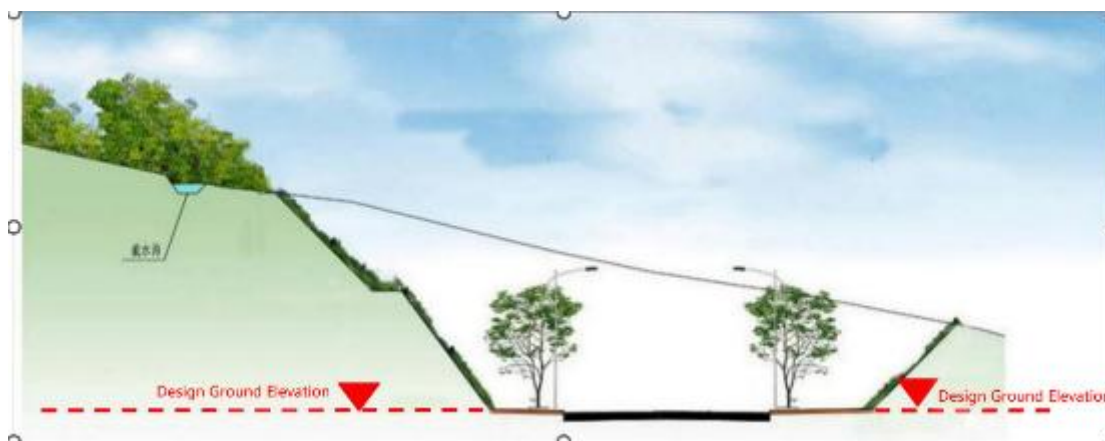


Figure III-16: General Cut Roadbed

(xi)Zero Fill and Zero Cut Roadbed: When the fill height is less than 1.5 meters, it is considered a zero-fill roadbed. The filling material or surface soil in the roadbed must be strictly regulated. If the minimum CBR (California Bearing Ratio) of the soil meets the specifications and the moisture content is appropriate, the material can be treated by excavation and compaction. If the moisture content is too high or the minimum CBR does not meet the standards, sand, gravel, or crushed stone can be used for replacement. However, due to the difficulty of mixing and quality control, the replacement method is preferred in most cases. If lime is used, the amount of quicklime powder should not be less than 5%. After treatment, the compaction of the upper and lower roadbed layers must not be less than 95%. When the cut height is less than 1.5 meters, it is considered a zero-cut roadbed. If the cut roadbed is a soil layer or the moisture content is too high to compress, special treatment is required for the subgrade below the road surface structure layer. The treatment method and compaction requirements are the same as for zero fill roadbeds.

(xii)Embankment Slope:The embankment section alternates between fill and cut. When the embankment slope height $H \leq 4.0$ meters, the soil slope surface is protected by turfing. When the embankment slope height $H > 4.0$ meters, the soil slope surface is protected by a triangular framework. For embankments in areas with waterlogged slopes, stone masonry protection will be used.

(xiii)Cut Slope: When the cut slope height is less than 4 meters, the soil cut slope is protected by turfing. When the cut slope height $H > 4.0$ meters, the soil slope surface is protected by a triangular framework.

3. Water Supply System

114. According to the *Urban Regulatory Detailed Plan of Dadong Town, Qinbei District, Qinzhou City (2009-2030) (Revised Edition, 2010)*, the maximum daily total water consumption of the park is approximately 6,700 cubic meters per day in the near term and about 15,000 cubic meters per day in the long term. The park's water supply is uniformly provided by the water treatment plants in Dadong Town and the Huangma Industrial Park, hence no independent water treatment plant will be constructed within the park itself. The park connects to the municipal water supply pipeline of the Huangma Industrial Park, with two DN500 municipal water supply mains linking the park's water supply network to that of the Huangma Industrial Park, forming a unified water supply system. The planned water supply pipes are arranged in a looped network along the park roads, with pipe diameters ranging from DN400 to DN500. The water sources for the park are consistent with those of the Qinzhou urban area, selecting the Qin River, Maoling River, Damaan Reservoir, and the Yujiang River Water Diversion Project as primary sources. Reservoirs in the northern mountainous areas, such as Matouling Reservoir and Wanwanling Reservoir, serve as backup water sources.



4. Drainage System

115. The drainage system of the project will adopt a separate storm-sanitary sewer system, with production wastewater, domestic sewage, and stormwater systems being separate.

(i) Stormwater Drainage System: According to the *Urban Regulatory Detailed Plan of Dadong Town, Qinbei District, Qinzhou City (2009-2030) (Revised Edition, 2010)*, the project area employs a separate storm-sanitary sewer system. Stormwater within the planned area will be collected by a dedicated stormwater pipeline network for unified discharge. Stormwater from peripheral areas will be discharged in a decentralized manner, following the principle of discharging near the point of collection based on natural catchment areas, utilizing larger rivers within the region for discharge where possible. The stormwater plan utilizes the current storm intensity formula for Qinzhou City with a recurrence interval of 5 years, while the stormwater pumping stations are checked for a recurrence interval of 30 years. Stormwater pipelines will be routed according to the topography and road vertical alignment, prioritizing gravity flow drainage where possible. Pipelines will be laid along roads, typically under the carriageway of planned roads. On 50-meter wide urban arterial roads, a bilateral layout will be used; otherwise, a single-side layout is adopted. The pipe diameter for stormwater pipes shall be $\geq \text{DN}1000$, with a minimum cover depth of $\geq 2.5\text{m}$. Most stormwater within the planned area will be discharged by gravity flow, collected via pipelines, and discharged into existing gullies. Stormwater collection and utilization facilities will be established. Collected and treated stormwater can be reused for road cleaning, urban landscaping, firefighting, and scenic environment water usage.

(ii) Production and Domestic Wastewater Drainage System: According to the same plan, the predicted average daily wastewater flow for the park is approximately 4,600 m³/day in the near term and 10,500 m³/day in the long term. Wastewater planning is integrated with that of the Huangma Industrial Park and Dadong Town, therefore, a separate wastewater treatment plant will not be constructed within the park in the long term. Wastewater pipelines will be aligned considering the layout and vertical design levels of planned roads, aiming for gravity flow drainage. Wastewater pipes will be laid along roads, typically under the carriageway. On 50-meter wide urban arterial roads, a bilateral layout is used; otherwise, a single-side layout is adopted, with pipe diameters ranging from DN400 to DN800. As gravity flow drainage is not feasible in the western and northern parts of the park, two buried wastewater lifting pump stations will be constructed in the low-lying areas of the west and north.

Wastewater from the project's intermodal freight yard service building and logistics park service center will be treated by grease separators and septic tanks, handling the domestic sewage and cafeteria wastewater. Other buildings near the logistics park will have septic tanks for handling domestic wastewater, and after treatment, the water will flow into the newly constructed sewage network.

The domestic sewage and storage and logistics wastewater of the project are treated through septic tanks and discharged into the existing sewage pipe network through the new sewage pipe network.

Wastewater from the project's garbage transfer station will be collected and transferred to a leachate collection tank, which will be transported daily in a sealed tank truck to the Huangma sewage treatment plant.

Two wastewater lifting pump stations will be constructed within the planned site for Hengjiu Road and the Entrance Trunk Road. These will collect park sewage, initially lifting it via the Hengjiu Road pump station to the Entrance Trunk Road. After flowing by gravity for a section, the sewage will then be pressurized by the Entrance Trunk Road pump station, conveyed under the Nanfang Railway, Yongbei Railway, and Qinfang Railway (4 lines in total) via a pressure pipe, and discharged into the existing sewage pipeline network of the Huangma Industrial Park, ultimately reaching the Huangma Wastewater Treatment Plant.



Figure III-18: Sewage Drainage Scheme

5. Garbage Transfer Station

116. The project plans to build a garbage transfer station to collect and compress the domestic waste generated by each area of the project. The garbage will be collected and compressed, and then entrusted to the local sanitation department for unified transportation and disposal. The designed compression and transfer capacity is 50 tons per day.

117. The garbage transfer station is located south of the freight yard, covering a site area of approximately 360 m². The waste processing area will be equipped with three sets of waste compression and handling systems to meet the operational demand.

Table III-13 List of Household Waste Treatment Equipment for the Project

No.	Name	Unit	Quantity	Technical Requirements
1	Scraper Separator Garbage Compactor	Set	3	Includes box body, gate opening and closing mechanism, box body locking mechanism, garbage crushing and pressing dehydration mechanism.
2	Horizontal Tilting Garbage Hopper	Set	1	Must meet requirements for unloading from 0.5-ton to 3-ton garbage collection trucks and facilitate automatic feeding.
3	Box Body Moving Separator Mechanism	Set	3	Allows separation and combination of box body and compactor with a movement distance $\geq 200\text{mm}$.
4	Hook-arm Garbage Transfer Vehicle	Vehicle	1	Equipped with a water reception trough to prevent secondary pollution during transportation.
5	Front-loading Rear-unloading Compactor Vehicle (8 tons)	Set	2	Ensures full unloading of garbage with a tightly sealed rear door to avoid secondary pollution.
6	Hydraulic Pump Station	Set	3	Automatically controls compression cycles.
7	Electrical Control System	Set	3	Enables full automation and semi-automatic operations for continuous cycles, reducing labor intensity.
8	High-pressure Cleaning Machine	Set	1	For cleaning and maintaining station equipment, dust reduction, etc.
9	Biological Deodorization System	Set	3	Atomizes deodorizing liquid to eliminate odors and prevent bacterial growth.
10	Negative Pressure Dust and Odor Removal System	Set	1	Combines dust and odor removal with a bio-filter and activated carbon adsorption.
11	Monitoring System	Set	1	Allows real-time monitoring through a camera system and controls equipment to minimize personnel exposure to waste.

Table III-14 Main Raw and Auxiliary Materials for the Garbage Transfer Station

Category	Item	Annual Consumption	Unit	Packaging	Transport Mode	Max. Storage	Remarks
Raw Material	Waste	18250	t/a	Barrels	Truck Transportation	/	/
Accessories	Biological deodorant solution	1.5	t/a	Barrels	Truck Transportation	0.5t	Negative pressure dust and deodorization system
	Deodorant of plant liquid	5	t/a	Barrels	Truck Transportation	0.5t	Negative pressure dust removal and deodorization system, space spray and discharge port spray dust reduction system
	Hydraulic fluids	0.05	t/a	Barrels	Truck Transportation	0.05t	Compression devices
Energy Consumption	Electricity	15	10 ⁴ KWh/a	Municipal power supply network			/
	Water	350.40	m ³ /a	Municipal network			/

118. The process flow and pollution production links of the garbage transfer station of this project are detailed in the following figure:

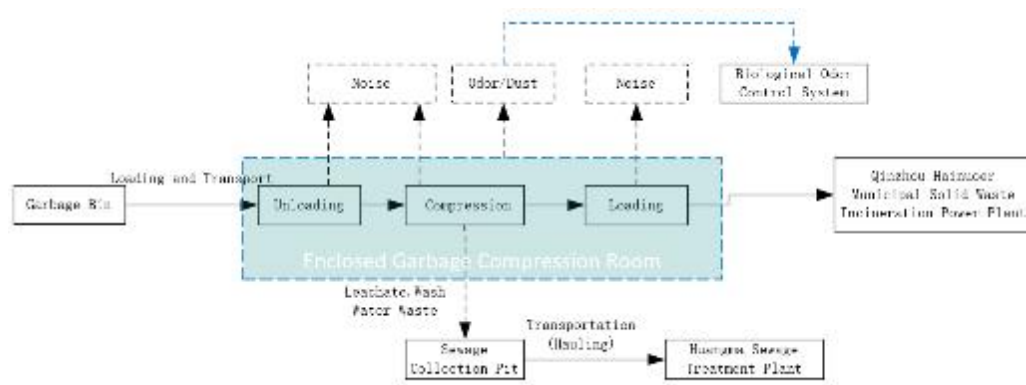


Figure III-18: Project Garbage Transfer Station Process Flow and Pollutant Generation Diagram

6. Electrical Engineering

119. The electrical system of this project includes high and low voltage power distribution systems; lighting and power distribution systems; intelligent engineering; weak current systems; and fire alarm and fire control linkage systems.

(i)Subproject 1 Power Supply for Logistics and Production Facilities: The existing 110kV Huangma Substation in the Huangma Industrial Park will supply electricity to the project area. The project area does not have an existing substation, and no new substations will be added. A 10kV switchgear will be installed near the smart logistics service center and cross-border e-commerce logistics and warehousing center, which will serve as the center of electricity load distribution. 3 x 2000kVA transformers will be installed at the e-commerce live-streaming base. 3 x 2000kVA transformers will be installed at the integrated warehousing center. 2 x 1600kVA transformers will be installed at the agricultural materials logistics and warehousing center. 2 x 2000kVA transformers will be installed at the cross-border e-commerce logistics and warehousing center. 2 x 2000kVA transformers will be installed at the logistics industry center. The total installed capacity is 23,200kVA. All transformers will be dry-type transformers. The total annual electricity consumption of this project is 46.9744 million kWh equivalent to 5,773.15 tons of standard coal (using a conversion factor of 0.1229 kgce/kWh). The detailed electricity consumption is shown in Table III-15.

Table III-15 Project Electricity Consumption Details

No.	Power Consumption Unit	Power Load (kW)	Operating Hours (h/a)	Average Active Load Factor	Total Annual Power Consumption (10,000 kWh)
1	Smart Logistics Service	1350.4	2000	0.7	189.06

No.	Power Consumption Unit	Power Load (kW)	Operating Hours (h/a)	Average Active Load Factor	Total Annual Power Consumption (10,000 kWh)
	Center				
2	Integrated warehousing center	1210.58	2000	0.7	169.48
3	E-commerce live-streaming base	1350.4	2000	0.7	189.06
4	Agricultural materials logistics and warehousing center	1459.5	2800	0.7	286.06
5	Commercial and trade logistics center	1225.23	2800	0.7	240.15
6	Logistics industry center	1290.89	2800	0.7	253.01
7	Cross-border Cold Chain Logistics Center	4622.39	8760	0.7	2834.45
8	Logistics Industry Center	612.62	2800	0.7	120.07
9	Basement	148.05	2800	0.7	29.02
10	Outdoor Lighting	185.20	3650	0.9	60.84
11	Charging Piles	2412.0	2000	0.4	192.96
12	Other Unforeseen Power Consumption	793.40	2400	0.7	133.29
Total		16660.63	/	/	4697.44

To ensure power supply reliability, each building will be equipped with a standby diesel generator set, with a capacity estimated at 15% of the transformer installation capacity to supply power to firefighting and important loads. The diesel generator and the city grid will be linked through mechanical and electrical interlocks, ensuring the diesel generator starts automatically within 15 seconds and supplies power to firefighting and critical loads when the city grid is down.

(ii)Subproject 2 Power Supply for Intermodal Freight Yard: Two 20kVA double-pole substations will be built to supply power to the track scale control room and AEI equipment room. These two substations will serve as backups for each other. The 10kV power supply will be derived from the existing distribution station's self-closing and through-lines. Additionally, the existing distribution station's self-closing voltage regulator will be upgraded from 315kVA to 400kVA to meet the current power demands; no further upgrades will be needed for the through-line voltage regulator.

A new substation will be built at the operations center, equipped with a 630kVA transformer. The power supply will be drawn from the local power grid via a 10kV line. A 100kW emergency diesel generator will also be installed as a backup power supply. The main power supply for the operations center's building, lighting, equipment, and fire-fighting systems will be sourced from the substation, while important equipment and firefighting systems will be powered by the emergency generator's bus.

An outdoor box transformer (equipped with a 630kVA transformer) will be installed at the operations center to supply power to two new gantry cranes. The power will be supplied by the newly built substation at the operations center.

7. Smart logistics information management platform.

120. The smart operation platform system adopts information technologies such as big data, video fusion analysis, NB-IoT, SOA architecture, GIS platform, and mobile internet. It involves overall planning, design, and implementation for collaborative business processing, data exchange, and comprehensive information services to meet system construction requirements. The platform establishes an overall framework of "2 Platforms and 7 Systems". The "2 Platforms" are the Smart Operation Management Platform and the Public Support Platform. The "7 Systems" include the Emergency Management System, Security Analysis System, Parking Management System, Property Management System, Energy Efficiency Management System, Fire Control Management System, and Structural Health Monitoring System.

121. The Smart Operation Management Platform serves as the command and control center for the Qinzhou Transshipment Center, providing the operating company with convenient, panoramic management services in areas such as basic information management, enterprise management, and property management. The Emergency Management System primarily provides collaborative linkage, daily monitoring, coordinated dispatching, mobile emergency response, emergency business applications, and decision support services. The Security Analysis System will build an integrated intelligent prevention and control system featuring front-end intelligent sensing collection, highly integrated data, and backend comparison analysis. This enables single-screen management of the Qinzhou Transshipment Center, real-time data collection for people and vehicles, intelligent analysis, early warning judgment, and trajectory analysis for targets within key areas, achieving refined and intelligent management of "people, events, and assets". The Parking Management System is a unified management service platform for all integrated parking lots within the Qinzhou Transshipment Center. Its objective is to provide more convenient and time-saving parking and management services for personnel working in the center through unified management of parking space resources, coordinated scheduling of vehicle parking, combined with new technologies such as online reservations and indoor parking guidance. The Property Management System acts as an online platform for property-related affairs at the Qinzhou Transshipment Center, enabling property services to respond instantly to enterprise needs, thereby improving service quality and enterprise satisfaction.

d. Land Use and Earthworks

122. The total permanent land area occupied by the project is 113.73 hm². The land primarily consists of agricultural land and construction land, with a

small amount of water areas and special-use land.

Table III-16 Land Use Area Statistics

Land Use Type			Area (hm²)	Proportion (%)
Agricultural Land	Woodland	Bamboo Forest Land	6.8	6.03%
		Other Forest Land	4.05	3.59%
		Arboreal Forest Land	45.79	39.77%
		Shrub Forest Land	1.94	1.72%
	Grassland	Other Grassland	1.69	1.50%
	Garden Land	Orchard	5.09	4.51%
	Cultivated Land	Dry Land	8.79	7.79%
		Paddy Field	19.64	17.41%
	Ditch		0.21	0.19%
	Aquaculture Ponds		0.41	0.36%
	Pit Pond Surface		5.07	4.49%
	Facility Agricultural Land		1.51	1.34%
Construction Land	Industrial Land		0.9	0.80%
	Rural Homestead		5.23	4.64%
	Commercial & Service Land		0.06	0.05%
	Logistics & Warehouse Land		0.14	0.12%
	Transportation Land		6.33	5.61%
Water Bodies	Ditch Water Surface		0.07	0.06%
Other	Special Use Land		0.01	0.01%
Total			113.73	100%

123. This project does not include a soil extraction site, self-extracted sand and gravel quarry, or spoil (waste) disposal site. The total excavation volume in the project area is 1,950,100 cubic meters, and the total filling volume is 3,129,100 cubic meters, with 1,179,000 cubic meters of borrowed material. The borrowed material will come from the Mudaoshui Quarry in Daping Town, Qinbei District, Qinzhou City, which began operations in March 2024. The soil is currently stored in a spoil yard located in a valley to the west of the quarry, covering an area of about 15.0358 hm², with an average pile height of 16.7 meters. During the operation period, a total of 3.0382 million cubic meters of spoil will be discarded. This mining area's surplus earth currently has no other designated recipient. Currently, about 900,000 cubic meters of spoil have been discarded, with an estimated 1.2 million cubic meters to be discarded in the coming year and the following year. Therefore, the required amount and timeline for borrowing material in this project can be met. According to map calculations, the average transportation distance for borrowing material is about 22 km, and the transportation route is: Mudaoshui Quarry — G325 National Road — Entrance Road/Logistics Park.

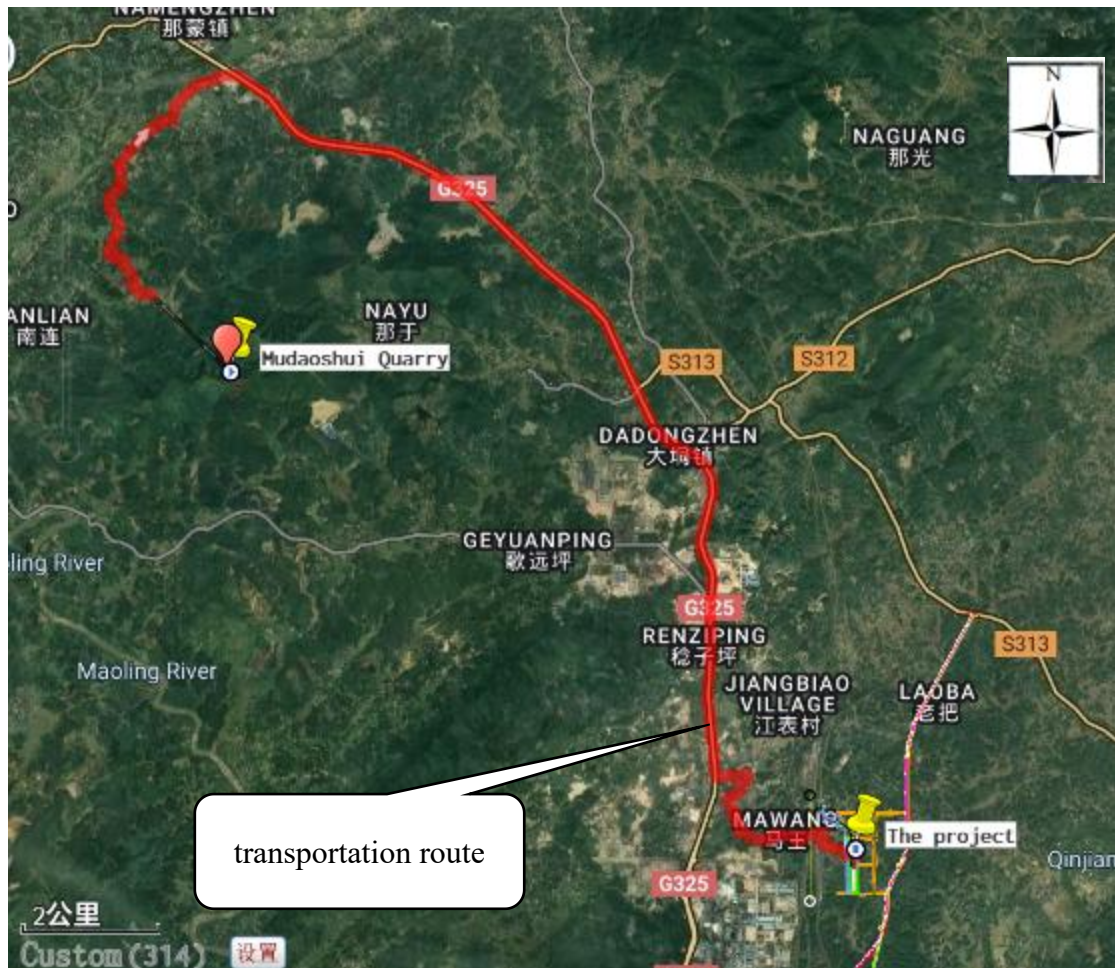


Figure III-19: Borrowed Material Transportation Route Map

e. Temporary Land Use

124. The temporary land use for this project primarily involves the construction office and production area, as well as temporary topsoil stockpiling areas. All these are located within the project's land acquisition redline. There are no areas with high embankments or deep excavations, and no borrow or spoil disposal sites are set up. The project does not establish temporary access roads and will directly use the existing Entrance Road for construction progress. There are no temporary construction living areas; workers will rent nearby residential houses. The temporary land use is primarily for the construction office and production areas, as well as temporary topsoil storage sites. Should the project implementation cause temporary land impacts outside the redline, the IA and the Qinbei District Expropriation Center will provide compensation for TLO and ground attachments (including young crops) in accordance with compensation standards. These costs will be covered under the contingency fund within the resettlement plan budget. The layout of the temporary facilities is shown in Figure III-20.

(1) Construction and Production Office Area. The construction and production office area is located within the intermodal freight yard and logistics

park, within the permanent land acquisition boundary, without requiring additional land. The area covers 1.40 hm², consisting of forest land, dry land, roads, and rice fields. It does not occupy prime agricultural land and is accessed via municipal half-roadbed and existing roads. The surrounding area consists mainly of forest and dry land, with no rivers, industrial sites, residential areas, or other public facilities. After construction is completed, the hardened site will be dismantled and converted into unloading area land and landscaping land for the logistics park.

(2) Topsoil Storage Area. Before construction, topsoil within the excavation disturbance area of the project will be stripped for later use in landscaping. A temporary topsoil storage site will be set up in the intermodal freight yard area within the designated soil storage zone. In the logistics park green space, two temporary topsoil storage sites will be established. The land types for these areas include forest land and orchard land, and they do not occupy prime agricultural land. They are accessible via the Entrance Road and municipal half-roadbed. The surrounding area consists mainly of dry land, with no rivers, industrial sites, residential areas, or other public facilities. The total area of the three topsoil storage sites is 4.10 hm², with an average height of 3 meters. The topsoil will be leveled with a bulldozer and lightly compacted, with a slope at the top to facilitate drainage. The total topsoil that can be stored is 123,000 cubic meters. Before the soil is piled, temporary drainage, intercepting, and sedimentation measures will be implemented. The project will carry out stripping, construction, and greening protection simultaneously, with the stripped topsoil being exposed to air for drying and then used for landscaping. The dredged sludge can either be naturally dried and piled in the topsoil storage sites or mechanically dewatered to form a mud cake, which is then layered and stored. The stripped topsoil along the Entrance Road will be piled along the road edge, and as soon as the volume is sufficient to fill the truck, it will be transported to the topsoil storage site.

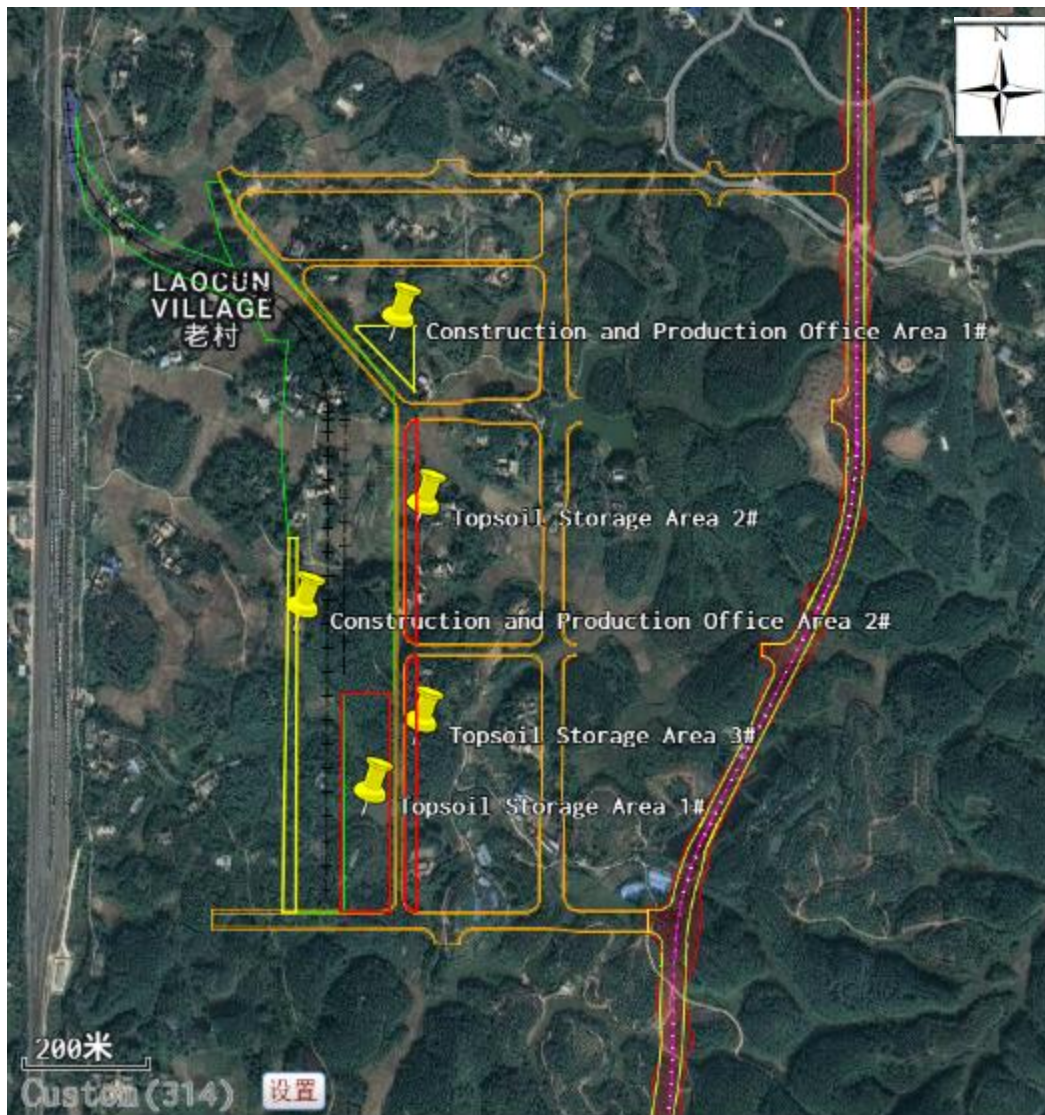


Figure III-20: Temporary Project Layout Diagram

E. Construction Plan

a. Road/Highway Construction Process and Pollution Sources

125. This project does not involve bridge engineering. The road/highway construction mainly consists of subgrade excavation and filling, subgrade protection and drainage, pavement, culverts, and other related works. The construction methods for each individual project vary, but generally, mechanical construction is the primary method, with some manual labor incorporated.

126. Construction generally follows the procedure: first bridges and culverts, then subgrade, slopes, followed by the pavement, and finally the ancillary facilities along the route. The subgrade, pavement, and bridge works are mainly

mechanized, while subgrade protection and drainage are primarily carried out manually. The main construction methods and processes are as follows:

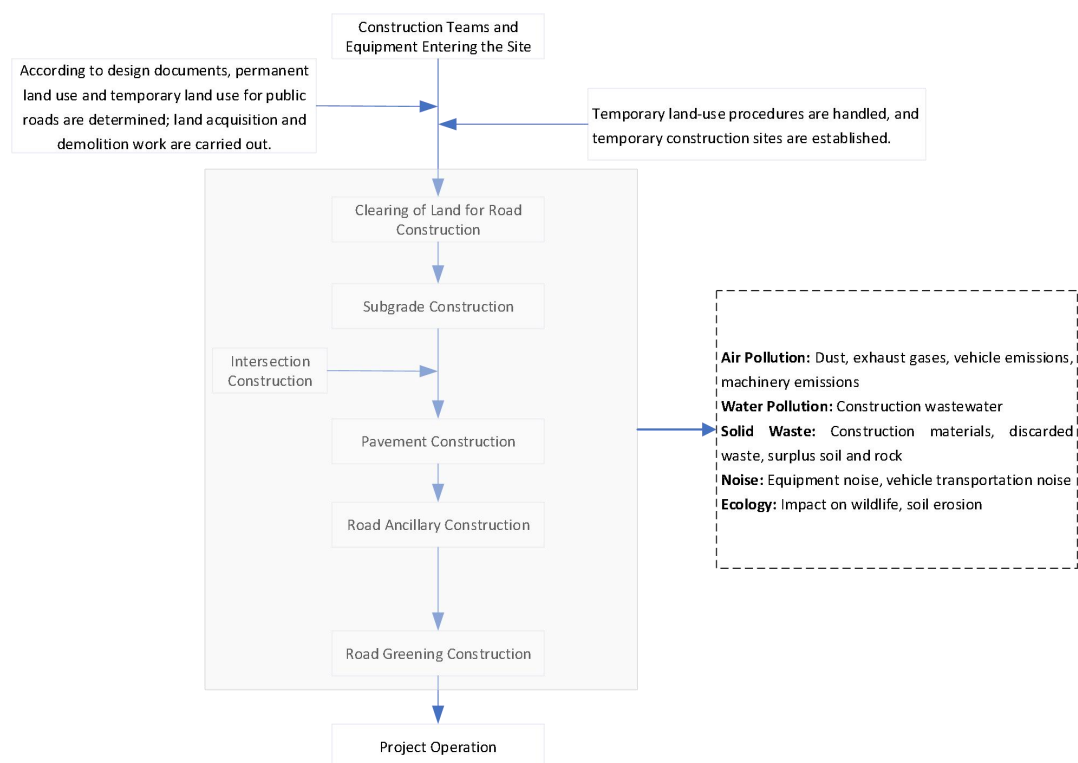


Figure III-21: Proposed Road/Highway Construction Process and Pollution Source Diagram

1. Subgrade Engineering

(i) Embankment Subgrade Construction: The embankment subgrade construction is primarily mechanized, with some manual labor. The construction method involves layered filling and compaction. The process includes: clearing topsoil (which is immediately transported to temporary storage sites) → leveling and grading with bulldozers and graders → compaction with roller machines → embankment filling. During filling, the width and height are appropriately increased, with the soil filled and compacted in layers. Excess material is removed and leveled with graders or other equipment.

(ii) Excavation and Semi-Fill, Semi-Excavation Subgrade Construction: Excavation is mainly mechanized, with some manual labor. The soil distribution and utilization must be considered. Before excavation, site cleanup and drainage should be carried out. If excavation is used for filling, topsoil should be removed and stored separately, or excavation should be done layer by layer to meet the embankment requirements. The process includes: clearing (topsoil is immediately transported to temporary storage) → marking and excavation of drainage ditches → subgrade filling and slope excavation → subgrade protection. Large-scale blasting is not allowed; excavation should proceed step

by step from top to bottom, with slope cutting and protection following.

2. Subgrade Excavation Material Placement

127. Before subgrade excavation, the soil along the route is tested. The stripped topsoil will be transported to temporary storage sites along the corresponding sections of the route for later use. Poor soil quality material will be temporarily stored on the subgrade slopes and transported to designated areas for disposal when construction vehicles pass. After the project is completed, the stripped topsoil will be backfilled into the subgrade's landscaping area for vegetation recovery, after leveling and performing vegetation restoration measures.

3. Culvert Engineering

128. This project does not involve bridges. The culvert construction along the entire route will be carried out using mechanical methods, combined with manual labor when needed, depending on the type and location of the culverts. The culverts' cover plates or round pipes will be ordered from specialized prefabrication plants, either manufactured centrally in factories or prefabricated on-site, and transported to the work site for installation.

4. Drainage System Construction

129. The drainage system design is based on the actual terrain, soil conditions, and alignment of the route. The primary method used on this section involves intercepting and draining ditches and side ditches.

(i)Intercepting and Drainage Ditches: These are generally used on embankment sections on one side of the mountain. According to the degree of erosion, slope gradient, and groundwater level, intercepting ditches are set up using manual labor.

(ii)Side Ditches: Used in excavation and zero-fill sections. For loose soil, steep slopes, severe water erosion, and collapsed areas, side ditches will be reinforced with masonry, constructed manually.

5. Pavement Engineering

130. Pavement construction is highly mechanized. Machinery with high automation levels and strong production capacity should be prioritized. Mixing should be carried out in centralized plants, with mixing and paving as the primary mechanized process, supported by transportation vehicles and compaction equipment for optimal combinations, ensuring full mechanization of

asphalt concrete pavement construction.

6. Landscaping Engineering Process

131. Landscaping construction takes place after the roadwork, mainly involving soil replacement, planting location marking, hole digging, tree planting, filling, watering, and fertilization.

b. Railway Dedicated Line Construction Process and Pollution Source Diagram

132. The railway dedicated line for this project does not involve bridges. The construction primarily consists of subgrade excavation and filling, subgrade protection and drainage, culverts, and track laying. The subgrade construction process is similar to that of road construction. Below is the process flow for the railway dedicated line construction and associated pollution sources.

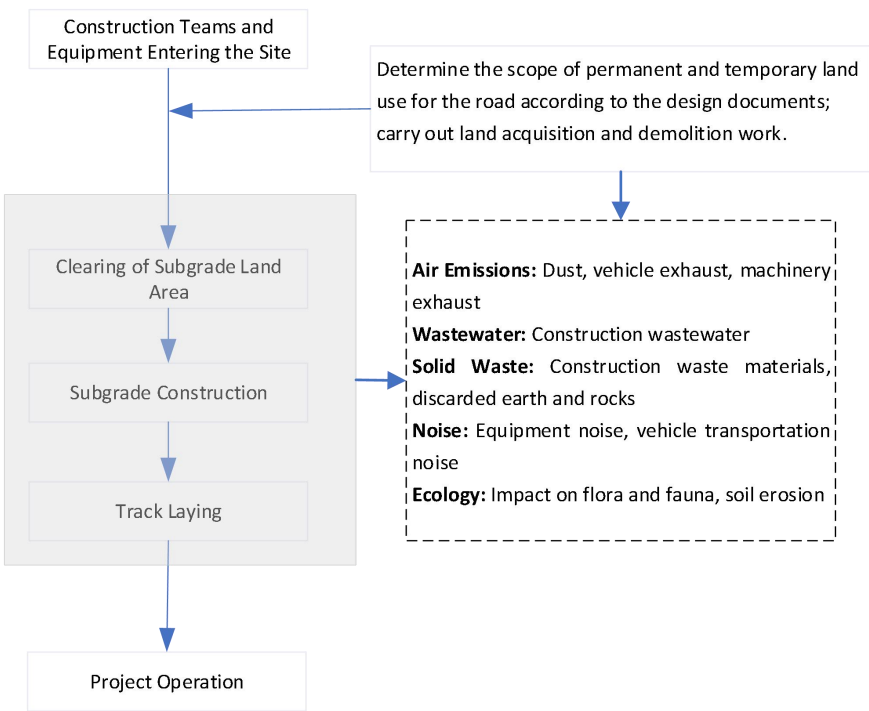


Figure III-22: Subgrade Construction Process Flowchart

1. Subgrade Engineering

(i) Embankment Subgrade Construction: Embankment subgrade construction is mainly mechanical, with some manual labor. The construction method involves layered filling and compaction. The process includes: clearing

topsoil (which is immediately transported to temporary storage) → leveling and grading with bulldozers and graders → compaction with roller machines → embankment filling. Excess material is removed and leveled with graders or other equipment.

(ii)Excavation and Semi-Fill, Semi-Excavation Subgrade Construction:

Excavation is mainly mechanized, with some manual labor. The soil distribution and utilization must be considered. Before excavation, site cleanup and drainage should be carried out. If excavation is used for filling, topsoil should be removed and stored separately, or excavation should be done layer by layer to meet the embankment requirements. The process includes: clearing (topsoil is immediately transported to temporary storage) → marking and excavation of drainage ditches → subgrade filling and slope excavation → subgrade protection. Large-scale blasting is not allowed; excavation should proceed step by step from top to bottom, with slope cutting and protection following.

2. Track Laying Engineering

133. Track laying and beam erection are carried out using mechanical methods. In sections with ballast track beds, long steel rails are laid using the replacement method, with a progress rate of 2.0 km/day for single-track rail laying. Pre-cast T-beams are installed at a rate of 32 meters per 3 beams per day.

134. The replacement method for laying continuous welded rail involves the following steps: preparation → laying the bottom layer of ballast → track laying → layering and leveling ballast → laying long steel rails → leveling ballast → welding unit track sections → stress relief and locking of the welded track → track finishing and grinding → track inspection and acceptance. Track laying should begin half a month after the completion of subgrade earthworks, during which time the subgrade and centerline should be checked to ensure readiness for track laying.

135. Track laying and ballast laying should not exceed 1 to 2 intervals. The ballast laying process follows layering procedures, with bottom ballast delivered by trucks and laid by ballast spreaders, while the surface ballast is transported by engineering trains. The first layer of surface ballast must be thoroughly compacted before the second layer is laid.

136. A track laying base will be set up on the northern side of the intermodal freight yard within the project area, equipped with one set of ballast laying and track laying machinery.

c. Photovoltaic Power Generation Construction Process and Pollution Source Diagram

137. Photovoltaic panels will be installed on the rooftops of buildings within the logistics park. There is no additional land acquisition, and no site leveling is required. The construction process for the photovoltaic power generation system and its associated pollution sources are shown in the following diagram.

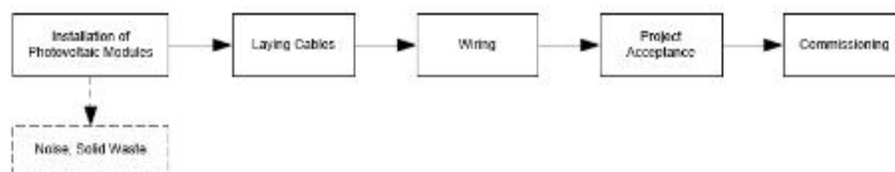


Figure III-23: Solar Power Equipment Installation Process and Pollution Source Diagram

138. **Main Construction Processes of Photovoltaic Array Installation:** The process begins with installing fixed brackets, followed by the installation of solar photovoltaic panels, related photovoltaic power generation components, and electrical equipment such as inverters. This is followed by cable and optical cable installation and the installation and commissioning of monitoring equipment. After construction is completed, the foundation surface is protected. Upon project completion, an inspection and acceptance process is conducted before commencing operations.

(i) Photovoltaic Equipment and Electrical Installation: This includes the installation of monocrystalline silicon modules (solar panels), fixed equipment brackets, grid-connected inverters, box-type transformers, and distribution cabinets. Photovoltaic equipment brackets are manually assembled on-site and then transported to the installation location using vehicles. The assembled brackets are manually installed, fixed, and commissioned. Electrical and control cables are connected and tested during commissioning. Grid-connected inverters, box transformers, and auxiliary transformers are transported using vehicles and lifted into place with a 16-ton truck crane. They are then manually installed, fixed, and grounded, including the equipment shell and lightning protection devices. High- and low-voltage cable connections and equipment testing and commissioning follow. Combiner boxes and distribution cabinets are transported using vehicles and lifted into place with an 8-ton truck crane. They are manually installed, fixed, grounded, and connected for entry and exit wiring, followed by equipment testing and commissioning.

(ii) Cable Installation: This project adopts a combination of overhead cables and directly buried cables. For directly buried cables, the process includes excavating cable trenches, laying sand and burying the cables, laying the cables and applying sand and weights, followed by backfilling and compacting.

For overhead cables, cable brackets are installed first, followed by cable installation. All cables are installed in sections, with each section inspected and accepted individually.

(iii)Commissioning and Operation: The project undergoes commissioning to ensure proper functionality before beginning operations.

d. Intermodal Freight Yard and Logistics Park Housing Construction

139. The construction of intermodal freight yard and logistics park housing construction project mainly includes earthwork excavation, site leveling, masonry engineering, concrete engineering, building decoration, equipment installation, etc. The construction of the loading and unloading yard includes the construction of the comprehensive office building, the foundation form is pile foundation and independent foundation, and the wall of the comprehensive office building adopts brick wall.

140. The construction process is as follows: It mainly includes processes such as manual digging piles, manual excavation, foundation pouring, and each layer frame.

141. Artificial excavation pile: construction pay-off → excavation pile hole → wall protection → bottom inspection→ reaming → installation of reinforcement cage→ pouring pile core → curing → pile head → pile foundation detection; Manual excavation: site leveling, pay-off→ positioning→ excavation → manual cleaning of virtual soil → elimination of stagnant water; Foundation pouring: pouring concrete cushion→ foundation binding reinforcement→ foundation support formwork→ foundation pouring concrete→ concrete curing → backfill; Frame of each layer: Measurement and pay-off → erection of scaffolding→ column reinforcement binding → pillar formwork→ support beam formwork→ beam reinforcement → formwork reinforcement → support platform formwork→ binding plate reinforcement → pouring concrete → concrete curing → demolding.

142. Engineering earthwork excavation adopts excavator excavation, site leveling adopts loader leveling and manual joint operation mode to carry out, masonry engineering mainly adopts concrete pouring, artificial masonry, concrete engineering mainly adopts cement tanker, hoisting car, vibrator vibrating chisel, the required concrete is purchased, the main body building is decorated after completion, equipment installation and commissioning are carried out after the completion of station construction.

e. Regional building materials and transportation conditions

143. This project directly purchases commercial concrete from Qinzhou City,

and there is no concrete mixing plant. Rebar, wood and other materials are purchased. Asphalt is purchased, and no asphalt mixing plant is set up. The water system along the line is developed, the groundwater is abundant, and the engineering water can be taken from the nearby rivers, villages and towns well water, with good water quality, low salinity, no erosion to concrete, and can be used as engineering water. The power grid along the demonstration area is dense, the power resources are abundant, the local power supply is sufficient, and the power consumption of the project is more convenient, which can be solved through consultation with the local power department. Construction materials are mainly transported by road. The road network along the project is relatively developed, and the highway grade is high, so it can meet the material transportation requirements during the construction of the project.

IV. Associated Facilities

144. The due diligence for this project considered three types of facilities: (i) Associated Facilities – According to the Asian Infrastructure Investment Bank’s (AIIB) Environmental and Social Framework (ESF), the criteria for identifying “associated facilities” are: (a) directly and materially related to the Project; (b) carried out, or planned to be carried out, contemporaneously with the Project; and (c) necessary for the Project to be viable and would not be carried out if the Project did not exist. (ii) Existing Project Facilities – These are facilities that are already established and operational, and the project will assist in upgrading or repairing them. (iii) Related Facilities – Existing facilities required for project operations but outside the project scope and not involving any engineering, activities, construction, operations, upgrades, or repairs supported by the project. The definition of “associated facilities” is derived from the AIIB’s Environmental and Social Framework (ESF). However, ESF does not define existing project facilities or related facilities.

145. This project is a new construction project and does not involve any modification or expansion of existing facilities. The screening of associated facilities is shown in Table IV-1. The due diligence for existing facilities of this project is described below and in Table IV-2.

Table IV-1 Identification of Associated Facilities

Facility Name	Criteria for Associated Facilities	Relation to This Project	Compliance Analysis	Determination
Mahuang Station	a. Directly and materially related to the Project;	This project is located opposite Mahuang Station. The dedicated railway line and loading/unloading yard of the sub-project will connect to Mahuang Station as the junction station. Freight marshalling operations for the Qinzhou area are handled by Mahuang Station. Constructed from 1983, operational since 1987, and upgraded in 2005, it was fully electrified in 2019. It currently handles no passenger or freight services. The station has 12 receiving-departure tracks (including 2 main lines), 2 shunting leads, and 1 basic platform.	The project's dedicated railway line branches off from the northern shunting lead of Mahuang Station, connecting to the Qinzhou regional railway network via the station. The renovation and expansion of Mahuang Station are directly related to this project.	Yes
	b. Carried out, or planned to be carried out, contemporaneously with the Project;	1) The Nanfang Railway Qinzhou-Fangchenggang Second Track Project will renovate Mahuang Station, adding 2 receiving-departure tracks opposite the station building, bringing the total to 14 tracks (including 4 main lines). This project will involve minor modifications to the northern shunting lead. 2) A planned capacity expansion proposes upgrading Mahuang Station to a "Three-yard, Level I" configuration, increasing the total number of tracks from 12 to 42. The existing yard would become the up-direction yard, with new down-direction and marshalling yards. The new marshalling yard would have 20 tracks. The new down-direction yard would have 9 tracks (including 2 main lines).	1) The Second Track Project has commenced and is expected for completion by end of 2025. This project is scheduled to start Dec 2026, with the dedicated line construction lasting 1.5 years. Connection work is typically scheduled last, around 2028, after the Second Track Project is finished. 2) The "Three-yard, Level I" expansion is in the planning stage, pending approval, and is expected to be implemented after this project's railway is complete. Temporary connection solutions during expansion would ensure uninterrupted operation of the dedicated line.	Yes
	c. Necessary for the Project to be viable and	The expansion of Mahuang Station is primarily to meet the increasing transport demands in	① The project will connect to Mahuang Station's existing northern outgoing line. Even without the	No

Facility Name	Criteria for Associated Facilities	Relation to This Project	Compliance Analysis	Determination
	would not be carried out if the Project did not exist.	Qinzhou. These works have been included in the Medium and Long-Term Railway Network Plan since 2016.	expansion of Mahuang Station, the project's dedicated railway line can still be used. ② The expansion of Mahuang Station stems from the need to increase transport capacity in Qinzhou, but the construction of this project is not the reason for Mahuang Station's expansion.	
Pinglu Canal	a. Directly and materially related to the Project;	The Pinglu Canal starts at Pingtang Jiangkou in the Xijin reservoir area, Hengzhou City, Nanning, enters the Beibu Gulf via the Qin River through Luwu Town, Lingshan County, Qinzhou City, with a total length of 134.2 km. The project site is adjacent to the under-construction Pinglu Canal, located 12 km from the planned Longwan Terminal on the Qin River (Pinglu Canal). Upon completion, the Longwan Terminal will become an inland river port in Qinzhou capable of berthing ships up to 5,000 DWT. This will further increase the project's short-sea and short-distance shipping volumes to Southeast Asian countries like Vietnam, Thailand, and the Philippines, as well as domestic Pinglu Canal intermodal volumes.	The project is close to the Pinglu Canal's Longwan Terminal. Once completed, the canal will enhance the project's sea-rail multimodal transportation capacity, directly related to the project.	Yes
	b. Carried out, or planned to be carried out, contemporaneously with the Project;	Construction of the Pinglu Canal officially commenced on August 28, 2022, and it is expected to begin operation in 2026.	The project is expected to start in the third quarter of 2025, so there may be some overlap with the construction period of the Pinglu Canal.	Yes

Facility Name	Criteria for Associated Facilities	Relation to This Project	Compliance Analysis	Determination
	c. Necessary for the Project to be viable and would not be carried out if the Project did not exist.	In January 2022, the Pinglu Canal project was included in the Ministry of Transport's "14th Five-Year Plan for Water Transport". Upon completion, 5,000 DWT river-sea direct vessels can sail directly from inland river ports on the Xijiang River to Chinese coastal ports and major Southeast Asian ports, improving connectivity between domestic and international markets. It will fundamentally change Guangxi's current situation of having no direct river access to the sea despite being coastal. The primary logistics route for this project's "Road-Rail-Sea" intermodality is: Road Logistics -> This Project -> Rail Logistics (Mahuang Station) -> River/Sea Port Logistics (Qinzhou Port); and the reverse. After the Pinglu Canal operates, the project will utilize the Longwan Terminal for container transport via rivers directly to the sea, achieving integrated "Road- Rail- River/Sea" intermodal transport.	This project connects to existing roads via the Entrance Trunk Road and to Mahuang Station via the dedicated railway line. Even if the Pinglu Canal were not built, the project could still achieve its "Road-Rail-Sea" intermodal function using the dedicated railway and connected roads and could operate normally. The Pinglu Canal's construction serves multiple economic zones along its route. While it could increase this project's logistics volume, this project's construction is not the reason for building the Pinglu Canal.	No

Table IV-2 Existing Facilities Due Diligence

No.	Facility Name	Relation to the Project	Construction Date	Scale	Environmental Due Diligence	Social Due Diligence
1	Huangma Sewage Treatment Plant	Sewage from the project area will be processed through septic tanks and then discharged to the Huangma Sewage Treatment Plant via the municipal pipeline.	Phase 1: 2015-2016, Phase 2: 2022-2024	Total treatment capacity: 32,000 tons/day; current load: 10,000 tons/day; excess capacity: 22,000 tons/day. Project's Max Daily Discharge: 1,100 tons/day.	The project has obtained EIA approval, passed environmental acceptance inspection, and acquired a pollutant discharge permit. No environmental penalty records. Effluent meets the GB18918-2002 Level A standard. WWTP has sufficient capacity to receive this project's wastewater.	Located in Zhusha Village, Huangma Neighborhood Committee, Changtian, Qinbei District. Site area: 22,000.3 m ² (~33 mu). Bldg. area: 2,262.82 m ² . Land real estate certificate obtained on Apr 13, 2021. Phase II is an expansion on the Phase I site. As an existing facility for this project, it has complete land procedures and no legacy issues.
2	Huangma Water Supply Plant	New water supply pipelines will be connected from the existing DN450 main on G325 National Highway near Chengbei Park to the project site. Two pipelines will be laid along G325 and the Entrance Trunk Road to meet water supply and firefighting demands. The pipeline construction will be synchronized with the Entrance Trunk Road	Phase 1: 2016-2018, Phase 2: 2022-2024	Capacity: 15,000 tons/day. Surplus Capacity: 1,500 tons/day. Project's Total Water Use: 1,300 tons/day.	The project has obtained EIA approval, passed environmental acceptance inspection, and acquired a pollutant discharge permit. No environmental penalty records. Water quality meets GB5749-2022 (Sanitary Standard for Drinking Water). The plant can supply this project's water demand.	Covering an area of about 32.7 acres, the land acquisition was completed in 2015. The water plant project will be constructed in two phases, and the first phase of the project has obtained the land real estate certificate in 2018. Officially put into operation on April 17, 2018, the second phase of the land is reserved for the construction of the water plant, which does not involve land acquisition and demolition, the feasibility study approval was obtained in August 2021, and the construction will be completed and put into use in 2022, with complete

No.	Facility Name	Relation to the Project	Construction Date	Scale	Environmental Due Diligence	Social Due Diligence
						land procedures and no remaining problems. There are 21 staff members, including 4 women.
3	Hainuoer Municipal Waste Incineration Plant	Municipal waste will be transported to the Hainuoer Municipal Waste Incineration Plant in Qinzhou.	Phase 1: 2014-2016, Phase 2: 2021	Phase I Capacity: 600 tons/day. Phase II Capacity: +300 tons/day. Current Load: 650 tons/day. Project's Waste Generation: 16.53 tons/day.	Environmental impact assessment completed; no environmental penalties; complies with GB18485-2001 standards for waste incineration.	Covering an area of 74 acres, the land is state-owned construction land, which was obtained in 2014 by way of state-owned land allocation, and does not involve land acquisition and demolition; The land formalities are complete and there are no remaining problems. There are 108 employees, including 15 women.
4	Linhu Substation	Power will be supplied by erecting a line from the Linhu Substation in Huangma Industrial Zone Area 1 to near Maqiong Village, Changtian Street, utilizing existing pylons to cross the railway before entering the project park.	2018	The 110kV Linhu Substation is an outdoor comprehensive automation substation, equipped with one 50MVA main transformer, two 110kV lines, three 35kV lines, and twelve 10kV lines. Sufficient capacity.	Environmental impact assessment completed; no environmental penalties. Electromagnetic environment in the project area meets requirements.	Linhu substation covers an area of 8.35 acres (all construction land, does not involve the occupation of cultivated land), of which 8.11 acres of land in the station area, in 2013 to complete the state-owned land allocation procedures, land procedures are complete, no remaining problems.
5	Guangxi Qinzhou Guotou Gas Station	Connect to the existing gate station of Guangxi Qinzhou Guangtou Gas Co., Ltd.	March 2017	Maximum flow: 14,000 Nm ³ /hour, daily supply: 28,000 m ³	Both the LNG vaporization station and the gate station have obtained EIA approval. No environmental penalty records. Impacts on air, surface water, noise, and solid waste comply with relevant standards.	It covers an area of 35.66 acres, 7.04 acres of cultivated land has been expropriated, the land acquisition work has been completed before 2018, all compensation has been paid in place, there are no historical problems, and the land real estate certificate will be obtained in 2022.

No.	Facility Name	Relation to the Project	Construction Date	Scale	Environmental Due Diligence	Social Due Diligence
6	Yinyuan Construction Waste Disposal Site	Construction waste shall be transported to Yinyuan Construction Waste Disposal Site for treatment.	Construction started in January 2024 and it was put into use in January 2025.	Design Capacity: 4.7 million m ³ . Current Volume: 100,000 m ³ . Surplus Capacity: 4.6 million m ³ . Project's Waste Generation: ~20,000 m ³ .	The project has obtained EIA approval and passed environmental acceptance inspection. No penalty records. Can accept the construction waste generated by this project.	Located in Laohutan Village, Youbu Village Committee, Shabu Town, Qinnan District. Site area: 325,167.5 m ² (487.8 mu). Land obtained via lease agreement from Youbu Village Committee/individuals of Laohutan Village to Qinzhou Yinyuan Investment Co., Ltd.

Note: Detailed due diligence on land use for existing facilities can be found in the Resettlement Plan report.

V. Alternatives Analysis

A. Without Project Option

146. Freight traffic in southwestern and central-southern China has traditionally relied on the Yangtze River and Shanghai's port as the main transportation route. Transporting goods via the NWLSC would save approximately 10 days compared to the Yangtze River and Shanghai route. This project is located at a key transshipment node of the NWLSC, and with convenient rail access, it can significantly improve cargo transit speed and reduce transportation costs.

147. According to the "Overall Plan for the New Western Land-Sea Corridor" issued by the National Development and Reform Commission of China, the Beibu Gulf Port is expected to exceed a container throughput of 10 million TEUs by 2025. With the increasing volume of cargo traffic along the NWLSC, the storage and logistics capacity of the three cities at the corridor's end (Beihai, Qinzhou, and Fangchenggang) will be unable to meet the rapidly growing demand for logistics services.

148. This project is based on multimodal transport using highways, railways, and shipping, coordinating the smooth flow of business, logistics, capital, people, and information across various ports in Guangxi. The multimodal transport system using containers as transport units will enable door-to-door transportation, improve transport efficiency, and reduce damage and loss of goods due to the elimination of transshipment between containers.

149. The construction of logistics and processing facilities in this project will double the current logistics and warehousing capacity of Qinzhou, Beihai, and Fangchenggang. The regions and cities directly benefiting from this project include ASEAN countries, especially coastal nations like Vietnam, the Philippines, Brunei, Thailand, Singapore, Malaysia, Indonesia, Cambodia, and Myanmar. On the Chinese mainland, regions such as Guizhou, Chongqing, Chengdu, and Hunan will directly benefit, and cities in Guangxi that are not on the coast will also benefit from enhanced logistics support for exports. Therefore, the "No Project" alternative for Subproject 1 is considered unacceptable.

150. The selected site for the China-ASEAN Sea-Rail Multimodal Logistics Project is located opposite the existing Mahuang Marshalling Station Yard in Qinzhou City. Currently, the yard's logistics transshipment efficiency is low, with railcars occupying the existing tracks for long periods (at least 5 hours). Once the project is completed, freight trains passing through the Mahuang Marshalling Station Yard can quickly store cargo in the logistics warehouses of the park, reducing train stop time to under 0.5 hours. Railway transport is more

energy-efficient and produces fewer emissions compared to road transport. Therefore, the "No Project" alternative for Subproject 2 is considered unacceptable.

151. The multimodal transport transshipment center requires external highway transport and will need infrastructure connections for utilities such as water, electricity, and gas. Therefore, the "No Project" alternative for Subproject 3 is considered unacceptable.

152. The consequences of not implementing this project are (i) increased vehicle transport costs and transport time; (ii) higher energy consumption and increased carbon emissions; (iii) limited transshipment capacity and efficiency at Mahuang Station. Once the project is completed, it will enhance the capacity of China-ASEAN Sea-Rail Multimodal Logistics warehousing, improve logistics turnover efficiency, reduce logistics costs, lower carbon emissions, and promote economic development, while providing employment opportunities to countries along the Belt and Road.

B. Subproject 2 Intermodal Freight Yard Alternative

Comparison

153. The project plans to set up the China-ASEAN Sea-Rail Multimodal Logistics Qinzhou Transshipment Center in the multimodal area opposite Mahuang Station. The project includes the construction of a dedicated railway line and a cargo handling yard. The dedicated railway line will connect from the northern end of Mahuang Station, integrating into the Qinzhou area railway network.

154. The proposed route of the new dedicated railway line is as follows: it branches off from the shunting lead at the northern end of Mahuang Station and extends to the opposite side of the station building, where the loading/unloading operation yard will be constructed. Based on the interrelationship between the loading/unloading yard and the site selection, zoning, and layout of Sub-project 1's logistics and production facilities, two route alignment alternatives have been proposed:

155. Route Alignment Alternative 1 (Alternative 1): Loading/unloading yard arranged parallel to the Mahuang Station yard.

156. The railway line branches from the northern end of Mahuang Station and extends southeast to set up a handling yard parallel to the Mahuang Station yard.

157. Route Alignment Alternative 2 (Alternative 2): Loading/unloading yard arranged opposite the Mahuang Station yard.

158. The railway line branches from the northern end of Mahuang Station

and extends northeast to set up a handling yard opposite the Mahuang Station yard.

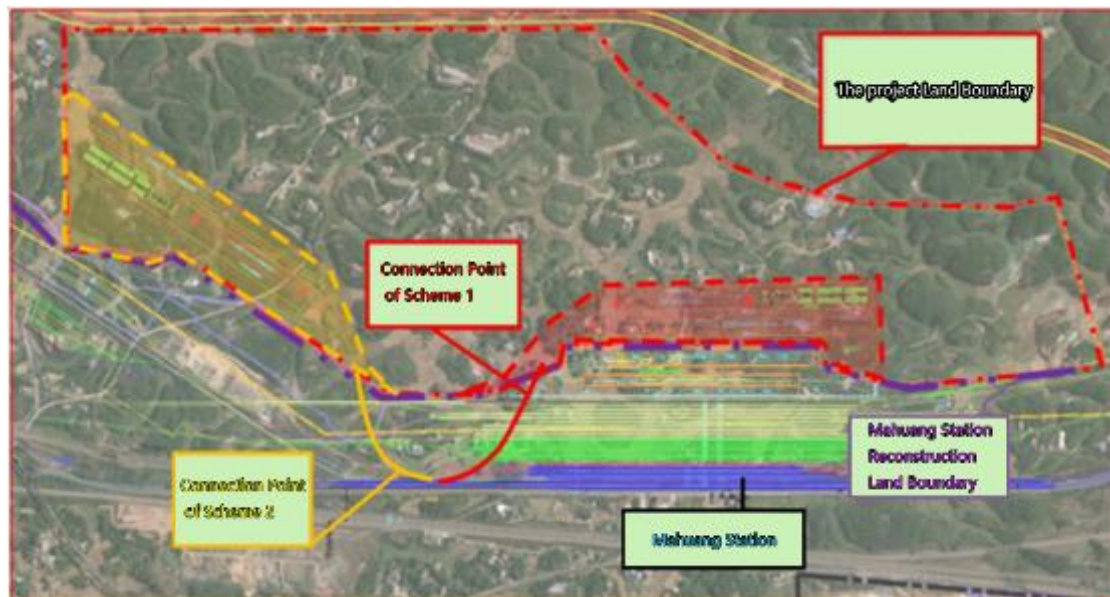


Figure V-1: Comparison of Railway Line Alignment Alternatives

159. In terms of engineering, transport organization, waste engineering, and land use, Alternative 1 is superior to Alternative 2. Therefore, Alternative 1 is recommended. A detailed comparison of Alternative 1 and Alternative 2 is shown in Table V-1.

Table V-1 Railway Line Engineering Factor Comparison

Factor	Alternative 1	Alternative 2	Recommended Alternative
Transport Organization	After arrival, freight can be directly pushed by the shunting locomotive to the freight yard for loading/unloading.	The road locomotive needs to turn around for placement and retrieval, resulting in inconvenient operations. Furthermore, it cannot connect to the marshalling yard in the long term, limiting operations to flat-shunting methods and making transport organization inefficient.	Alternative 1
Waste Engineering	The dedicated railway line branches off from the northern shunting lead of Mahuang Station, turning southeast to the loading/unloading yard. This better aligns with the planned lines of the Mahuang Station freight yard, resulting in less trackage being abandoned..	The connection is at the throat area at the northern end of Mahuang Station, with the multimodal zone located east of the reserved depot area. This leads to low line utilization rates in both near and long terms, resulting in more abandoned track.	Alternative 1
Land Use	Occupies an area of 259.78 mu. There is no trapped land	Occupies an area of 262.37 mu. A trapped land parcel of	Alternative 1

Factor	Alternative 1	Alternative 2	Recommended Alternative
	parcel between the site and the Mahuang Station boundary, leading to higher land use efficiency.	188.65 mu would exist between the site and the expanded Mahuang Station boundary. If this land is included in the Qinzhou Transshipment Center, the center would be segmented by the multimodal zone, causing operational inconvenience.	
Comprehensive recommendation			Alternative 1

160. The comparison of environmental factors in Alternative 1 and Alternative 2 is shown in Table V-2.

Table V-2 Railway Line Environmental Factors Comparison

Environmental Factor		Alternative 1	Alternative 2	Recommended Alternative
Ecological Environment	Environmental Sensitive Areas	Does not involve sensitive ecological areas, conservation red lines, or basic farmland.	Does not involve sensitive ecological areas, conservation red lines, or basic farmland.	Comparable
	Land Area and Vegetation	Occupies 259.78 acres, with all vegetation destroyed but no key protected plants or forests affected.	Occupies 262.37 acres, with all vegetation destroyed but no key protected plants or forests affected.	Alternative 1
	Animals	As Alternatives 1 and 2 are located in the same area, their impact on animal quantity and populations is similar. Alternative 1 occupies less land, resulting in a slightly smaller impact.		Alternative 1
Soil and Stone Work		Earthworks volume: 46.9 (Fill: 23.9; Cut: 23.1). Cut and fill are essentially balanced.	Earthworks volume: 61.2 (Fill: 43.7; Cut: 17.5). Cut and fill are unbalanced.	Alternative 1
Noise Impact		21 households located within 60m of the main railway line, outside the occupation area.	16 households located within 60m of the main railway line, outside the occupation area.	Alternative 2
Vibration Impact		9 households located within 60m of the main railway line, outside the occupation area.	3 households located within 60m of the main railway line, outside the occupation area.	Alternative 2
Water Sources		Does not involve important water bodies or drinking water source protection zones.	Does not involve important water bodies or drinking water source protection zones.	Comparable

Environmental Factor	Alternative 1	Alternative 2	Recommended Alternative
House Demolition	Demolition of approximately 9,401 m ² of buildings.	Demolition of approximately 680 m ² of buildings.	Alternative 2
Comprehensive Recommendation			Alternative 1

161. In terms of environmental factors, neither Alternative 1 nor Alternative 2 involves ecologically sensitive areas and important water bodies, nor do they involve key protected plants, public welfare forests and natural forests; Alternative 1 occupies less land, has less impact on the surrounding ecological environment and the living environment of animals and plants, and the earthwork can be basically balanced, and the excavation and filling of the earth and stone in Alternative 2 is unbalanced, and the fill is much larger than the excavation; The number of environmental protection targets along the line of Alternative 1 is greater than that of Alternative 2, but the impact of noise and vibration can be effectively reduced after corresponding environmental protection measures are taken during the operation period. Considering comprehensively, from the perspective of the environment, this evaluation recommends Alternative 1.

162. To sum up, comprehensively consider engineering factors and environmental factors and recommend Alternative 1.

C. Subproject 3 Entrance Trunk Road Alternative

Comparison

163. The Entrance Trunk Road's first section (RYK0+000 to RYK4+530.639) passes through a significant amount of basic farmland, making its route unique. For the remaining sections, three route alternatives are proposed: Route K, Route A and Route C.

164. Route K: Starts at RYK0+000 and ends at RYK9+778.849, with a total length of 9778.849 meters. The route is designed to follow the railway alignment to minimize unused land between the road and railway.

165. Route A: Starts at AK0+000 and ends at AK10+034.852, with a total length of 10,034.852 meters. This is the initial design, and the route passes under the railway.

166. Route C: Starts at CK0+000 and ends at CK9+486.088, with a total length of 9,486.088 meters. This line follows relatively flat terrain with gentle slopes.

167. The specific direction of each program line is shown in Figure V-2.

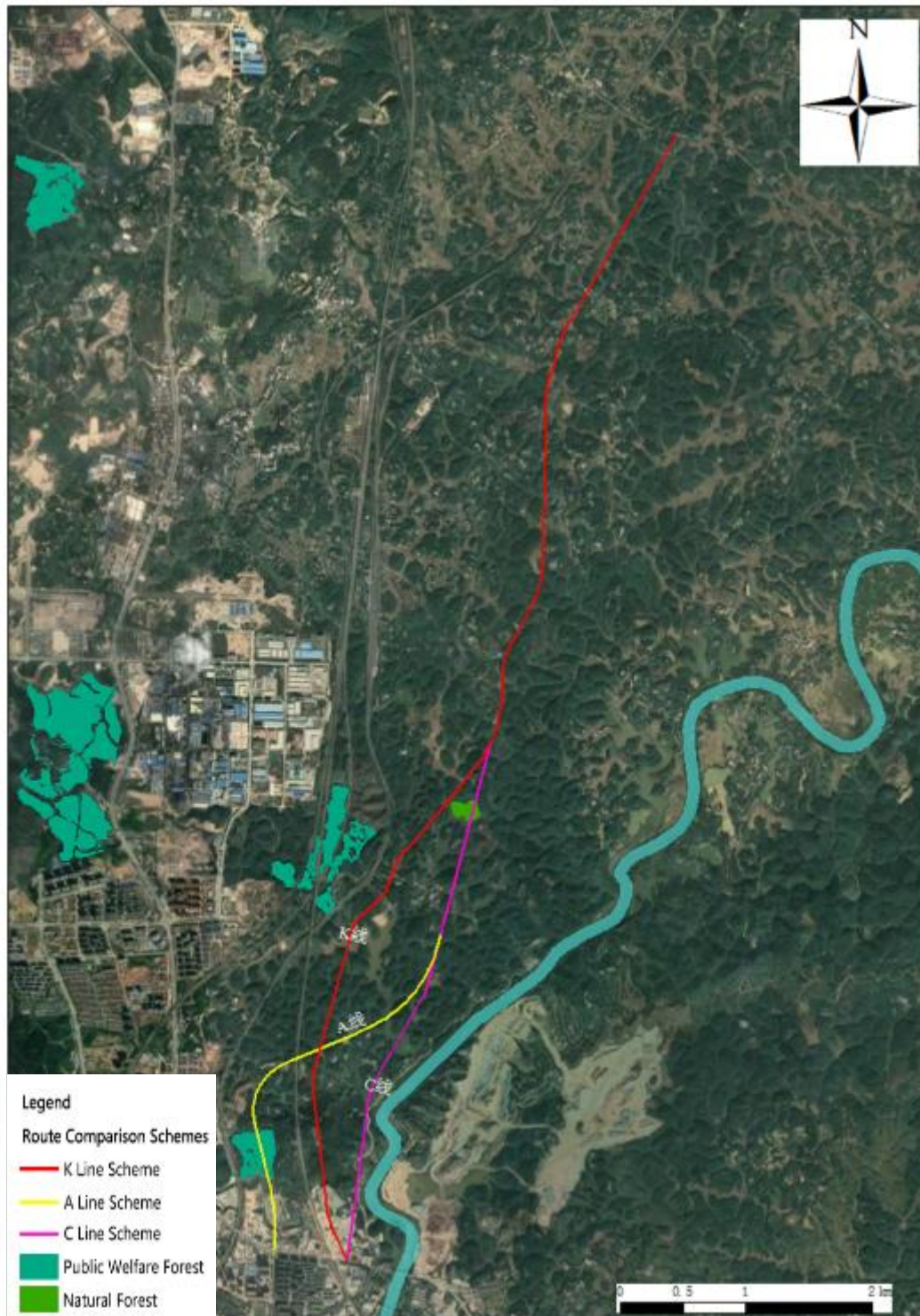


Figure V-2: Entrance Trunk Road Route Comparison

(i)Engineering Factors: A comparison of the engineering factors for the route alternatives is shown in the figure below. Route A has a longer length and higher cost, and addressing the issue of passing underneath the Qin Port Second Additional Railway Line is challenging. Although Route C has a relatively lower project cost, its construction and land acquisition are constrained by the planning of the Pinglu Canal, making project implementation

comparatively difficult. Route K offers higher land use efficiency, and the disadvantage of relatively large earthworks for cut and fill can be mitigated by conducting overall site leveling in advance. Therefore, considering the engineering factors comprehensively, Route K is recommended.

(ii)Environmental Factors: A comparison of the environmental factors for the route alternatives is shown in the table below. Both Route A and Route C pass through natural forests and public welfare forests, encroaching on forest resources. Furthermore, Route C is in close proximity (only 17m) to the Qin River, meaning both construction and operation would have a significant impact on the Qin River's water environment. Regarding noise impact, the assessment areas for Route A and Route C encompass a relatively higher number of residential houses. In terms of housing demolition, Route A affects a relatively larger number. For land occupation, Route C requires less area. Considering the ecological environment sensitive areas and noise impact comprehensively, Route K is recommended for this project.

168. To sum up, this project chooses Route K as the recommended alternative.

Table V-3: Comparison of Engineering Factors for the Entrance Trunk Road Alternatives

Alternative	Major scale			Advantages	Disadvantages
	Route length	Floor space	Project cost		
Route K	9.754	663.99 acres	Higher	The alignment is planned to follow the minimum setback distance along the proposed Qin Port Second Additional Railway Line, reducing the land area between the railway and the road and increasing land use efficiency.	The route passes through several existing mountains, resulting in significant longitudinal grade changes, large earthworks volumes for cut and fill, relatively high slopes, and extensive slope protection areas.
Route A	10.035	683.33 acres	Higher	As the initial design route, preliminary surveys of the land along the route have been conducted, making the land acquisition conditions relatively mature.	The Route A intersects with the Qin Port Second Additional Railway Line at one location, requiring the construction of an underpass railway tunnel, which involves complex preliminary procedures and construction techniques.
Route C	9.486	645.94 acres	Lower	Features higher road design standards, providing more comfortable and smoother traffic flow. The total route length is shorter, and the earthworks volume is relatively less.	The route is located close to the Pinglu Canal. Its finalization depends on the confirmation of the Pinglu Canal project site, meaning the road construction is constrained by the canal's planning.

Table V-4 Comparison of Environmental Factors of the Entrance Trunk Road Alternatives

Compare items		Route K	Route A	Route C	Compare the results
Ecological environment	Environmentally sensitive areas	It does not involve ecological redlines and does not occupy basic farmland.	It does not involve ecological redlines, does not occupy basic farmland, occupies about 5912 m ² of natural forests, and occupies 11271 m ² of public welfare forests.	It does not involve ecological redlines, does not occupy basic farmland, and occupies about 5912m ² of natural forests.	Route K is excellent
	Land area (acres)	663.99	683.33	645.94	Route C is excellent
	High-fill and deep-dug sections	not	not	not	Comparable
Water environment		Qinjiang, the nearest distance is about 370m.	Qinjiang, the nearest distance is about 430m.	Qinjiang, the nearest distance is about 17m.	Route A is excellent
Noise impact		Outside the area of land, there are about 179 households within the evaluation range of 200m of the road.	Outside the area of land, there are about 193 households within the evaluation range of 200m of the road.	Outside the area of land, there are about 189 households within the evaluation range of 200m of the road.	Route K is excellent
House demolition		7 households were involved in the demolition	8 households were involved in the demolition	7 households were involved in the demolition	Route K and Route C are better

D. Pavement Material Selection Comparison

Table V-5 Asphalt Concrete Pavement

Advantages		Disadvantages
1	Smooth surface, low noise, minimal dust, and harmonizes with surrounding environment.	Prominent issues with moisture susceptibility, high-temperature stability, and fatigue resistance.
2	High adaptability to roadbed deformation.	Short lifespan.
3	High driving comfort, easy construction, and quick maintenance.	Susceptible to significant asphalt price fluctuations and high cost.

Table V-6 Cement Concrete Pavement

Advantages		Disadvantages
1	High strength, high stiffness, long service life, good structural bearing capacity and durability, good thermal stability.	Poor ability to adapt to subgrade deformation, many joints, affect flatness, poor driving comfort.
2	It is not susceptible to water while ensuring the quality of joints and substrates, and is suitable for rainy and humid areas.	It is difficult to repair after destruction.
3	Low cost, bright color, good reflectivity, good driving at night, make full use of local building materials.	The construction period is long, the opening of traffic is late, and it is difficult to reconstruct and maintain the old road.

169. The characteristics of the two kinds of pavement structure are as follows, the cement concrete pavement has the characteristics of abrasion resistance, strong deformation resistance, long service life, low maintenance cost, low engineering cost, etc., and its disadvantage is that there are many joints, driving vibration is large, noise is high; Asphalt concrete pavement has the characteristics of short construction period, comfortable driving, low driving noise, simple maintenance, good landscape effect, etc., and its disadvantages are easy to deform, poor abrasion resistance, short service life, and high engineering cost.

170. The construction technology of cement pavement and asphalt pavement structure in China is very mature, and the supply of building materials is relatively sufficient. With the continuous development of cities, the requirements for road quality and landscape are getting higher and higher. Combined with the actual consideration of this project, this project recommends an asphalt concrete pavement alternative with the advantages of comfortable driving, low driving noise, simple maintenance and good landscape effect.

E. Refrigerant comparison

171. Sub-project 1 will use coolant for refrigeration. The coolant suitable for sub-project 1 is a medium temperature coolant (condensation pressure less than 2MPa and evaporation temperature greater than -60°C). Commonly used medium-temperature refrigerants include R717, R22, etc., and the condensation pressure of carbon dioxide is high, which is suitable for the low

temperature part of the cascade refrigeration unit or the low temperature device below -70 °C. The coolants that may be used in this project include R22 (a coolant widely used in China in the past), R717, R717 + CO₂ (this project proposal).

Table V-7: Comparative analysis of refrigerant selection

Name	R717	R22	R717+CO₂(this project proposal)
Chemical Formula	NH ₃	CHF ₂ Cl	NH ₃ +CO ₂
GWP	0	1700	1
ODP	0	0.055	0, Non-noozone-depleting substances
Comparison	Leaks can be hazardous; not recommended.	According to the Montreal Protocol, the use of R22 will be banned in developed countries from 2020 and in developing countries from 2030. Therefore it is not recommended.	Causes no ozone depletion and is an environmentally friendly refrigerant. NH ₃ has a high energy efficiency ratio, and cascading with CO ₂ can significantly reduce the ammonia charge, thereby lowering the associated hazards. Therefore recommended.

172. Based on the analysis in the table above, the refrigerant selected for sub-project 1 is more advantageous than the other options.

VI. Environmental and Social Baseline

A. Geographic Location and Administrative Division

173. This project will be constructed in the Qinbei District of Qinzhou City, Guangxi Zhuang Autonomous Region, China.

174. Qinzhou City is located in the southern part of Guangxi, on the northern shore of Beibu Gulf. It is a transportation hub for sea and land in the Beibu Gulf Economic Zone of Guangxi and a key access point for the southwestern region to the sea. Qinzhou is also a frontier city of the China-ASEAN Free Trade Area.

175. Qinbei District is under the jurisdiction of Qinzhou City, situated in the southern part of Guangxi, along the coastline of Beibu Gulf, in the northern part of Qinzhou City. The district has a favorable geographical location, serving as the northern gateway to Qinzhou and a key area for the southwestern region's access to the sea. Qinbei District governs 11 towns: Bancheng, Xintang, Changtan, Xiaodong, Dadong, Nameng, Dasi, Guitai, Dazhi, Pingji, and Qingtang, as well as 3 sub-districts: Changtian, Zicai, and Hongting, covering a total area of 2,217 square kilometers.

176. The project is located in Dadong Town and Changtian Sub-district of Qinbei District. Dadong Town is situated in the central part of Qinzhou City, 13 kilometers from the city center, 30 kilometers from Qinzhou Port, and 80 kilometers from the provincial capital Nanning. It is an important traffic artery connecting Beihai, Hepu, Qinzhou, Fangchenggang, Lingshan, and Pubei counties and the provincial capital Nanning. Dadong Town has a total area of 127.87 square kilometers and includes 2 communities and 9 administrative villages: Dadong Community, Jiangbiao Community, Dadong Village, Pingshan Village, Liangtian Village, Mijia Village, Datang Village, Gebiao Village, Dapian Village, Pingliao Village, and Hengling Village, covering 84 natural villages. Changtian Sub-district is located in the northern part of Qinzhou City, with a total area of 34.01 square kilometers. It governs 3 communities: Chengbei Community, Huangma Community, and Dajing Community.

177. The geographical location of the project is shown in Figure VI 1: Project Location Map.

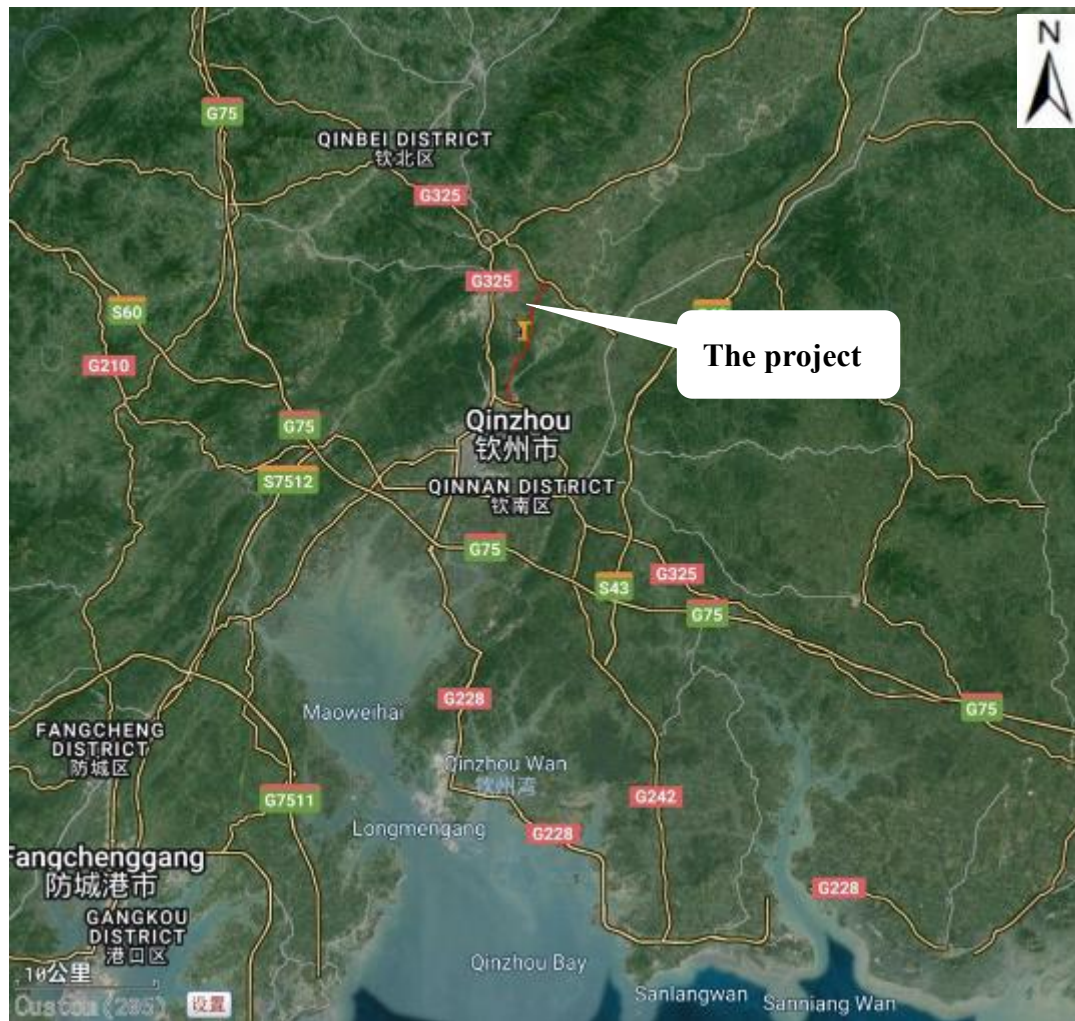


Figure VI-1: Project Location Map

B. Topography and Geomorphology

178. Qinzhou City is a hilly region with varying terrain. The landform types from north to south are: mountains, hills, plateaus, and plains, forming a regular distribution.

179. The majority of Qinbei District is hilly terrain, with the land sloping from the northwest to the southeast. The highest peak is Dulong Mountain, with an elevation of 994.6 meters.

180. The project is located in Qinbei District, where the landform is characterized by low, gentle hills. The general terrain is higher in the north and lower in the south, with slopes mostly between 15 and 25 degrees, although local variations in topography exist. The logistics and production facilities (Sub-project 1) and intermodal freight yard (Sub-project 2) are situated to the east of Huangma Station in Qinbei District. The terrain is relatively flat, with elevations ranging from 20 to 40 meters. The southeastern part of the area has some regions with elevations exceeding 30 meters, while other areas are generally between 20 and 30 meters. The access road to the park (Sub-project 3) is a

linear project with a length of 9.75 kilometers, beginning at the S313 Provincial Road in Dadong Town and connecting to the G325 National Road in Qinbei District. The elevation along the route ranges from 10 to 50 meters, with a small hill near K9+000 having an elevation of 50 meters. The rest of the area generally has an elevation of about 20 meters. The vegetation in the region is well-developed, with eucalyptus, pine trees, mixed woods, and weeds covering the slopes, while the valleys are mainly cultivated farmland and ponds.

C. Soil

181. The parent rocks and materials forming the soils in Qinzhou City primarily include seven types: sand-shale, granite, sandstone, purple rock series, shallow sea sediments, Quaternary red clay, and alluvial deposits. Additionally, there are shale, siltstone, grey limestone, and other materials. The diversity of parent materials has led to the formation of a wide variety of soil types. The main parent rocks are sand-shale and granite, which are distributed in alternating bands. The terrain is flat, and most areas have been cultivated into agricultural soils. The general distribution pattern is as follows, from paddy fields to hilly areas: Paddy soils derived from sand-shale and granite parent materials — Submergic paddy soils — Cultivated Latosols (Red Earths) formed from sand-shale and granite — Latosols (Red Earths) derived from sand-shale and granite (typically forest soils). There are numerous waterlogged fields present in the valleys.

182. The project area consists mostly of original landforms, with natural vegetation, farmland, and residential buildings. There are no industrial enterprises or suspected contaminated soil sites.

D. Climate

183. Qinzhou City has a tropical monsoon climate of the southern subtropical zone, with characteristics of a marine monsoon climate transitioning from subtropical to tropical. The region has abundant heat and long sunshine hours, with an average annual sunshine duration of approximately 1,800 hours and an average annual temperature of 23°C. January is the coldest month, with an average temperature between 13°C and 14°C, and the extreme minimum temperature is 5°C. The frost-free period lasts over 350 days. July is the hottest month, with an average temperature between 28°C and 29°C, and the extreme maximum temperature is 36.8°C. The prevailing wind direction is from the north, with a frequency of 16.5%. The average wind speed is 2.2 m/s, with a maximum wind speed of 21.7 m/s.

184. Qinzhou, being near the ocean, is frequently affected by tropical storms during the summer and autumn. The city receives abundant rainfall, with an average annual precipitation of 2,252.2 mm. Most of the rainfall occurs during the flood season from April to September, which typically accounts for more than 80% of the total annual precipitation. The annual rainfall varies significantly, with a variation coefficient of about 0.2. The difference between the maximum

and minimum rainfall can exceed 1,000 mm. In 1961, the rainfall at Lingshan Lingdong Reservoir was 2,434.3 mm, while in 1989, it was only 866.2 mm, a difference of 1,568.1 mm.

185. The maximum water evaporation occurs in July, and the minimum occurs in February. The average annual water surface evaporation in Qinbei and Qinnan Districts is 860.2 mm, with Lingshan County at 875.9 mm, and Pubei County at 848.0 mm. The average evaporation on land is 870.0 mm.

E. Geological Structure and Earthquakes

186. Geologically, Qinzhou lies on the southern wing of the wide-scale Pingnan syncline, with earthquake risks influenced by the Pingshi fault zone and the Lingshan seismic belt. The maximum seismic intensity from these two belts does not exceed 3 degrees, and according to China's seismic intensity zoning map, the Qinzhou area falls into a 6-degree zone, indicating a stable region for construction.

187. Based on the topography, landform formation, and lithological characteristics, the project area is divided into three engineering geological units.

188. Hilly Area: This area is found in the western, northern, and eastern suburban areas of the planned town, with exposed base layers of Silurian rocks such as sandstone, mudstone, and shale. The rocks are not very hard, but they provide good bearing capacity and stable strata, with most of the bedrock exposed on the surface. The groundwater is deep and suitable for building.

189. Secondary Terrace, Low Alluvial-Diluvial Area: This area is located along the northern axis of the old town district. The surface is mainly covered by Quaternary accumulated materials, including clay, sandy clay, and light clay, with a bearing capacity of 15 tons per square meter or more. The underlying bedrock is buried 3 to 8 meters deep, with the weathered layer thickness of 3 to 5 meters and a bearing capacity of 22.35 tons per square meter. This area is suitable for the foundations of ordinary buildings.

190. The site mainly consists of fill soil, mud, Quaternary clastic and alluvial clay, gravel soil, and Paleogene mudstone and sandstone, with special attention to swelling and shrinking clays, and mudstone as special types of soil.

F. Water Resources

191. Qinzhou's total underground water resources are approximately 1.608 billion cubic meters, with 482 million cubic meters available for use, mainly for municipal water supply. However, surface water resources are abundant, with an annual runoff of 6.48 billion cubic meters from rivers, accounting for 2.68% of the total runoff in the region. The average annual runoff depth is 1,091

millimeters.

192. Surface water resources are distributed unevenly throughout the year, with frequent destructive floods during the rainy season (April to September) and droughts during the dry season (October to March). The rainy season (May to September) is characterized by frequent heavy rains, which contribute approximately 80% of the annual rainfall.

193. The annual runoff distribution is uneven, with 83% of the flow in the rainy season for the Qinjiang River, 77.2% for the Maolingjiang River, and 87.9% for the Dafengjiang River, while the dry season sees 17% of the annual flow, leading to a 20% reduction in water resources.

a. Surface Water

194. There are 32 large and small rivers in Qinzhou, with a total length of 2794m, a river network density of 6km/km², and 3 large rivers with an area of more than 1800km², namely Maoling River, Qinjiang River and Dafeng River. The three rivers all flow from the northeast to the southwest, roughly parallel to the territory, flow southward into Qinzhou Bay, belong to the southern coast of Guizhou and flow into the seawater system, of which the Qinjiang River runs through the urban area of Qinzhou, is the main water source and sewage body in the urban area.

195. The nearest surface water body of the project is the Qinjiang River, and the project does not cross the Qinjiang River, and the closest distance from the Qinjiang River is 245m.

196. The Qinjiang River is the second largest river in Qinzhou. The total length of the Qinjiang River is 179 km, and the basin area is 2457 km². Among them, the length of the river in Qinzhou is 90.4km, and the basin area is 851km². The slope of the main stream of the river is 0.31‰, the average elevation of the basin is 90.8m, the total drop is 107.7m, and the bending coefficient of the river channel is 1.94. The Qinjiang River has abundant water, with an average annual flow of 64.37 m³/s, an average annual runoff of 2.03 billion m³, and an annual runoff depth of 900 mm. Due to the influence of uneven precipitation changes, the annual variation of the flow is large, in the flood season (April ~ September), its flow accounts for 83% of the annual flow, of which the flow in August is the largest, accounting for 22% of the annual flow; The flow in the dry season (October~March) accounts for only 17% of the annual traffic, the minimum flow occurs in December~February, and the three-month flow accounts for only 6% of the annual traffic. The average annual sediment content of the river is 0.22kg/m³, the annual sediment transport is 465,000 t, and the erosion modulus is 199t/km². The river section in Qinzhou City belongs to the middle and lower reaches of the Qinjiang River. The riverbed is sandy and subject to significant scour and deposition changes. The stretch near Qinzhou urban area is a tidal reach, with tidal influence extending upstream to the Qingnian Sluice.

b. Groundwater

197. According to the stratigraphic lithology and rock formations, the occurrence conditions of groundwater and the characteristics of groundwater aquifer media, the types of groundwater in the demonstration area are divided into two types: Quaternary loose rock pore water and clastic rock bedrock fracture water.

198. The types of groundwater in the areas through which the route passes are relatively complex, and the infiltration of atmospheric precipitation and the lateral recharge of rivers are the main recharge methods of groundwater, and the main discharge methods are groundwater runoff, river water discharge and artificial exploitation. According to the lithology, occurrence conditions, and hydraulic properties and characteristics of the strata, the groundwater along the line can be divided into three categories: loose rock pore water, clastic rock fracture water, and magmatic rock weathering fracture water.

199. Loose rock pore water. It mainly occurs in the pores of Quaternary gravel, gravel and silt layer in the middle of the river plain and terrace, mainly diving, mainly receiving atmospheric rainfall recharge, but also accepting river lateral recharge, the excretion mode is mainly evaporation, artificial pumping, local hydraulic contact with the underlying bedrock layer, the overall water quality is good, and the salinity is good <1.0g/L.

200. Clastic rock fissure water. It mainly occurs in the Silurian and Permian ~ Cretaceous sandstone, conglomerate, mudstone, shale and other strata, and its aquifer is unbalanced, the spring water flow is very small, and the water content is very weak and scarce. The drinking water for people and livestock in the villages in the survey area has been manually excavated shallow wells and deep wells have been drilled. The depth of the excavation civil wells is less than 10m, the diameter of the well is about less than 1m, the machine well is 25~50m, the bottom of the well is to the full regolith or strong regolith of the underlying rock layer, the wellhead is generally closed, and the water is taken by hand cranking well or submersible pump, and the mining volume is 5~30m³/h.

201. Magmatic rock-like weathering fissure water. It is mainly distributed in intrusive granite strata, with severe weathering, strong fracture water in fracture development, and its burial depth is not large, and groundwater is exposed in the form of fracture springs, and the amount of water is small ~ general.

G. Mineral Resources

202. Qinzhou City has discovered 46 kinds of minerals, a total of 176 deposits and ore sites, 46 of which are above the small scale, including one large gypsum deposit (Qinling gypsum mine), one medium-sized lead-zinc deposit and one rare earth deposit, 130 coal, ceramic earth, oil shale, manganese, iron, titanium, phosphorus, kaolin, limestone for cement, shale for

cement ingredients, limestone for building materials, granite for building materials, etc. The main minerals that have been developed and utilized are lead-zinc ore, coal mine, manganese ore (manganese oxide), ceramic soil, gypsum ore, ilmenite ore, limestone, granite and construction sand.

203. According to the information on overlying mineral resources provided by the Department of Natural Resources of Guangxi Zhuang Autonomous Region, the project has not overburdened mineral resources.

H. Social Baseline

a. Regional Socio-economic Overview

204. **Guangxi Zhuang Autonomous Region** is located in southern China, with a land area of approximately 237,600 square kilometers. In 2024, its regional Gross Domestic Product (GDP) reached RMB 2,864.94 billion, representing a year-on-year increase of 4.2% calculated at comparable prices. The per capita GDP, based on the resident population, was RMB 57,071, an increase of 4.5% over the previous year. The resident population at the end of 2024 was 50.13 million, a decrease of 140,000 from the end of the previous year. The urban population was 28.77 million, accounting for 57.39% of the resident population. The per capita disposable income of residents was RMB 31,125, a year-on-year increase of 5.5%. The per capita disposable income of urban residents was RMB 43,044 (up 4.3%), and that of rural residents was RMB 19,954 (up 7.0%).

205. **Qinzhou City** is located in the coastal southern part of Guangxi, on the northern shore of the Beibu Gulf. It covers a total area of 10,897 square kilometers and administers 2 municipal districts and 2 counties. As a crucial node city in the China-ASEAN Free Trade Area and the "Belt and Road" Southbound Corridor, Qinzhou boasts significant geographical advantages and a developed port economy. In 2024, Qinzhou's GDP reached RMB 187.896 billion, a year-on-year increase of 5.2%. The value-added of the primary industry was RMB 39.850 billion, the secondary industry RMB 64.968 billion, and the tertiary industry RMB 83.078 billion. The industrial structure was 21.2:34.6:44.2. The per capita GDP was RMB 56,522, an increase of 5.0% year-on-year. At the end of 2024, the registered population of Qinzhou City was 4.2133 million, and the resident population was 3.3323 million, with an urbanization rate of 45.63%. The per capita disposable income of residents was RMB 30,416 (RMB 44,576 for urban residents and RMB 20,605 for rural residents). The economy maintained steady overall growth, with continuous increases in urban and rural residents' incomes.

206. **Qinbei District** is located in the northwest of Qinzhou City and serves as the core area for Qinzhou's integrated land-sea development. It covers a total area of 2,240.17 square kilometers and administers 3 sub-districts and 11 towns. In 2024, the GDP of Qinbei District reached RMB 34.594 billion, a year-on-year increase of 5.9% calculated at comparable prices. The value-added of the primary industry was RMB 9.002 billion (up 4.1%), the secondary industry

RMB 7.796 billion (up 9.0%), and the tertiary industry RMB 17.796 billion (up 5.4%). The shares of the primary, secondary, and tertiary industries in the regional GDP were 26.02%, 22.54%, and 51.44%, respectively. The per capita GDP, based on the resident population, was RMB 47,652, an increase of 5.6% over the previous year. At the end of 2024, the registered population was 883,000, comprising an urban population of 221,400 and a rural population of 661,600. In 2024, the per capita disposable income of urban residents was RMB 44,136, and that of rural residents was RMB 20,646. The district's leading industries are primarily manufacturing, logistics and warehousing, and agricultural products processing, featuring a stable economic structure and sound coordinated urban-rural development.

207. Based on the 2024 Statistical Bulletins on National Economic and Social Development and official data from GZAR, Qinzhou City, and Qinbei District, the 2024 socio-economic baseline data for the project area are detailed in Table below.

Table VII- 1 Socio-economic Baseline Data for the Project Area (2024)

Indicator	Project Area (City/District)		
	GZAR	Qinzhou City	Qinbei District
Total Registered Population (year-end, 10,000 persons)	5748.00	421.33	88.30
Total Resident Population (year-end, 10,000 persons)	5013.00	333.23	72.78
Agricultural Population (10,000 persons)	2136.00	180.00	66.16
Urban Population (10,000 persons)	2877.00	152.06	22.14
Male Population (10,000 persons)	2589.00	182.00	49.31
Female Population (10,000 persons)	2424.00	151.00	38.99
Ethnic Minority Population (10,000 persons)	1895.00	47.7	34.19
Gross Domestic Product (GDP) (RMB 100 million)	28649.40	1878.96	345.94
Primary Industry (RMB 100 million)	4751.54	398.50	90.02
Secondary Industry (RMB 100 million)	9300.99	649.68	77.96
Tertiary Industry (RMB 100 million)	14596.87	830.78	177.96
Per Capita GDP (yuan)	57071	56522	47652
New Employment (10,000 persons)	40.55	1.90	0.30
Per Capita Disposable Income of Residents (yuan)	31125	30416	31579
Per Capita Disposable Income of Urban Residents (yuan)	43044	44576	44136
Per Capita Disposable Income of Rural Residents (yuan)	19954	20605	20646
Population Receiving Minimum Living Guarantee Subsistence (10,000 persons)	282.68	16.68	3.53
Extremely Impoverished Individuals (10,000 persons)	27.29	2.31	0.45

b. Socio-economic Profile of the Project Impact Area

208. The project is located within Dadong Town and Changtian Sub-district, Qinbei District, Qinzhou City, affecting a total of five villages/communities: Jiangbiao Community, Hengling Village, Chengbei Community, Huangma Community, and Longwan Community. The total resident population of Changtian Sub-district and Dadong Town is approximately 118,100. Migrant populations are primarily concentrated around industrial parks and transport hubs, with a significant number of seasonal workers. The project impact area benefits from convenient transportation and superior locational conditions. Its socio-economic base is dominated by industry and mining, transportation, logistics services, and traditional agriculture. The regional economic structure shows a trend towards diversification, features a high degree of urban-rural integration, and has overall well-developed public services and infrastructure.

209. **Changtian Sub-district** is located in the northern part of Qinzhou's urban area, with an administrative area of 34.01 square kilometers. It is situated 1 km from downtown Qinzhou and serves as the seat of the Qinbei District People's Government. It administers four community committees: Chengbei, Dajing, Huangma, and Longwan. The resident population is approximately 80,000. The local economy is primarily based on manufacturing, services, and commerce. The area is characterized by concentrated residential zones and a relatively high level of public services.

(1) **Chengbei Community**: Located in the southern part of Changtian Sub-district, Qinbei District, it covers an area of approximately 12.23 square kilometers and has a resident population of about 32,000 people, with no ethnic minority population. The community primarily administers two natural villages, Shiji Village and Luowu New Village, and manages over ten residential complexes, including Bali Huating, Bali Zunpin, and Hailunbao Dongfang. Its development focuses on urban residence, commercial retail, and services, providing convenient living conditions for residents.

(2) **Huangma Community**: Located in the northern part of Changtian Sub-district, it covers a total area of approximately 18.94 square kilometers. Major transport routes, including Provincial Highway S-325, the Nanfang Railway, the Nanqin High-Speed Railway, and the Liqin Railway, pass through the community, giving it a significant transportation advantage. The community administers 4 natural villages and 15 resident groups. It has a total registered population of 2,150 households (6,448 individuals), with no ethnic minority population. Infrastructure within its jurisdiction is well-developed.

(3) **Longwan Community**: Located in the southeastern part of Changtian Sub-district, Qinbei District, it covers a total area of approximately 10.23 square kilometers. It administers 4 natural villages (Niutouwan Village, Shuijindong Village, Maqiong Village, Qingshuiwo Village) and 19 residential complexes. It has a total registered population of 3,164 households (10,622 individuals), with no ethnic minority population. The community's economy is primarily based on

residence, commerce, and small-scale services, supported by well-developed infrastructure.

210. **Dadong Town** is located in the northeast of Qinbei District, covering a total area of approximately 127.87 square kilometers. It administers 2 communities and 9 administrative villages, with a resident population of approximately 38,000. The town enjoys convenient transportation, with National Highway G325 and railway freight lines passing through its territory. It is an important industrial and red brick production base for Qinbei District.

(1) Jiangbiao Community: Situated southeast of Dadong Town, it administers 5 natural villages and villager groups. It has a total of 891 households and a population of 4,071 people. There is no ethnic minority population. Its characteristic industries include high-quality rice, chicken farming, pig farming, peanuts, and corn.

(2) Hengling Village: Located in the northwest of Qinzhou City, 4 kilometers from the seat of Dadong Town Government, Jiuda Highway runs through the village, providing good transport convenience and a foundation for secondary and tertiary industry circulation. It administers 5 natural villages, with 1,041 households and a total of 4,811 people. The village area is 11 square kilometers, featuring 6370 mu (approximately 425 hectares) of forest area and 3943 mu (approximately 263 hectares) of cultivated land (including 3400 mu of paddy field and 6300 mu of woodland). The village has rich vegetation with a forest coverage rate of 70%. Main tree species include pine and eucalyptus. Primary crops are corn, rice, and vegetables. Villagers are mainly engaged in agriculture, services, and migrant work.

211. Land use in the project area is primarily agricultural land, forest land, and construction land. Main crops include rice, corn, peanuts, and commercial vegetables. Forestry is dominated by eucalyptus and pine trees. In recent years, industrial and logistics parks have been gradually established in the region, and the tertiary sector (logistics, catering, commerce, and services) has developed rapidly. Multiple industrial zones, residential areas, and public infrastructure such as educational and medical facilities are distributed throughout Changtian Sub-district and Dadong Town, indicating a diversifying economic structure.

212. The primary sources of income for farmers in the project area include agricultural cultivation, migrant work, and local non-agricultural industries such as construction, transportation, and services. The proportion of the employed population working in the secondary and tertiary industries has increased year by year. According to surveys, the average annual household income ranges from approximately RMB 18,000 to 40,000. With the development of the Qinzhou port and related industrial parks, part of the labor force is shifting towards industrial parks, warehousing, and the construction sector. The economic structure is stabilizing, and employment channels are showing a trend towards diversification.

213. The project area enjoys convenient transportation, with National

Highway G325, Provincial Highway S313, and the dedicated rail line of Qinzhou East Station passing through it. The road network is well-developed, ensuring smooth connections between villages/towns and the urban district. Water supply, power supply, telecommunications, and medical service facilities are complete. All villages have achieved full coverage of tap water, electricity, and broadband. Educational resources are reasonably distributed, with primary schools in every village, and middle schools and health centers located within Changtian Sub-district and Dadong Town.

C. Poverty and low-income situation

214. Through targeted poverty alleviation initiatives and a decisive poverty eradication campaign, Qinzhou City achieved the complete alleviation of poverty for 68,337 individuals registered as impoverished by 2020, with 64 impoverished villages removed from the list. Absolute poverty has been historically eradicated. However, this does not mean that poverty issues no longer exist, as poverty may still appear in forms such as relative poverty or low-income populations. In this context, "impoverished population" refers to low-income individuals who transitioned from poverty after 2020.

215. According to the 2024 National Economic and Social Statistical Bulletin of Qinbei District, a total of 2,342 people in Qinbei District received urban subsistence allowances, and 33,000 people received rural subsistence allowances in 2024. Interviews with officials from the Qinbei District Civil Affairs Bureau, Changtian Subdistrict Office, and Datong Town People's Government, as well as the latest statistical data from civil affairs departments, reveal that there are 278 low-income households (subsistence allowance households) comprising 693 people in the project's direct impact area (Changtian Subdistrict and Datong Town). This represents approximately 0.59% of the total population of 118,100 people in the project area.

216. Based on literature research and field survey findings, the causes of poverty or low income in the project area are analyzed as follows:

(1) **Influence of historical and geographical factors:** Limited resources and a low level of local economic development. The modern cost of living in rural areas steadily increases, with higher expenses for water, electricity, and gas.

(2) **Difficulty in employment:** Low-income individuals are generally older, have a lower level of education, lack job skills, and struggle to adapt to the demands of modern life. Their low motivation to participate in retraining further increases their difficulty in finding employment, as they often only qualify for physically demanding jobs and face frequent "unemployment," resulting in persistent low-income status.

(3) **Poverty due to illness or disability:** Many low-income individuals have lost the ability to work due to health issues, relying on government support.

Some have fallen into debt due to illness, leading to financial hardship.

217. The main support measures for impoverished/low-income populations in Qinbei District are as follows:

(1) **Subsidized small loans for poverty alleviation:** Small loan subsidies are available for registered impoverished populations in Qinbei District (including those at risk of returning to poverty). This policy supports those who manage primary family assets and production activities, typically between 18 and 65 years old. Borrowers must have a clean legal and credit record. Loan amounts generally do not exceed RMB 50,000, with a term of up to three years, exempt from guarantees or collateral, and offered at a market interest rate with full interest subsidy and district-level risk compensation.

(2) **Social assistance measures:** According to the joint notice issued by the Guangxi Department of Civil Affairs and the Department of Finance, "Regarding Raising the Subsidy Levels for Urban and Rural Subsistence Allowances and the Standards for Two Types of Disability Subsidies Across the Region," effective January 1, 2025, the average urban subsistence allowance shall be no less than 410 CNY per person per month, and the average rural subsistence allowance shall be no less than 250 CNY per person per month. The standard for the two types of disability subsidies will be increased from the current 80 CNY per person per month to 90 CNY per person per month. These measures support basic living needs, social stability, and poverty reduction. Financial support, work-study jobs, education loans, and fee reductions ease the educational burden for children from low-income families, ensuring their access to education.

(3) **Healthcare support:** Medical institutions provide "treatment-before-payment" and "one-stop" billing services. Family doctor services are offered, with a 100% registration rate for households previously registered as impoverished. This supports improved health and reduces poverty due to illness.

(4) **Data management and dynamic adjustment:** As a provincial pioneer, a "Dynamic Management Method for Registered Poverty-Alleviation Targets" was implemented to collect and update data on impoverished households and villages, ensuring precise poverty targeting with a dynamic management approach.

These policies aim to support Qinbei District's low-income groups through financial, educational, and social services, raising their standard of living and development potential. Through these measures, Qinbei District has achieved significant success in its poverty alleviation efforts.

Table VI-2 Poverty/Low-Income Population and Subsidy Standards in the Project Area

Subproject		Unit	Rural	Urban	Remarks
Qinbei District	Subsistence Allowance Standard	yuan/person/month	Not less than 250	Not less than 410	
	Disability Assistance	yuan/person/month	90		

Data source: Qinbei District Government Website

d. Population of Women in the Project Area

218. According to the 2024 Statistical Bulletin on National Economic and Social Development for the project area, the registered population of Qinbei District was 883,000 at the end of 2024. The resident population of Qinbei District at the end of 2024 was 727,800, of which 338,400 were female, accounting for 46.5% of the resident population. Based on grassroots population statistics provided by the township/subdistrict authorities, the resident population in the two affected townships/subdistricts within the project impact area is 118,100, including 53,100 females, accounting for 45.1% of the total population. The gender structure is relatively balanced.

Table VI-3 Overview of the Female Population in the Project Area

Project Area	Registered Population	Permanent Population	Registered Population		
			Male	Female	Proportion of Women
Qinzhou City	421.33	333.23	182.28	150.95	45.30%
Qinbei District	88.30	72.78	38.94	33.84	46.50%
Changtian Street	3.79	8.00	4.48	3.52	44.00%
Dadong Town	2.00	3.81	2.02	1.79	47.00%

Data source: 2024 Qinzhou City and Qinbei District National Economy and Social Development Statistical Bulletin, as well as data from townships and subdistricts.

219. Qinbei District actively implements the "Qinbei District Women's Development Plan (2021-2030)", adheres to the basic national policy of gender equality, and continuously improves mechanisms for women's all-round development and protection. The plan focuses on five key areas: women's health, education, economic participation, political rights, and social security, to promote the achievement of gender equality and women's empowerment goals.

220. According to the final statistical monitoring and evaluation report of the "Qinbei District Women and Children Development Plan (2011-2020)" released by the Qinbei District Women's Federation, phased achievements were made in multiple areas of women's development over the past decade.

(i) In the health sector, the women's healthcare service system has been continuously improved. In 2020, the systematic management rate of pregnant and lying-in women reached 94.78%, and the screening rate for common female diseases reached 86.69%, both showing significant increases compared to ten years ago, effectively safeguarding women's health. In education, the gender ratio is basically balanced across all educational stages.

The proportion of female students in the senior high school stage is slightly higher than that of males. Female participation in vocational education and skills training reached 75%, indicating continuous optimization of the educational structure for women.

(ii) In terms of economy and employment, the scale of women's employment has steadily expanded, with the employment structure gradually shifting towards non-agricultural industries and modern services. The number of women employed in urban units in 2019 increased by 14,080 compared to 2011, and income levels continued to rise. Social security coverage expanded significantly. In 2020, the number of women covered by basic old-age insurance for urban workers and urban and rural residents reached 18,200 and 150,000 respectively, representing substantial growth compared to 2011.

(iii) The Qinbei District Women's Federation, in collaboration with multiple departments, promotes women's entrepreneurship and employment by providing skills training in agriculture, handicrafts, domestic services, etc., and offering small-guaranteed loans and diverse social support to help women in difficulty improve their lives and enhance their development capabilities. In grassroots governance, all village and community "Two Committees" have female members, and all chairs of grassroots women's federations have joined the "Two Committees" teams. Women's participation and voice in public affairs continue to increase.

221. Overall, women in the project area enjoy relatively equal development opportunities in education, employment, social security, and other aspects, and gender equality policies are effectively implemented. With subsequent project advancement, infrastructure improvements and increased job opportunities are expected to further broaden the avenues for women's participation in economic and social activities and enhance their economic empowerment and development momentum.

e. Due diligence on Ethnic Minority Population in the Project Area

222. As of 2024, the total population of GZAR is approximately 50.13 million, of which 18.95 million are ethnic minorities, accounting for 37.8%. GZAR is home to 12 indigenous ethnic groups: Han, Zhuang, Yao, Miao, Dong, Mulao, Maonan, Hui, Jing, Yi, Shui, and Gelao. The Zhuang, the largest minority in both GZAR and China, have deep historical roots and a rich cultural heritage. Based on this, the Chinese government established GZAR as a provincial-level autonomous region under the Constitution and the Law on Regional Ethnic Autonomy, with the Zhuang as the principal body exercising regional autonomy.

223. Qinzhou City has a total population of 4.2133 million, with an ethnic minority population of approximately 477,000, accounting for 11.3% of the total population. The Zhuang population accounts for 11% of the total population.

224. During the preparatory phase, the E&S consultants systematically

collected baseline data on the population composition, ethnic minority distribution, and cultural practices within the project area. Data sources included official publications such as the 2024 Qinbei District Statistical Yearbook, the National Economic and Social Development Bulletin, and information from the Qinbei District Ethnic and Religious Affairs Bureau.

225. From May 8 to 20, 2024, with the assistance of the PMO, PIU, the Qinbei District Ethnic and Religious Affairs Bureau, and officials from Changtian Sub-district, Dadong Town, and the five affected villages/communities, the E&S consultants conducted systematic social surveys. The surveys were carried out in the villages/communities within the directly affected areas of Changtian Sub-district and Dadong Town. The objectives were to confirm whether groups meeting the identification criteria of ESS3: EMs exist in the project area, assess the potential social impacts of project construction on them, and ensure the protection of equal rights for all ethnic groups throughout the project cycle. The survey employed a combination of key informant interviews, focus group discussions, and questionnaires. It focused on ethnic minority groups in the project area and included in-depth interviews, group discussions, and questionnaire surveys with a total of 34 Zhuang residents, officials from the five villages/communities, and cadres from the Qinbei District Ethnic and Religious Affairs Bureau as key informants.

(I) Distribution of Ethnic Minorities in the Project Affected Area

226. The scope of this project involves five villages/communities in Changtian Sub-district and Dadong Town, including Huangma Community, Longwan Community, Chengbei Community, Jiangbiao Community, and Hengling Village. These villages are located in the suburbs of Qinzhou City and have historically been Han communities. There are no compact EM communities in the project area. Only Hengling Village has approximately 60 EM residents, all of whom are Zhuang, accounting for 0.05% of the population in the project area. These households are scattered residents, primarily formed through intermarriage or migration.

(II) Analysis Based on ESS3 Indigenous Peoples Identification Criteria

1. Self-identification as members of a distinct indigenous cultural group and recognition of this identity by others; Based on field surveys and in-depth interviews conducted in the project area, the project's affected area covers 5 villages/communities in Changtian Sub-district and Dadong Town: Huangma Community, Longwan Community, Chengbei Community, Jiangbiao Village, and Hengling Village. These are located in the suburbs of Qinzhou City and have historically been Han Chinese communities. According to the Qinbei District Ethnic and Religious Affairs Bureau, there are no ethnic minority compact communities within the project area. Only Hengling Village has 60 ethnic minority residents (all Zhuang), accounting for 0.05% of the total population in the area. These are scattered residents who migrated primarily through marriage since approximately 1986, forming neither compact villages nor indigenous communities. Surveyed households generally reported no significant

differences from Han residents in production activities, language communication, marriage and funeral customs, or daily practices. Notably, the traditional Zhuang festival, Sanyuesan festival³, has evolved in GZAR into a local folk activity widely participated in by all ethnic groups, including the Han. Overall, Zhuang and Han residents exhibit a high degree of consistency in festivals, rituals, dietary habits, and other aspects. However, in accordance with the Constitution of the PRC and the country's system of regional ethnic autonomy, the Zhuang are explicitly recognized as one of China's ethnic minorities and as one of the 12 indigenous ethnic groups of the GZAR.

2. Collective attachment to geographically distinct habitats, ancestral territories or areas of seasonal use or occupation in the Project area and to the natural resources in these areas;

According to the survey, Zhuang households in the project area demonstrate production methods and living patterns highly similar to those of Han residents, with diversified income sources. Questionnaire data indicate that the per capita annual income of the surveyed resident sample is RMB 18,150, while that of Zhuang residents is RMB 17,800, showing no significant difference. In terms of income composition, migrant work and scattered employment constitute the primary source, accounting for 42.86%, supplemented by agricultural income at 38.66%. Similar to Han families, in scattered Zhuang households, men predominantly engage in migrant work, while women tend to undertake scattered employment near their residences, combining this with agricultural production and care for the elderly and children. The land to be acquired for this project consists entirely of contracted land long-term cultivated by local Han villagers under the household responsibility system, historically forming the agricultural land of Han villages. The 11 affected Zhuang residents in Hengling Village became members of contracting households through marriage or relocation; the cultivated land they use is jointly managed land acquired after joining these households, not ancestral land or traditional territory personally owned by them as indigenous minorities. Surveys and interviews reveal that neither Zhuang nor Han families rely on land resources as their sole livelihood source; both prefer to broaden income channels through employment in nearby factories or migrant work. Overall, residents in the project area do not exhibit high dependency on natural resources (including land, forests, and water areas) within specific habitats. No special resource use rights or dependency relationships based on minority identity were identified. According to the survey, among the 60 Zhuang individuals in the project area, 11 persons (0.3% of the project's affected population) will be impacted by land acquisition. As their agricultural income loss is less than 5%, the impact of land acquisition on them is very limited.

3. Customary cultural, economic, social or political institutions that are distinct or separate from those of the dominant society or culture; All residents in the

³ The Sanyuesan Festival (Third Day of the Third Lunar Month) is a traditional festival of the Zhuang people and one of the items listed on the National Intangible Cultural Heritage Inventory.

project area, regardless of ethnic composition, are subject to China's socioeconomic management and political participation mechanisms, maintaining a high degree of consistency with the mainstream social system. All political, economic, cultural, and educational systems within the project area strictly adhere to the national legal framework and policy system; no independent or separate institutional arrangements exist outside the mainstream system. In terms of political rights, social welfare, and public services, including but not limited to housing security, educational opportunities, healthcare, employment support, and elderly care, EM and Han residents enjoy completely equal policy treatment, reflecting the universality and consistency of rights protection. The only regional cultural distinction is reflected in holiday practices: pursuant to the Holiday Regulations for EMs in the GZAR, the Sanyuesan is designated as a traditional Zhuang festival, with the autonomous region government arranging a region-wide 2-to-3-day holiday. This holiday applies to all government agencies, enterprises, and social institutions within the region, not only safeguarding the rights of Zhuang and other minority groups to celebrate their traditional festivals but also serving as a platform for all ethnic groups to participate in and share cultural events, thereby further promoting ethnic unity and social harmony. This policy arrangement reflects both the state's respect for and protection of ethnic cultures and demonstrates sound practices in embracing and promoting cultural diversity.

4. A distinct language or dialect, often different from the official language or languages of the country or region in which they live. Although the Zhuang have their own language, it is not the sole language used for communication among them. Within GZAR, the Zhuang language itself can be divided into two major dialect areas, Northern and Southern, which further comprise approximately 20 sub-dialects. Differences among these dialects are primarily reflected in intonation and certain vocabulary items. In the survey sample, all Zhuang respondents were able to communicate fluently in Mandarin. Furthermore, due to the prevalence of migrant work experience among residents in the project area, the frequency of Mandarin usage in both work and daily interactions has been further reinforced. Overall, Zhuang residents in the project area predominantly use Mandarin in their work, education, and daily communication. While the Zhuang language persists as an ethnic language, its frequency and scope of use in actual communication have significantly declined.

227. To ensure the objectivity and reliability of the assessment basis, the above findings were discussed with the Qinbei District Ethnic and Religious Affairs Bureau and representatives from the relevant townships/sub-districts. The identification of ethnic minorities (ESS3) is summarized in the following table:

Table VI-4 Indigenous Peoples (ESS3) Identification Matrix

Identification Criteria	Yes	No	Findings
1. Self-identification as members of a distinct indigenous cultural group and recognition of this identity by others;	✓		This Criteria is met. The survey shows no compact ethnic minority communities in the project area; only 60 scattered Zhuang residents exist, accounting for approximately 0.05% of the total population. These

			are isolated individuals who migrated primarily through marriage. Zhuang residents demonstrate a high degree of integration with the local Han population in terms of language, marriage customs, production methods, and daily life, with no significant differences in production activities, festivals, or marriage and funeral rituals. However, according to Constitution and relevant laws, the Zhuang are legally recognized as an ethnic minority and one of Guangxi's indigenous groups; therefore, Zhuang residents in the project area legally possess minority status.
2. Collective attachment to geographically distinct habitats, ancestral territories or areas of seasonal use or occupation in the Project area and to the natural resources in these areas		✓	Surveys indicate that the five villages/communities involved in the project area have historically been Han compact communities. The current household-contracted farmland was obtained by local Han villagers under the national household responsibility system and does not constitute ancestral territory or traditional indigenous land for Zhuang residents. Since approximately 1986, some Zhuang residents have migrated primarily through marriage, becoming members of contracting households. The land they actually use is jointly managed land acquired after joining these households, not independently owned minority traditional territory. Zhuang and Han households exhibit highly similar production methods and income structures, relying primarily on migrant work and scattered employment, supplemented by agricultural income. Land is not the sole livelihood source; the economic structure has shifted from resource dependence to industry and employment dependence, with no special resource rights or dependency relationships based on ethnic identity. Only 11 of the 60 Zhuang individuals are affected by land acquisition, with agricultural income losses below 5%, resulting in very limited impact. In summary, residents in the project area do not exhibit institutionalized high dependency on natural resources within specific habitats, and no special resource use rights or dependency relationships based on minority identity were identified.
3. Customary cultural, economic, social or political institutions that are distinct or separate from those of the dominant society or culture		✓	No independent institutions separate from mainstream society exist. All ethnic residents in the project area are integrated into the unified national political, economic, and social management system, with no institutional arrangements independent of the mainstream system. In terms of public services and social welfare, including housing, education, healthcare, employment, and elderly care, minority and Han residents enjoy completely equal policy treatment. Guangxi's designation of the third day of the third lunar month as a regional holiday not only safeguards the rights of Zhuang and other ethnic minorities to celebrate their traditional festivals but also provides a platform for all ethnic groups to participate in folk activities, reflecting respect for and inclusion of ethnic cultures within the unified institutional framework.
4. A distinct language or dialect, often different from the official language or languages of the country or region in which they live		✓	The survey shows that although the Zhuang possess their own language (Zhuang), it is not the lingua franca for Zhuang residents in the project area. Within GZAR, the Zhuang language itself comprises two major dialect groups, Northern and Southern, and approximately 20 sub-dialects, with differences primarily in intonation and vocabulary. In the survey sample, all Zhuang respondents were able to communicate fluently in Putonghua (Mandarin).

			Furthermore, due to the prevalence of migrant work experience among residents in the project area, the frequency of Putonghua usage in work and daily interactions has been further reinforced. Overall, Zhuang residents in the project area predominantly use Putonghua in their work, education, and daily communication. While the Zhuang language persists as an ethnic language, its frequency and scope of use in actual communication have significantly declined.
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(III) Applicability Analysis of ESS3 under the ESF

228. Based on the assessment of the Project's potential impacts on ethnic minorities, Guangxi had a total population of approximately 50.13 million in 2024, of which 18.95 million (about 37.8%) were ethnic minorities, with the Zhuang ethnic group representing the largest share. Qinzhou Municipality had a total population of 4.21 million, including approximately 477,000 ethnic minority residents (11.3%), of whom the Zhuang ethnic group accounts for around 96%. The Project area covers five villages/communities: Huangma, Longwan, Chengbei, Jiangbiao and Hengling, which are located in the Changtian subdistrict and Dadong town. These villages are in the peri-urban area of Qinzhou City. There are no ethnic minority-concentrated communities within the Project area. Ethnic minority residents comprise around 60 individuals, all of whom are Zhuang, accounting for 0.05% of the Project area population. These households are scattered residents, primarily formed through marriage or migration, and based on key informant interviews and focus group discussions conducted during the Project Team's (PT's) September 2025 site visit, ethnic minority participants reported that they are able to communicate in Mandarin and have access to the same public services as the Han population. In terms of social welfare entitlements, legal rights and protections, no material differences were identified. While ethnic minority residents maintain their own cultural customs and living practices, these do not affect their access to services or participation in local socioeconomic activities.

229. Although some characteristics of the Zhuang are less pronounced within the project area due to their integration into the broader Han social and economic systems, the Zhuang are explicitly recognized as one of China's ethnic minorities and as an indigenous ethnic group of the GZAR under the Constitution of the PRC and the system of regional ethnic autonomy. The Zhuang residents in the project area, regardless of their population size, are entitled to the ethnic minority status conferred by the Constitution and laws. Consequently, ESS3 has been triggered.

230. In accordance with ESS3, meaningful, culturally appropriate, accessible, and gender-sensitive consultations were conducted with Zhuang individuals to ensure culturally appropriate benefits and to avoid or mitigate adverse impacts. Of the 60 Zhuang individuals in the Project area, 11 individuals (approximately 0.3% of Project-affected people) will be affected by land acquisition, with limited impacts as income loss is estimated at less than 5% of their agricultural income. Consultations indicate strong community support for the Project, particularly due to anticipated employment opportunities.

Indigenous Peoples due diligence has been integrated into the ESIA/ESMP and RP, with culturally appropriate engagement, grievance redress, and monitoring measures reflected in the SEP and GRM.

I. Environmental Quality Baseline

a. Surface Water Environment

231. Qinzhou City has seven national control assessment sections, two of which are located in the Qinjiang River. One of these is the Youth Water Gate section, which is about 510 meters from the end of the project's entrance trunk road. According to the "2023 Qinzhou City Environmental Quality Report" published by the Ecology and Environment Bureau of Qinzhou City, the water quality of major rivers in Qinzhou continued to maintain good or better levels in 2023, with the Qinjiang main river's water quality remaining excellent.

232. The Qinjiang River Basin has a wet season from April to September and a dry season from October to March each year. The monitoring for this project was conducted during the wet season (June 11-13, 2024). Therefore, the monitoring results of the Qinjiang River Basin during the dry season refer to the relevant contents of "Environmental Impact Assessment Report for the Pinglu Canal (from Pingtang River Mouth to Qinjiang Bridge Section) Project" (hereinafter referred to as the "Pinglu Canal EIA Report"), mainly citing the monitoring results of the monitoring point near this project - Section 14# Qinjiang Shuijindong (about 2km upstream of Qingnian Sluice).

233. According to the Pinglu Canal EIA Report, Guangxi Zhongsai Testing Technology Co., Ltd. carried out the current situation monitoring of the river water environment from February 4 to 6, 2021(Among these, water temperature, pH value, suspended solids and salinity are monitoring values, while the others are evaluation values). The monitoring contents are shown in VI-5, the locations of monitoring points are shown in Figure VI-2, and the monitoring results are shown in Table VI-6.

234. Two monitoring sections were also set up along the Qinjiang River for this assessment, one near Shui Jindong, which is closest to the project, and the other near the original Qinjiang water intake point. Sampling and monitoring were conducted by Guangxi Jiuwan Testing Service Co., Ltd. from June 11–13, 2024. The monitoring items are listed in Table VI-5, and the monitoring locations are shown in Figure VI-2. The results are presented in Table VI-6.

Table VI-5 Surface Water Monitoring Items

No.	Water Body	Monitoring Point	Monitoring Parameters	Monitoring Frequency	Remarks	
W1	Qin River	Near Shuijindong	pH, DO, Permanganate Index, COD, BOD, NH ₃ -N	Once per day, for 3 days.	Closest point to the project	Monitoring conducted for this

W2		Near the existing Qin River water			Background water quality point	
14#	Qin River	Shuijindong Section (approx. 2 km upstream of			Data cited from the Pinglu Canal EIA Report.	

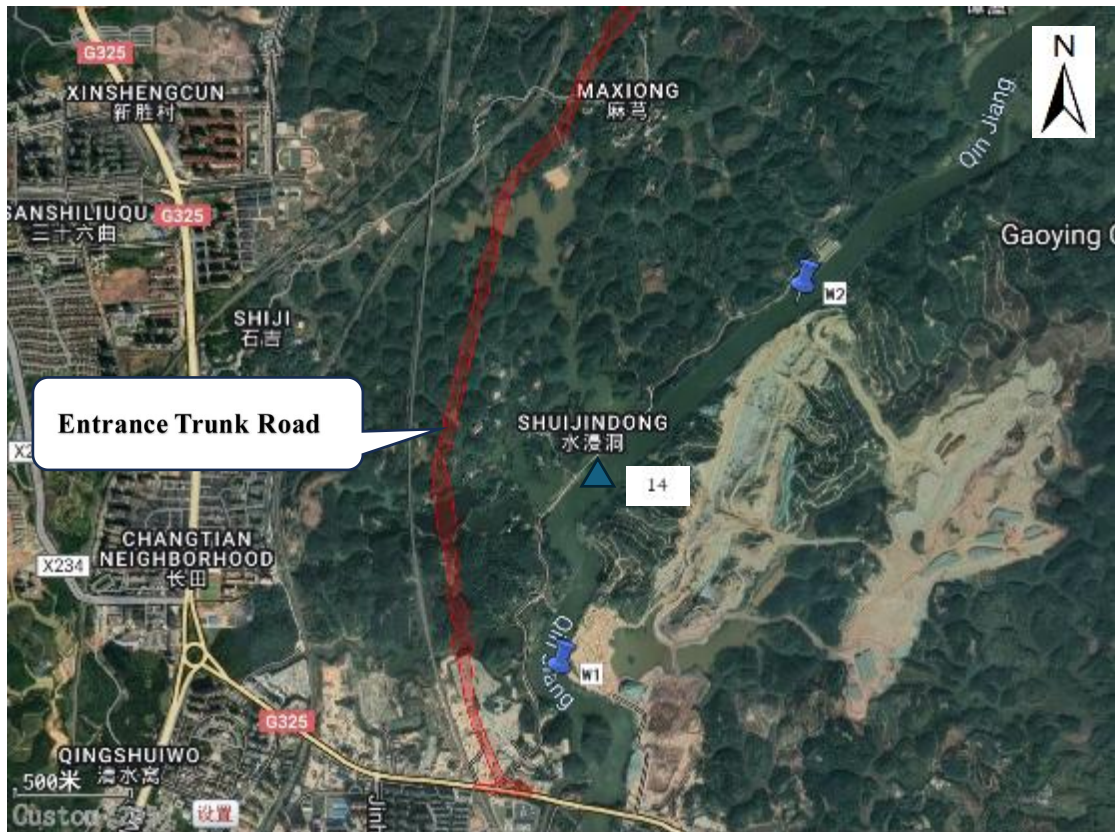


Figure VI-2: Surface Water Monitoring Location Diagram

Table VI 6 Surface Water Quality Monitoring Results (Unit: mg/L)

Monitoring Item		W1 Shui Jindong			W2 Qinjiang Intake Point			14# Shuijindong Section (located approximately 2 km upstream of the Qingnian Sluice/Gate)		
		2024 wet season						2021 dry season		
		June 11	June 12	June 13	June 11	June 12	June 13	February 4	February 5	February 6
pH	Monitored values	7.3	7.2	7.4	7.2	7.3	7.5	8.04	7.98	8.06
	Standard	9	9	9	9	9	9	9	9	9

Monitoring Item		W1 Shui Jindong			W2 Qinjiang Intake Point			14# Shuijindong Section (located approximately 2 km upstream of the Qingnian Sluice/Gate)		
		2024 wet season						2021 dry season		
June 11	June 12	June 13	June 11	June 12	June 13	February 4	February 5	February 6		
	limit									
	Standard Index	0.15	0.1	0.2	0.1	0.15	0.25	0.52	0.49	0.53
DO	Monitored values	6.19	6.1	6.2	6.21	6.26	6.29	/	/	/
	Standard limit	5	5	5	5	5	5	5	5	5
	Standard Index	0.63	0.66	0.63	0.63	0.61	0.60	0.73	0.75	0.76
NH ₃ -N	Monitored values	0.306	0.3	0.328	0.293	0.319	0.306	/	/	/
	Standard limit	1	1	1	1	1	1	1	1	1
	Standard Index	0.31	0.30	0.33	0.29	0.32	0.31	0.52	0.50	0.51
SS	Monitored values	8	9	8	7	10	8	10	13	9
	Standard limit	/	/	/	/	/	/	/	/	/
TP	Monitored values	0.14	0.12	0.15	0.12	0.1	0.13	/	/	/
	Standard Limit	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
	Standard Index	0.7	0.6	0.75	0.6	0.5	0.65	0.80	0.80	0.80
TN	Monitored values	0.75	0.72	0.86	0.79	0.76	0.78	/	/	/
	Standard Limit	1	1	1	1	1	1	1	1	1
	Standard Index	0.75	0.72	0.86	0.79	0.76	0.78	3.02	3.14	2.78
Petroleum	Monitored values	0.03	0.02	0.02	0.03	0.02	0.02	ND	ND	ND

Monitoring Item		W1 Shui Jindong			W2 Qinjiang Intake Point			14# Shuijindong Section (located approximately 2 km upstream of the Qingnian Sluice/Gate)		
		2024 wet season						2021 dry season		
		June 11	June 12	June 13	June 11	June 12	June 13	February 4	February 5	February 6
	Standard Limit	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
	Standard Index	0.6	0.4	0.4	0.6	0.4	0.4	/	/	/
COD	Monitored values	11	12	12	12	13	13	/	/	/
	Standard Limit	20	20	20	20	20	20	20	20	20
	Standard Index	0.55	0.6	0.6	0.6	0.65	0.65	0.8	0.67	0.73
BOD ₅	Monitored values	2.2	2	1.8	1.8	1.9	1.1	/	/	/
	Standard Limit	4	4	4	4	4	4	4	4	4
	Standard Index	0.55	0.50	0.45	0.45	0.48	0.28	0.40	0.40	0.40

235. According to the monitoring results, the water quality at monitoring points near W1 Shuijindong and W2 existing Qinjiang water intake meets the Class III standard requirements specified in the *"Surface Water Environmental Quality Standards" (GB3838-2002)*. For the monitoring point at Section 14# Shuijindong (approximately 2 km upstream of Qingnian Sluice), all factors except total nitrogen meet the Class III standard requirements of the *"Surface Water Environmental Quality Standards" (GB3838-2002)*. It can be seen from this that the water quality of the Qinjiang River during the wet season is relatively good.

b. Air Quality

236. Based on the environmental air quality classification definitions in the *"Ambient Air Quality Standards" (GB3095-2012)*, the project area is classified as a Category II area, and the environmental air quality complies with the Category II standards in GB3095-2012. According to the announcements from the Ecology and Environment Department of Guangxi Zhuang Autonomous Region, the annual concentration evaluation indicators for SO₂, NO₂, PM_{2.5}, PM₁₀, CO, and O₃ in Qinzhou City in 2023 all met the Category II standards in

GB3095-2012. Comparison with the evaluation standards for this project (Chapter II, Section E, Part C, Table II 10: *Current Chinese Ambient Air Quality Standards (GB 3095-2012)* and *WHO's Global Air Quality Guidelines (2021 Edition)* in units of mg/m³) shows that the air quality results meet the standards of both China and the EHS guidelines.

Table VI-7 Basic Pollutant Environmental Quality in the Project Area

Evaluation Factor	Annual Evaluation Indicator	Unit	Project Evaluation Standard	Current Concentration	Compliance Status
SO ₂	Annual average concentration	µg/m ³	60	8	Compliant
NO ₂		µg/m ³	40	19	Compliant
PM _{2.5}		µg/m ³	35	24.3	Compliant
PM ₁₀		µg/m ³	70	44	Compliant
CO	24-hour average 95th percentile	mg/m ³	4	1.13	Compliant
O ₃	Maximum 8-hour moving average 90th percentile	µg/m ³	160	118	Compliant

237. An air quality monitoring point was set up near a residential area within the scope of the sub-project 1 Logistics and Production Facilities. Guangxi Jiuwan Testing Service Co., Ltd. conducted sampling and monitoring from June 11–17, 2024. The monitoring items are shown in Table VI-8: Atmospheric Environmental Monitoring Content. The monitoring location is shown in FigureVI-3.

Table VI-8 Atmospheric Environmental Monitoring Content

Serial No.	Monitoring Point	Relative Direction	Monitoring Items	Monitoring Frequency
1#	Laocun Village	Inside the logistics park	TSP, PM ₁₀ , PM _{2.5}	Continuous 7 days, 24 hours each day

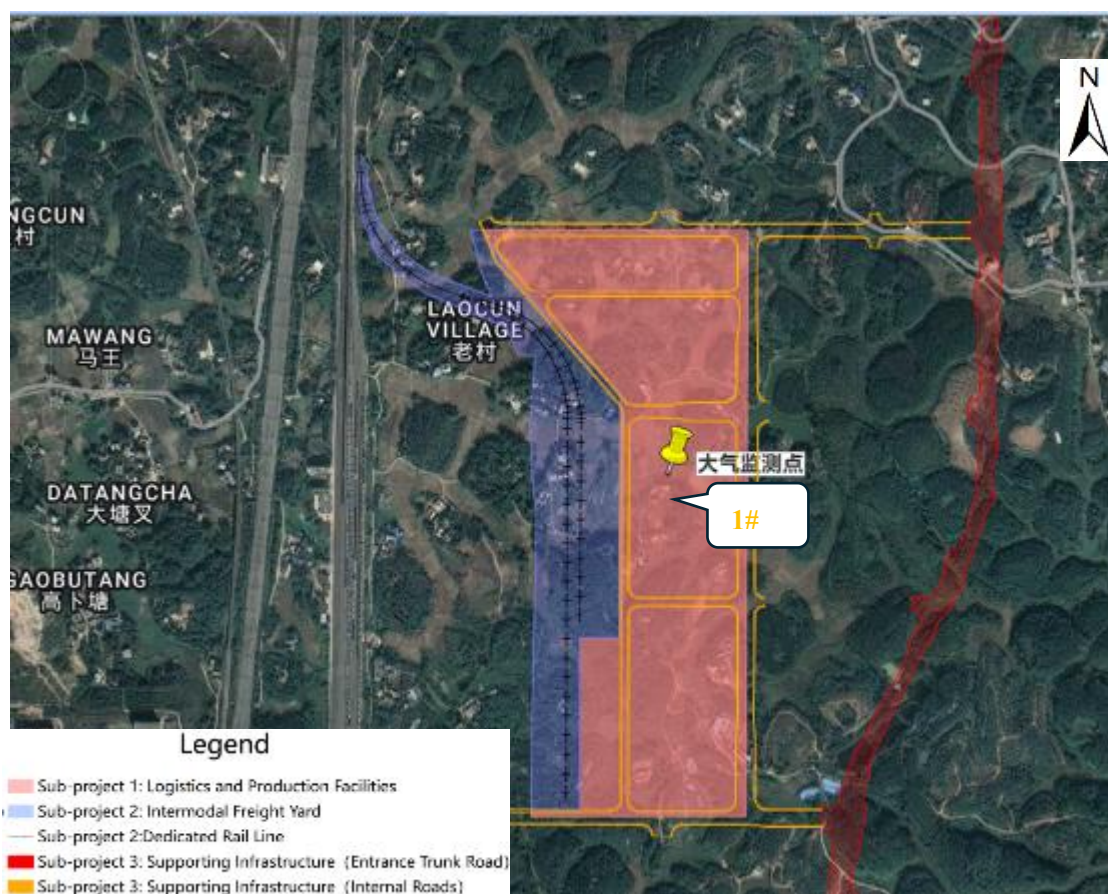


Figure VI-3: Air Quality Monitoring Location Diagram

Table VI-9 Atmospheric Environmental Monitoring Results

Monitoring Point	Item	PM _{2.5}	PM ₁₀	TSP
1# Laocun Village	Concentration range (mg/m ³)	0.019–0.029	0.033–0.048	0.052–0.069
	Project Evaluation Standard (mg/m ³)	0.075	0.15	0.3
	Compliance Status	Compliant	Compliant	Compliant

Table VI-10 Detection Methods

Pollutant	Reference Standard	Method	Detection Limit
SO ₂	HJ/T482-2009	Formaldehyde absorption - p-nitroaniline spectrophotometry	1-hour average concentration: 0.007 mg/m ³ , 24-hour average concentration: 0.004 mg/m ³
NO ₂	HJ/T479-2009	Spectrophotometry	1-hour average concentration: 0.005 mg/m ³ , 24-hour average concentration: 0.003 mg/m ³
TSP	GB/T15432-1995	Gravimetric method	0.001 mg/m ³
PM ₁₀	HJ 618-2011	Gravimetric method	0.010 mg/m ³
PM _{2.5}	HJ 624-2011	Gravimetric method	0.010 mg/m ³

O ₃	GB/T9801-1988	Ultraviolet photometry	0.002 mg/m ³
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238. Monitoring results indicate that the air quality at the monitoring points meets national standards.

c. Acoustic Environment

239. According to the "2023 Environmental Quality Status Report of Qinzhou City" published by the Ecological Environment Bureau of Qinzhou, in 2023, the daytime compliance rate for 15 acoustic environment functional areas in the urban area of Qinzhou reached 100%, while the nighttime compliance rate was 85.0%. Compared with last year, the daytime compliance rate remained the same, and the nighttime compliance rate decreased by 8.3 percentage points. The average daytime noise level in the urban area was 54.6 decibels, which is a decrease of 0.4 decibels from last year, and the noise quality was rated as "good." The average nighttime noise level was 48.7 decibels, with the noise quality rated as "fair." The average daytime noise level for urban road traffic in the urban area was 65.3 decibels, a decrease of 0.4 decibels from last year, with the noise quality rated as "good." The average nighttime noise level was 61.7 decibels, and the noise quality was rated as "fair."

240. This evaluation considers the impacts of various sub-projects and the existing railway. Monitoring was conducted at sensitive points within the influence range of the sub-projects: the Entrance Trunk Road, Intermodal Freight Yard, and Logistics and Production Facilities. A total of 21 acoustic environment monitoring points were set, including 20 monitoring points for sensitive areas and 1 boundary noise monitoring point. These points were monitored by Guangxi Jiuan Testing Service Co., Ltd. from June 11 to June 17, 2024. The details are shown in the table below (VI-11: Sensitive Point Noise Monitoring Setup). The monitoring point layout is shown in Figures VI-4 to VI-6.

Table VI-11 Noise monitoring distribution at sensitive points

Serial number	sub-project content	Orientation	Measuring Point Name	Latitude and Longitude Coordinates	Distance		function
N1	Entrance Trunk Road	West	Hengling Village	g108.67372960,22.08222244	Distance from road centerline/m	152	Residential Buildings
N2		East	Hengling Village	g108.67380201,22.07754224		100	Residential Buildings
N3		East	Laoba Village	g108.66945124,22.06962492		66	Residential Buildings
N4		West	Qingtang Village	g108.66437461,22.05855342		105	Residential Buildings
N5		East	Maxiong Village1#	g108.65583831,22.02806280		174	Residential Buildings
N6		East	Maxiong Village2#	g108.65446970,22.02765455		53	Residential Buildings
N7		West	Maxiong Village3#	g108.65367405,22.02809557		39	Residential Buildings
N8		West	Maxiong Village4#	g108.65307506,22.02821763		102	Residential Buildings
N9		East	Shuijindong Village1#	g108.64943683,22.01318198		125	Residential Buildings
N10		West	Shuijindong Village2#	g108.64853960,22.00952514		21	Residential Buildings

N11		West	Tianyuan Hanlin Zunfu Community	1st floor	g108.64955924,21.99975183		174	Residential Buildings
				3st floor				Residential Buildings
				5st floor				Residential Buildings
N12		West	Hanlinzunfu kindergarten	1st floor	g108.64965543,22.00020718		146	Residential Buildings
				3st floor				Residential Buildings
N13		Dedicated Rail Line	left	Laocun Village1#	g108.65343389,22.05592346		Distance from outer track centerline/m	80
N14	left		Laocun Village2#	g108.65363502,22.05448084		58		Residential Buildings
N15	right		Laocun Village3#	g108.65400180,22.05318182		37		Residential Buildings
N16	right		Laocun Village4#	g108.65493824,22.05275100		50		Residential Buildings
N17	right		Laocun Village5#	g108.65591264,22.05130621		93		Residential Buildings
N18	right		Laocun Village6#	g108.65194769,22.05381812		125		Residential Buildings
N19	Logistics and	North	Laocun Village	g108.65978479,22.05500656		Distance	43	Residential

	Production Facilities				from the nearest factory boundary/m		Buildings
N20		South	South side boundary	g108.65877092,22.04303379		14	industry
N21		East	Laocun Village	g108.66141558,22.05012409		69	Residential Buildings

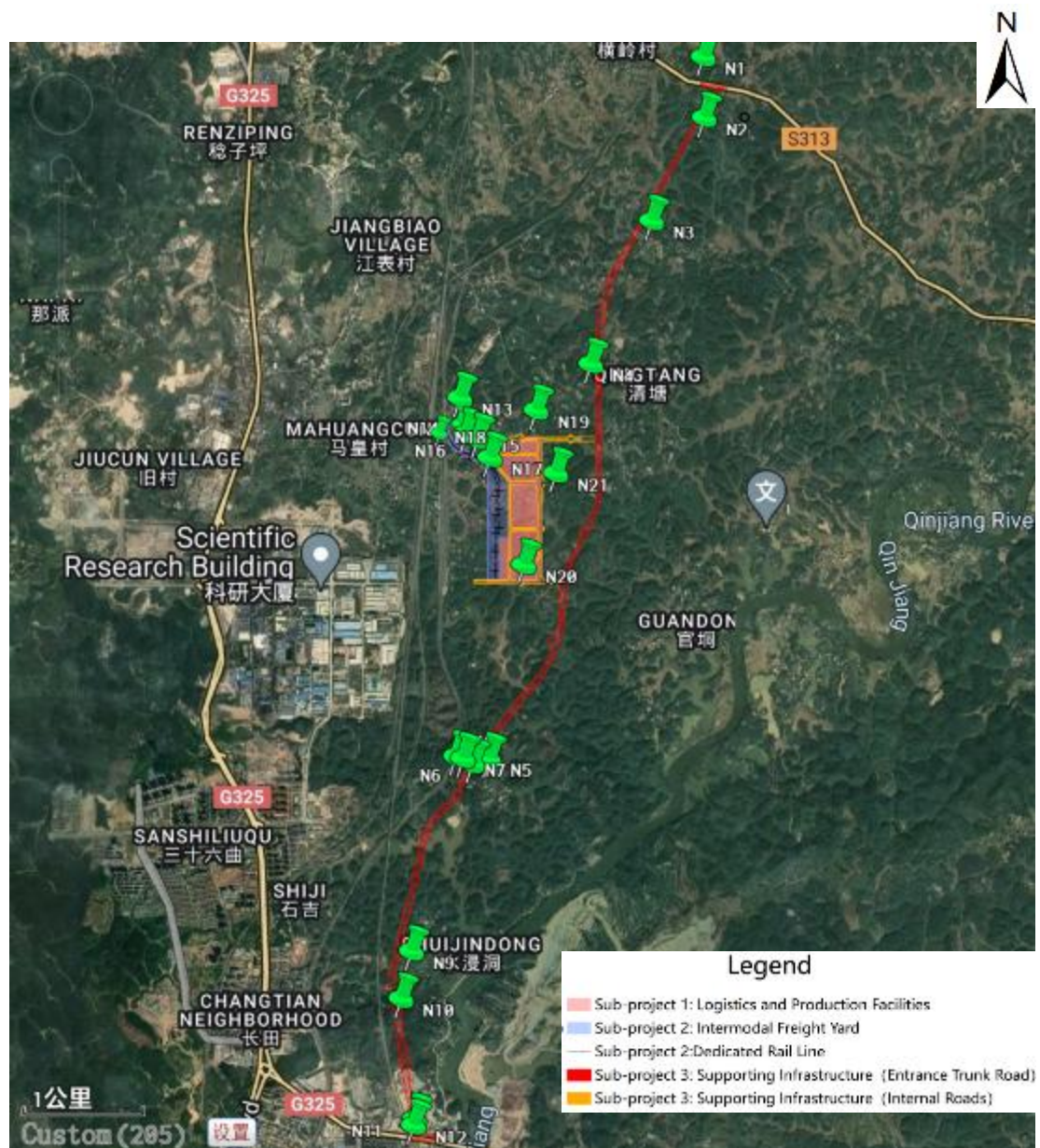


Figure VI-4: Schematic diagram of acoustic environment monitoring locations (overall)

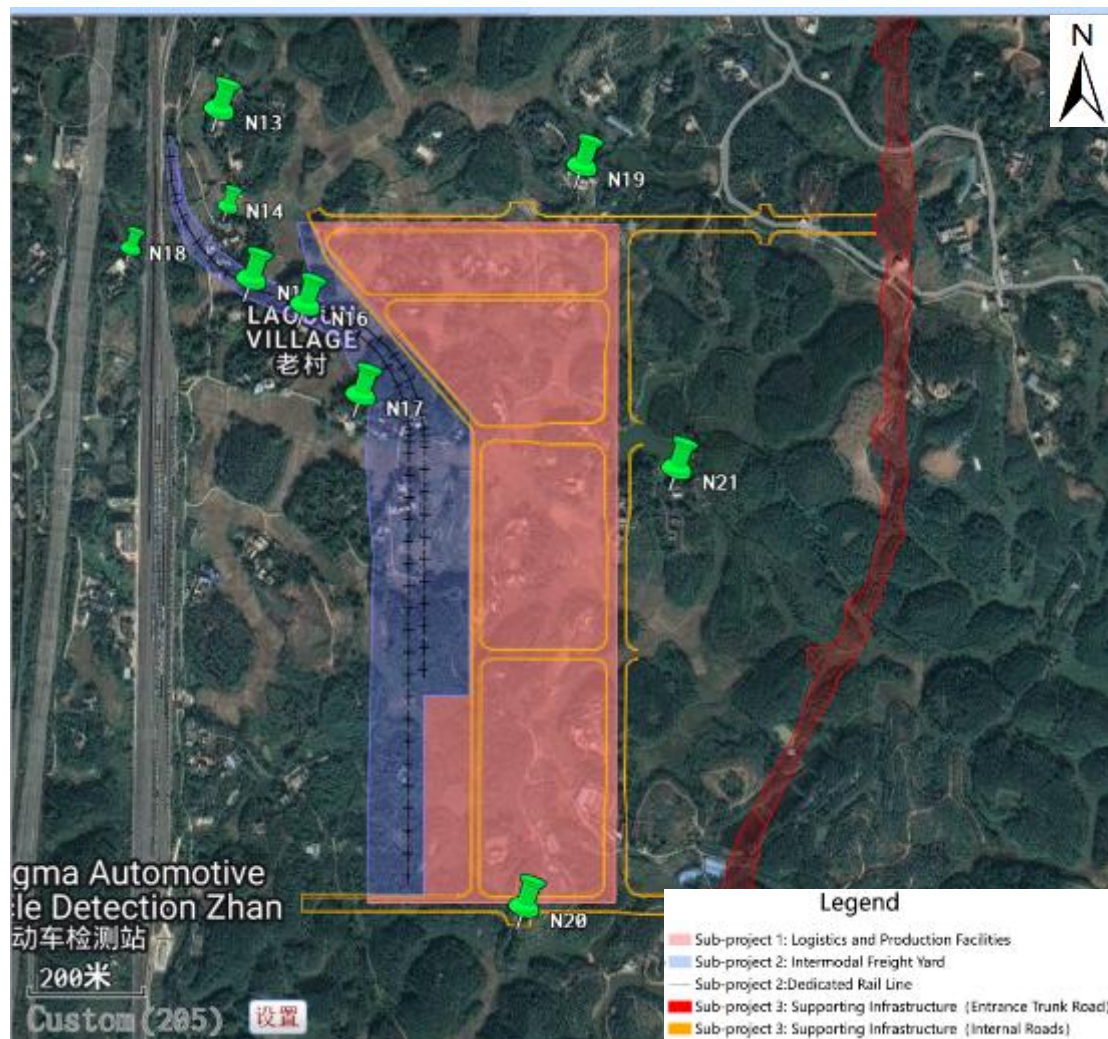


Figure VI-5: Schematic diagram of the distribution of acoustic environment monitoring sites (intermodal freight yard and logistics park area)

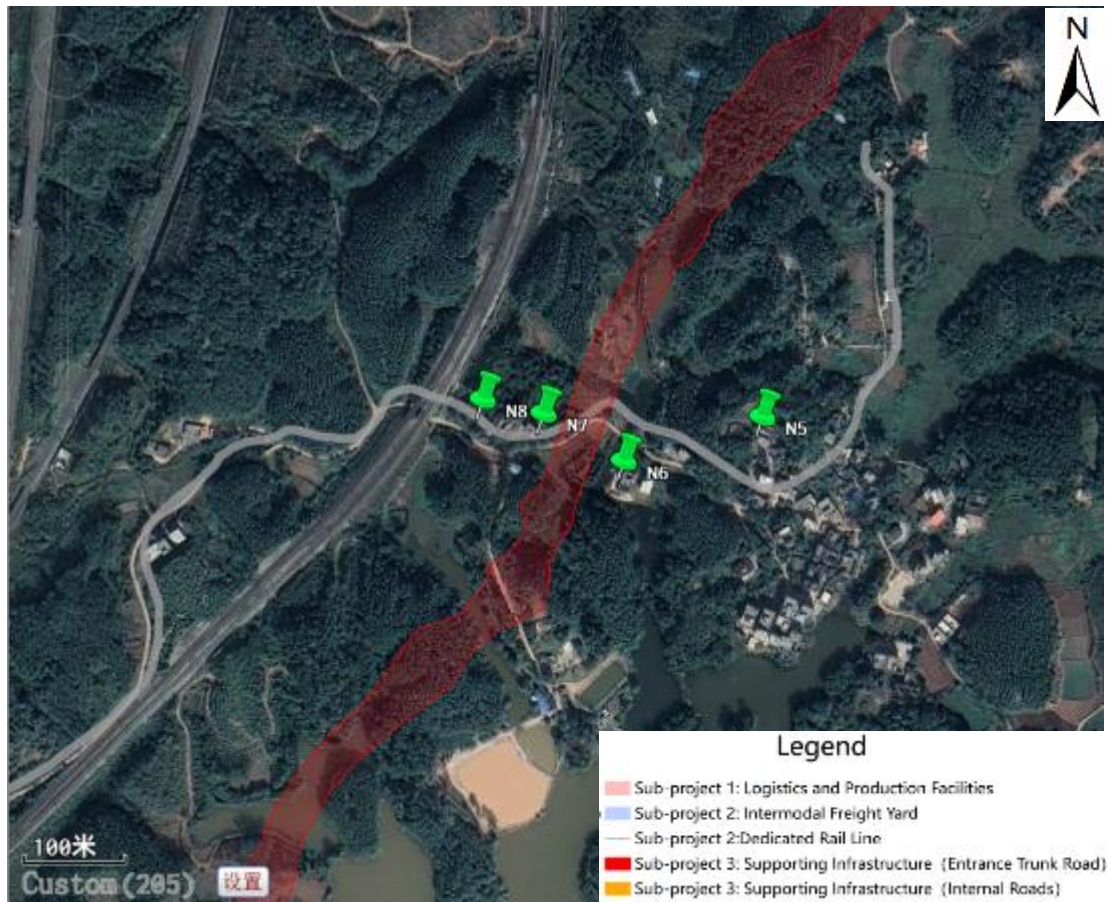


Figure VI-6: Schematic diagram of acoustic environment monitoring locations (near Maxiong Village)

Table VI-15: Noise monitoring results at sensitive points

Monitoring Point		China Current Function Zone	Monitoring Results		Project Standard Values		Compliance Status	
			Day	Night	Day	Night	Day	Night
N1 Hengling Village		Category4a	55	45.5	70	55	Compliance	Compliance
N2 Hengling Village		Category 2	49	40.5	60	50	Compliance	Compliance
N3 Laoba Village		Category 2	49	41.5	60	50	Compliance	Compliance
N4 Qingtang Village		Category 2	49	40.5	60	50	Compliance	Compliance
N5 Maxiong Village 1#		Category 2	50	40.5	60	50	Compliance	Compliance
N6 Maxiong Village 2#		Category 2	50	40.5	60	50	Compliance	Compliance
N7 Maxiong Village 3#		Category 2	52.5	41.5	60	50	Compliance	Compliance
N8 Maxiong Village 4#		Category 2	53.5	42.5	60	50	Compliance	Compliance
N9 Shuizhendong 1#		Category 2	50.5	40.5	60	50	Compliance	Compliance
N10 Shuizhendong 2#		Category 2	51.5	42	60	50	Compliance	Compliance
N11 Tianyuan Hanlin Zunfu	1F	Category 2	55.5	44.5	60	50	Compliance	Compliance
	3rd Floor		54	44	60	50	Compliance	Compliance
	5th Floor		53.5	42.5	60	50	Compliance	Compliance
N12 Hanlin Zunfu Kindergarten	1st Floor	Category 2	56.5	45	60	50	Compliance	Compliance
	3rd Floor		54.5	43.5	60	50	Compliance	Compliance
N13 Laocun 1#		Category 2	51.5	41.5	60	50	Compliance	Compliance
N14 Laocun 2#		Category 2	51	42.5	60	50	Compliance	Compliance
N15 Laocun 3#		Category 2	50.5	42.5	60	50	Compliance	Compliance
N16 Laocun 4#		Category 2	50.5	41.5	60	50	Compliance	Compliance
N17 Laocun 5#		Category 2	50.5	41.5	60	50	Compliance	Compliance
N18 Laocun 6#		Category 4b	52	42.5	70	60	Compliance	Compliance
N19 North Side Laocun		Category 2	48.5	41.5	60	50	Compliance	Compliance

N20 South Side of the Project Boundary	Category 3	49	41.5	65	55	Compliance	Compliance
N21 East Side Laocun	Category 2	49	41.5	60	50	Compliance	Compliance

241. Based on the current monitoring results, the noise levels at all sensitive points of this project meet the requirements of China's *Standard of Environmental Noise of Urban Area* (GB3096-2008).

d. Groundwater

242. According to the "2023 Environmental Quality Status Report of Qinzhou City" published by the Ecological Environment Bureau of Qinzhou, in 2023, the water quality of the four groundwater monitoring wells (points) in Qinzhou City was classified as Class IV. Among them, two drinking water source monitoring points, located at the upstream water intake wells at Dengjia Village (Team 2) and Ping Tang Village in Xinxu Town, Lingshan County, and at Liangshuikou, Zuo'e Village, Zaixu Town, Pubei County, both showed water quality exceeding the Class III standard. The factors that exceeded the Class III quality limits were manganese (0.2 times, Class IV) and pH (0.3).

243. In this project, three groundwater quality and water level monitoring points and three water level monitoring points were set within the influence range of the logistics and production facilities. Sampling monitoring was entrusted to Guangxi Jiuan Testing Service Co., Ltd., which conducted the sampling on June 11, 2024. The details are shown in Table VI-13, and the locations are shown in Figure VI-7.

Table VI-13 Groundwater Supplementary Monitoring Points Overview

Monitoring Point ID	Monitoring Point	Point Function	Monitoring Type
D1	Ma Huang Village, Team 3, Chen Hengbang's Residence	On-site	Water Quality, Water Level
D2	Ma Huang Village, Team 1, Huang Heng's Residence	Upstream	Water Quality, Water Level
D3	Ma Huang Village, Team 3, Luo Zushua's Fish Farm	Downstream	Water Quality, Water Level
D4	Ma Huang Village, Team 2, Huang Jinjun's Residence	Side stream	Water Level
D5	Ma Huang Village, Team 1, Huang Jinteng's Residence	Side stream	Water Level
D6	Qingtang Village, Jiang Mingxi's Residence	Side stream	Water Level

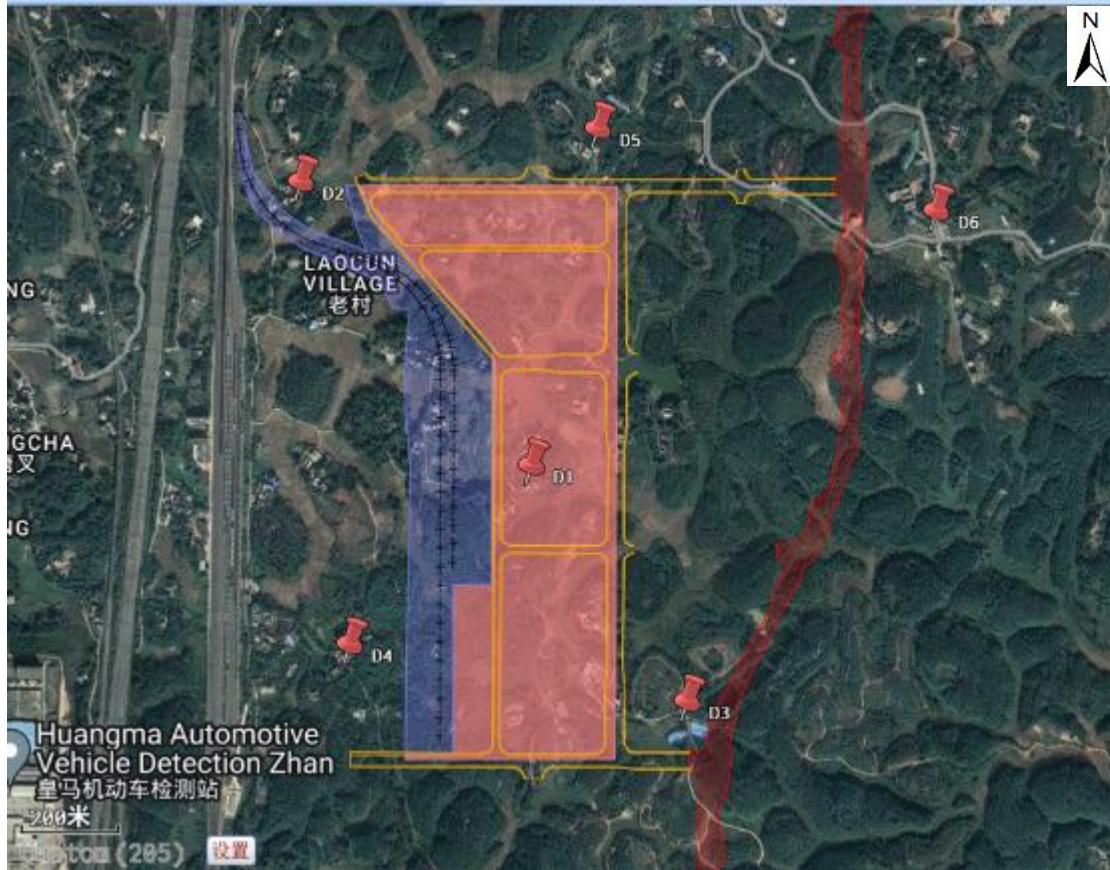


Figure VI-7: Groundwater Environmental Monitoring Points Schematic

Table VI-17 Groundwater Quality Monitoring Results(Unit: mg/L)

Monitoring Item		D1	D2	D3
pH Value	Monitoring Value	7.5	7.6	7.7
	Standard Limit	6.5-8.5	6.5-8.5	6.5-8.5
	Compliance Status	Compliance	Compliance	Compliance
Total Hardness	Monitoring Value	94.7	110	47.2
	Standard Limit	450	450	450
	Compliance Status	Compliance	Compliance	Compliance
Ammonia Nitrogen	Monitoring Value	0.144	0.068	0.046
	Standard Limit	0.5	0.5	0.5
	Compliance Status	Compliance	Compliance	Compliance
Nitrate (as N)	Monitoring Value	2.8	2.4	ND
	Standard Limit	20	20	20
	Compliance Status	Compliance	Compliance	Compliance
Nitrite Nitrogen	Monitoring Value	0.003	0.007	0.002
	Standard Limit	1	1	1
	Compliance Status	Compliance	Compliance	Compliance
Total Dissolved Solids	Monitoring Value	115	123	75
	Standard Limit	1000	1000	1000
	Compliance Status	Compliance	Compliance	Compliance
Hexavalent Chromium	Monitoring Value	0.011	0.007	0.008
	Standard Limit	0.05	0.05	0.05
	Compliance Status	Compliance	Compliance	Compliance

Monitoring Item		D1	D2	D3
Volatile Phenol	Monitoring Value	ND	ND	ND
	Standard Limit	0.02	0.02	0.02
	Compliance Status	Compliance	Compliance	Compliance
Sulfur Compounds	Monitoring Value	ND	ND	ND
	Standard Limit	0.02	0.02	0.02
	Compliance Status	Compliance	Compliance	Compliance
Anionic Surfactants	Monitoring Value	ND	ND	ND
	Standard Limit	0.3	0.3	0.3
	Compliance Status	Compliance	Compliance	Compliance
Permanganate Index (Oxygen Demand)	Monitoring Value	0.7	1.24	0.52
	Standard Limit	3	3	3
	Compliance Status	Compliance	Compliance	Compliance
Chlorides (Cl ⁻)	Monitoring Value	41.1	24.9	8.8
	Standard Limit	250	250	250
	Compliance Status	Compliance	Compliance	Compliance
Sulfates (SO ₄ ²⁻)	Monitoring Value	ND	6	ND
	Standard Limit	250	250	250
	Compliance Status	Compliance	Compliance	Compliance
Arsenic	Monitoring Value	0.002	0.0005	ND
	Standard Limit	0.01	0.01	0.01
	Compliance Status	Compliance	Compliance	Compliance
Mercury	Monitoring Value	0.0005	0.0008	0.0006
	Standard Limit	0.001	0.001	0.001
	Compliance Status	Compliance	Compliance	Compliance
Cyanide	Monitoring Value	ND	ND	ND
	Standard Limit	0.05	0.05	0.05
	Compliance Status	Compliance	Compliance	Compliance
Fluoride	Monitoring Value	ND	ND	ND
	Standard Limit	1	1	1
	Compliance Status	Compliance	Compliance	Compliance
Aluminum	Monitoring Value	0.07	0.046	0.024
	Standard Limit	0.2	0.2	0.2
	Compliance Status	Compliance	Compliance	Compliance
Total Coliforms (CFU/mL)	Monitoring Value	3	2	3
	Standard Limit	100	100	100
	Compliance Status	Compliance	Compliance	Compliance
Total Coliform Bacteria (MPN/100mL)	Monitoring Value	ND	ND	ND
	Standard Limit	3	3	3
	Compliance Status	Compliance	Compliance	Compliance
Copper	Monitoring Value	ND	ND	ND
	Standard Limit	1	1	1
	Compliance Status	Compliance	Compliance	Compliance
Zinc	Monitoring Value	ND	ND	ND
	Standard Limit	1	1	1
	Compliance Status	Compliance	Compliance	Compliance
Lead	Monitoring Value	ND	0.0026	ND
	Standard Limit	0.2	0.2	0.2
	Compliance Status	Compliance	Compliance	Compliance

Monitoring Item		D1	D2	D3
Cadmium	Monitoring Value	ND	ND	ND
	Standard Limit	0.005	0.005	0.005
	Compliance Status	Compliance	Compliance	Compliance
Ferrum	Monitoring Value	0.1	ND	ND
	Standard Limit	0.3	0.3	0.3
	Compliance Status	Compliance	Compliance	Compliance
Manganese	Monitoring Value	0.08	0.08	0.04
	Standard Limit	0.1	0.1	0.1
	Compliance Status	Compliance	Compliance	Compliance
Selenium	Monitoring Value	ND	ND	ND
	Standard Limit	0.01	0.01	0.01
	Compliance Status	Compliance	Compliance	Compliance

244. The monitoring factors at each groundwater quality monitoring point of the project meet the requirements of the *"Groundwater Quality Standards" (GB/T 14848-2017)* for Grade III water quality standards.

e. Vibration

245. Guangxi Jiuwan Testing Service Co., Ltd. conducted vibration monitoring at sensitive points next to the dedicated railway line for sub-project 2 from June 23–24, 2024. The monitoring locations are shown in Table VI-15, and the monitoring point layout diagram is shown in Figure VI-8. The monitoring results are presented in Table VI-16.

Table VI-15 Vibration Monitoring Locations at Sensitive Points Near the Railway

Serial No.	Sub-project	Orientation	Monitoring Point	Latitude and Longitude Coordinates	Latitude and Longitude Coordinates	Evaluation Standard
Z1	Dedicated Rail Line	Left	Laocun Village 1#	g108.65343389,22.05592346	80	Residential, educational areas: 70 (daytime), 67 (nighttime)
Z2		Left	Laocun Village 2#	g108.65363502,22.05448084	58	
Z3		Right	Laocun Village 3#	g108.65400180,22.05318182	37	
Z4		Right	Laocun Village 4#	g108.65493824,22.05275100	50	
Z5		Right	Laocun Village 5#	g108.65591264,22.05130621	93	
Z6		Right	Laocun Village 6#	g108.65194769,22.05381812	125	

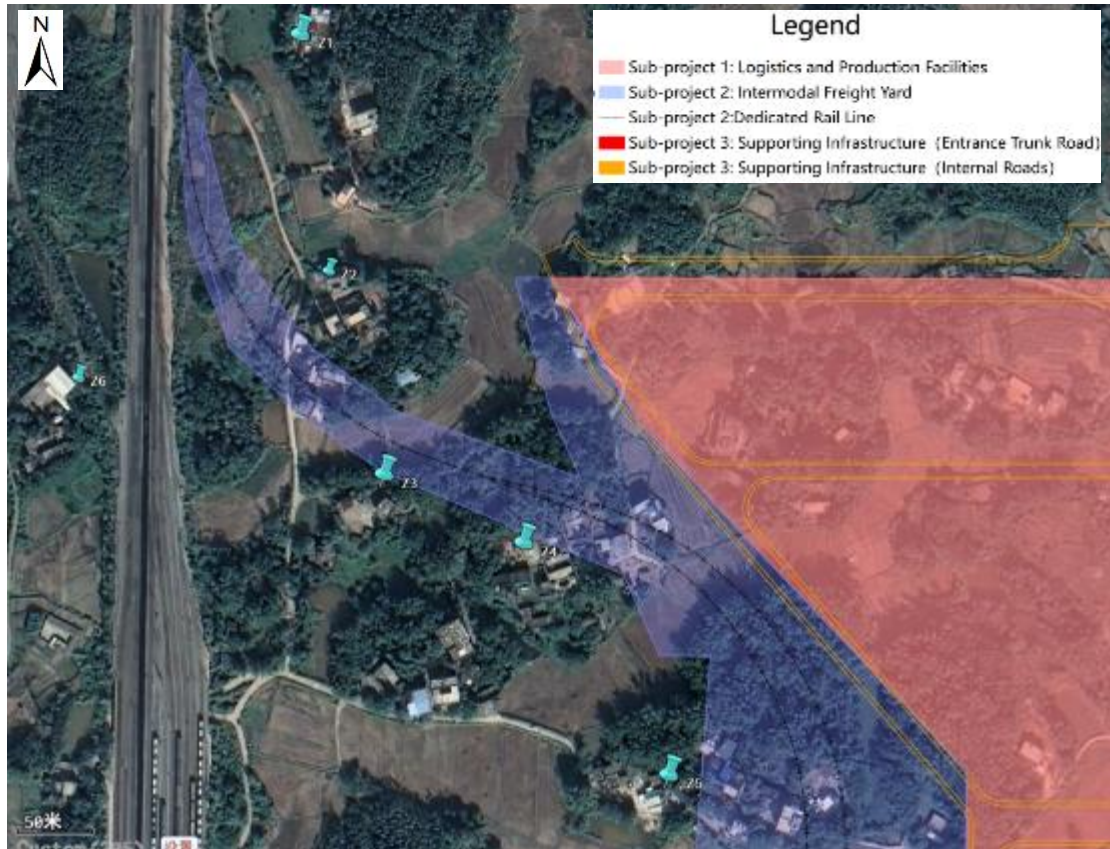


Figure VI-8: Vibration Monitoring Location Layout Diagram

Table VI-16 Vibration Monitoring Results at Sensitive Points

Monitoring Point	Ground Condition	Monitoring Date	Monitoring Time	Monitoring Result (VLZ ₁₀)	Evaluation Standard	Compliance Status
Z1 Laocun Village 1#	Flat	June 23, 2024	Daytime	64.5	70	Compliant
			Nighttime	57.3	67	Compliant
		June 24, 2024	Daytime	65.1	70	Compliant
			Nighttime	55.3	67	Compliant
Z2 Laocun Village 2#	Flat	June 23, 2024	Daytime	63.1	70	Compliant
			Nighttime	55.2	67	Compliant
		June 24, 2024	Daytime	64.2	70	Compliant
			Nighttime	54.1	67	Compliant
Z3 Laocun Village 3#	Flat	June 23, 2024	Daytime	64	70	Compliant
			Nighttime	54.5	67	Compliant
		June 24, 2024	Daytime	65.1	70	Compliant
			Nighttime	50.3	67	Compliant
Z4 Laocun Village 4#	Flat	June 23, 2024	Daytime	62.8	70	Compliant
			Nighttime	54.1	67	Compliant
		June 24, 2024	Daytime	63.1	70	Compliant
			Nighttime	51.8	67	Compliant
Z5 Laocun Village 5#	Flat	June 23, 2024	Daytime	63.7	70	Compliant
			Nighttime	53.8	67	Compliant
		June 24, 2024	Daytime	64.4	70	Compliant
			Nighttime	52.5	67	Compliant
Z6 Laocun	Flat	June 23,	Daytime	65.8	70	Compliant

Monitoring Point	Ground Condition	Monitoring Date	Monitoring Time	Monitoring Result (VLZ ₁₀)	Evaluation Standard	Compliance Status
Village 6#		2024	Nighttime	58.4	67	Compliant
		June 24, 2024	Daytime	64.9	70	Compliant
			Nighttime	53.4	67	Compliant

246. Based on the monitoring results, the vibration environment at all monitoring points meets the requirements of the *"Urban Area Environmental Vibration Standards" (GB10070-88)* for "residential and educational areas." The regional vibration environment is considered good.

f. Soil

247. The land in the project area mainly consists of original landforms, with natural vegetation, farmland, and residential buildings distributed throughout, and no industrial enterprises or suspected contaminated soil sites. According to the monitoring results of the agricultural land near Shuiyindong, along the Entrance Trunk Road, conducted by Guangxi ZhongSai Testing Technology Co., Ltd. from February 1 to 10, 2021, all monitoring indicators met the risk screening values for agricultural land soil. Overall, the soil environmental quality along the project area is good, with low risks to agricultural product quality, crop growth, or the soil ecosystem. Since the project involves land acquisition for industrial use, this evaluation compares soil risk control with the industrial land risk screening values, which meet the industrial land screening value requirements, posing no risk to human health.

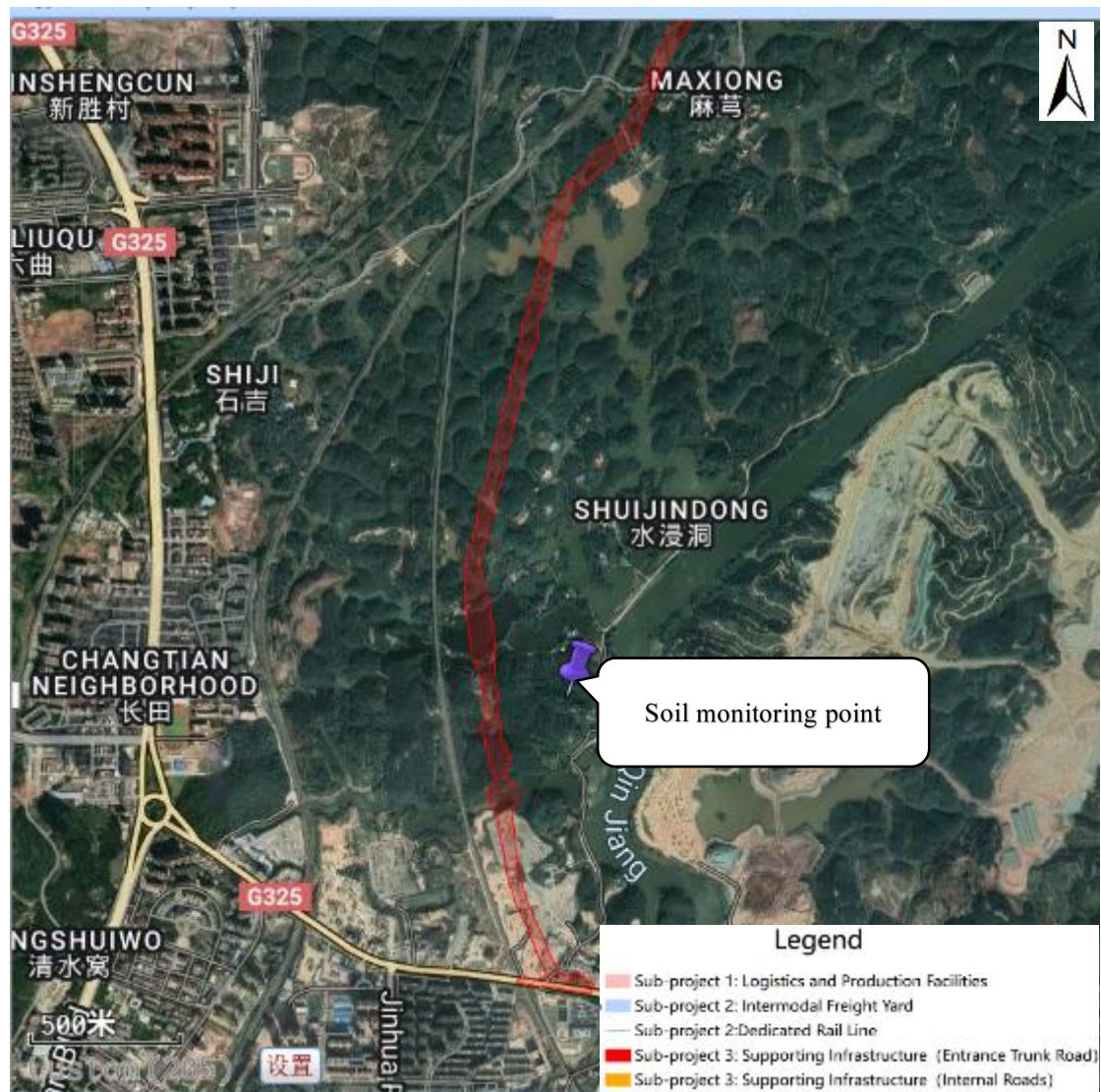


Figure VI-9: Soil Monitoring Location Layout Diagram

Table VI-17 Soil Quality Monitoring Results (Unit: mg/kg, Dry Weight)

Monitoring Indicator	pH	Cadmium (Cd)	Mercury (Hg)	Arsenic (As)	Lead (Pb)	Chromium (Cr VI)	Hexavalent Chromium	Copper (Cu)	Nickel (Ni)	Zinc (Zn)
Monitoring Value	6.62	0.3	0.027	0.92	80	49	<0.5	10	22	37
Agricultural Land Risk Screening Value	6.5 < pH ≤ 7.5	0.3	2.4	30	120	200	/	100	100	250
Construction Land Screening Value	/	65	38	60	800	/	5.7	18000	900	/

Monitoring Indicator	pH	Cadmium (Cd)	Mercury (Hg)	Arsenic (As)	Lead (Pb)	Chromium (Cr VI)	Hexavalent Chromium	Copper (Cu)	Nickel (Ni)	Zinc (Zn)
ng Value										
Compliance Status	/	Compliance	Compliance	Compliance	Compliance	Compliance	Compliance	Compliance	Compliance	Compliance

J. Biodiversity

248. To understand the biodiversity in the project construction area, an environmental and social consulting team organized a survey from August 2023 to May 2024, including four biodiversity experts who conducted research through document reviews, interviews, and field investigations.

249. The project area is primarily composed of forest ecosystems, shrubland ecosystems, grassland ecosystems, wetland ecosystems, agricultural ecosystems, and urban ecosystems.

250. No national-level or Guangxi Zhuang Autonomous Region-level key protected wild plants were found within the project impact area. No plants listed in the CITES (Convention on International Trade in Endangered Species of Wild Fauna and Flora) appendices were found, nor any plants included in the IUCN Red List (2010), and no ancient or famous trees were discovered. However, based on interviews, the nationally protected second-class plant, *Cibotium barometz*, was once widely distributed in the project area. In recent years, however, the large-scale planting of eucalyptus has caused a significant reduction in the number of *Cibotium barometz*, and residents from several villages along the project route reported that they have not seen *Cibotium barometz* in the area in recent years.

251. Based on field investigations, and interviews with local residents and the Qinbei District Forestry Bureau, as well as data from previous wildlife surveys in surrounding areas, it was found that the number and variety of animal species in the project area are relatively low. No large wild animals were found within the project's impact zone. The animal resources mainly consist of various migratory bird species and a small number of amphibians, reptiles, and small mammals.

252. A total of 69 species of terrestrial wild animals could potentially be present in the impact area, of which 37 species are protected wild animals. Eighteen of these are nationally protected second-class wild animals, including species such as the Snake Eagle, Red Falcon, Eurasian Blackbird, Brown-winged Cuckoo, and Little Cuckoo. Nineteen species are listed in the "Guangxi Zhuang Autonomous Region Wild Key Protected Animals List". One species is included in the IUCN Red List (Zhou Shan Cobra). Four species are listed in the CITES appendices (with some species appearing in multiple listings). In

terms of protected species, birds dominate with 29 species, accounting for about 78.4% of the protected animals; mammals account for 2.7%, reptiles 8.1%, and amphibians 10.8%.

253. The main ecological environmental issues faced along the project route include high human activity disturbance, a lack of forest diversity, and declining ecological service functions such as water conservation and soil preservation. Human interference has caused some animal populations to decrease, and invasive plant species like *Bidens pilosa* (Tickseed) have severely occupied the habitat space of local species. The areas for agricultural and forestry land use along the route are expected to increase, resulting in a further reduction in natural vegetation, with the area covered by single-species plantations (such as Eucalyptus, Chinese Pine, and Fir forests) expanding year by year, which is detrimental to the protection of local biodiversity.

254. For a more detailed analysis of biodiversity, please refer to the biodiversity survey and assessment report for this project.

K. Protected Areas

255. On May 31, 2024, the People's Government of Guangxi Zhuang Autonomous Region issued the "Approval of the People's Government of Guangxi Zhuang Autonomous Region on the Adjustment of the Qinjiang Drinking Water Source Protection Area in Qinzhou City" (Gui Zheng Han [2024] No. 93), which adjusted the location of the Qinjiang Drinking Water Source Protection Area in Qinzhou City. According to the adjusted boundaries of the protection area, the project does not intersect with the water source protection area, and the nearest distance between the project and the water source protection area is approximately 2.3 km.

256. According to field survey results, there are no other natural protected areas or cultural heritage protection areas designated by Chinese law within the vicinity of the project.



Figure VI 10: Relationship Diagram of the Project with the Adjusted Qinjiang Drinking Water Source Protection Area

VII. Environmental Impact Assessment and Mitigation Measures

A. Project Impact Scope and Sensitive Receptors

257. In order to define the scope of the impact assessment, two concepts, "project impact area" and "sensitive receptors," are introduced.

258. The project impact area is defined as the total area that may be adversely affected by the project. The following principles are used to determine it:

(1) To prevent noise pollution during construction and operation, the construction site and a 200-meter range from the project boundary are defined as the project impact area;

(2) To prevent air pollution during the construction phase, the construction site and a 200-meter range from the project boundary are defined as the project impact area;

(3) To prevent air pollution during the operational phase, the furthest point that could be affected by odors from the Garbage Transfer Station is considered, and the project impact area is defined as a rectangular area with a 5 km side length, centered on the Garbage Transfer Station;

(4) To prevent impacts on ecosystems during the construction and operation phases, the construction site and a 300-meter range from the project boundary are defined as the project impact area.

259. Sensitive receptors are defined as residential areas or environments that may be affected by project construction or operation. These receptors include: (1) communities (residential areas) or environments that may be affected by construction or operational noise and air pollution; (2) public service facilities that are vulnerable to interference or pollution; and (3) plant, animal habitats, and agricultural land.

260. Based on the above definitions and principles, the existing sensitive receptors within the project impact area are summarized as follows:

(1) Groundwater Environmental Protection Targets: According to surveys, the drinking water in the villages along the project route is mainly supplied by self-built wells. There is no centralized drinking water source protection area within the project impact area. The groundwater protection

target for the project area is the drinking water wells and groundwater aquifers in the local villages, with a functional category defined by the "Groundwater Quality Standards" (GB/T 14848-2017) as Class III.

(2) Surface Water Environmental Protection Targets: The project does not cross any rivers. The main surface water body in the area is the Qinjiang River, located 245 meters to the east, with a surface water function classified under the "Surface Water Environmental Quality Standards" (GB 3838-2002) as Class III.

(3) Air Quality Protection Targets: During the construction phase, there are 8 environmental air protection targets within a 200-meter radius around the project (Table VII-1), including 6 villages, 1 residential community, and 1 kindergarten. During the operational phase, there are 33 environmental air protection targets within the impact area of the Garbage Transfer Station (Table VII-2), including 5 schools, and the remainder are villages and residential communities. Additionally, there are 7 air quality protection targets within 200 meters on both sides of the Entrance Trunk Road during the operational phase (Table VII-2), which include 5 villages, 1 kindergarten, and 1 residential community. Among them, Ma Xiong Village and Qing Tang Village are both within the evaluation range of the Garbage Transfer Station, and are not counted twice.

Table VII-1 Environmental Air and Noise Protection Targets During Construction

No.	Protected Object	Function Type	Location	Relative Distance (m)	Population Size	Standards
1	Hengling Village	Residential	Both sides	87	6	《Ambient Air Quality Standards》(GB3095-2012) 2nd standard and amendments
2	Lao Ba Village	Residential	Both sides	8	240	
3	Shui Jin Cave	Residential	Both sides	1	80	
4	Qing Tang Village	Residential	Both sides	13	148	
5	Lao Village	Residential	Both sides	21	359	
6	Ma Xiong Village	Residential	Both sides	22	72	
7	Tian Yuan Han Lin Zun Fu	Residential	Right	119	800	
8	Han Lin Zun Fu Kindergarten	School	Right	143	160	
Total					1865	/

Table VII-2 Environmental Air Protection Targets During Operation

No.	Protected Object	Function Type	Engineering Content	Location	Nearest Distance (m)	Population Size	Standards
1	Laocun Village	Residential	Garbage Transfer Station	Northwest	270	500	《Ambient Air Quality Standards》(GB3095-2012) 2nd standard and amendments
2	Dadong Town Middle School	School		Northwest	2780	1362	
3	No. 19 Primary School	School		Northwest	2120	1074	
4	Qinbei District Special Education School	School		Northwest	2050	180	
5	Huanghua Dong Village	Residential		Northwest	2400	100	
6	Gaobu Tang Village	Residential		Northwest	890	112	
7	Ma Fen Primary School	School		Northwest	1300	200	
8	Datang Village	Residential		Northwest	1000	98	
9	Dajing Community	Residential		Northwest	2100	8000	
10	Hangma Community	Residential		Northwest	2120	4000	
11	Hangma Village	Residential		Northwest	1620	98	
12	Wangongling Village	Residential		Northwest	1790	70	
13	Yau Hang Village	Residential		Northwest	1700	200	
14	Pingleqiao Village	Residential		Northwest	2100	83	
15	Jiankai Taoyuan Villa	Residential		west	2200	300	

No.	Protected Object	Function Type	Engineering Content	Location	Nearest Distance (m)	Population Size	Standards
16	Huafa No. 1	Residential		southwest	2330	1120	
17	Huafa Primary School	school		southwest	2600	1928	
18	Luowuxin Village	Residential		southwest	2763	78	
19	Helenbergh East	Residential		southwest	2580	3000	
20	Xianheng Kang Bridge	Residential		southwest	2970	4000	
21	Fuxing Homestead	Residential		southwest	3200	2000	
22	Happy Home Tiandi Building	Residential		southwest	2710	1800	
23	Hairun Bailey	Residential		southwest	2890	3000	
24	Linhu Community	Residential		southwest	3200	300	
25	Maxiong Village	Residential		south	1440	158	
26	Tan House Village	Residential		southeast	1270	63	
27	Yangjiangping Village	Residential		southeast	2450	53	
28	Guandong Village	Residential		southeast	1630	180	
29	Gaoqiao Village	Residential		east	2160	27	
30	Gaoxiao primary schools	school		east	2200	1120	
31	Qingtang Village	Residential		northeast	1200	800	
32	Zhengwu Village	Residential		northeast	2400	18	

No .	Protected Object	Function Type	Engineering Content	Location	Nearest Distance (m)	Population Size	Standards
33	Nading Village	Residential		northeast	3300	10	
34	Hengling Village	Residential	Pathway to the Park	Sides	87	6	《Ambient Air Quality Standards》(GB3095-2012) 2nd standard and amendments
35	Laoba village	Residential		Sides	8	240	
36	Shuijindong Village	Residential		Sides	1	30	
37	Tianyuan Hanlin Zun Mansion	Residential		right	119	800	
38	Hanlin Zunfu Kindergarten	school		right	143	160	
Total						37268	



Figure VII-1: Environmental Air Protection Targets During Operation (Garbage Transfer Station)

(4) Noise and Vibration Environmental Protection Targets: During the construction phase, there are 8 noise and vibration protection targets within 200 meters around the project (Table VII-1), including 6 villages, 1 residential

community, and 1 kindergarten. During the operational phase, there are 8 noise protection targets within 200 meters, including 6 villages, 1 residential community, and 1 kindergarten. The details of noise protection targets along the Entrance Trunk Road, the railway dedicated line, intermodal freight yard, and logistics park area are provided in Tables VII-3 to VII-5. Additionally, there is 1 vibration environmental protection target along the railway dedicated line during the operational phase, which is Laocun Village.

Table VII-3 Environmental Protection Targets for the Operation Period of the Entrance Trunk Road

No.	Name	Section	Mileage Range	Route Type	Orientation	Height Difference between Road Surface and Forecast Point (m)	Distance from Road Occupied Land Boundary (m)	Distance from Road Centerline (m)	Number of Households/Population in Different Functional Zones (Post-planning)			Environmental Protection Target Details	Relation to Route Position	Sensitive point photos
									Category 4a	Category 1	Category 2			
1	Hengling Village 1	Primary Highway Section	K0+000	Roadbed	Right	0	136	152	1/2	0	0	Scattered households in Hengling Village, with houses made of mixed brick structure, under construction, facing southwest, 2 stories. Located on the west side of the entrance trunk road, with S313 Provincial Road and eucalyptus forest between it and the entrance trunk road. This area belongs to S313 Provincial Road category 4a zone, and the environment is relatively noisy.		
	Hengling Village 2	Primary Highway Section	K0+460	Roadbed	Left	-1	87	100	0	1/4	0	Scattered households in Hengling Village, with houses made of mixed brick structure, facing north, 1 story. Located on the east side of the entrance trunk road, with artificial forest and farmland between it and the entrance trunk road. The environment is relatively quiet.		
2	Laoba Village 1	Primary Highway Section	K1+020 ~ K1+320	Roadbed	Left/Right	-3	129~160	143~175	0	6/25	0	Houses made of mixed brick structure, with a scattered distribution, facing northwest, 1-3 stories. There are artificial forests and farmland between it and the entrance trunk road, and the surrounding roads are rural, making the environment relatively quiet.		

No.	Name	Section	Mileage Range	Route Type	Orientation	Height Difference between Road Surface and Forecast Point (m)	Distance from Road Occupied Land Boundary (m)	Distance from Road Centerline (m)	Number of Households/Population in Different Functional Zones (Post-planning)			Environmental Protection Target Details	Relation to Route Position	Sensitive point photos
									Category 4a	Category 1	Category 2			
	Laoba Village 2	Primary Highway Section	K1+360 ~ K1+520	Roadbed	Right	-1~0	55~127	66~147	3/12	27/110	0	Houses made of mixed brick structure, more concentrated, facing southwest, 1-3 stories. There are artificial forests, farmland, and ponds between it and the entrance trunk road, and the surrounding roads are rural, making the environment relatively quiet.		
	Laoba Village 3	Primary Highway Section	K1+520 ~ K2+060	Roadbed	Right	+4~+7	8~85	28~105	2/8	21/85	0	Houses made of mixed brick structure, scattered, facing southwest, mainly 2-3 stories. There is farmland between it and the entrance trunk road, and the surrounding roads are rural, making the environment relatively quiet.		
3	Qingtang Village	Primary Highway Section	K2+580 ~ K3+740	Roadbed	Left/Right	0~+5	13~181	26~194	2/13	31/135	0	Houses made of mixed brick structure, scattered, mainly facing south, with 2-3 stories. There are artificial forests and farmland between it and the entrance trunk road, and the surrounding roads are rural, making the environment relatively quiet.		 

No.	Name	Section	Mileage Range	Route Type	Orientation	Height Difference between Road Surface and Forecast Point (m)	Distance from Road Occupied Land Boundary (m)	Distance from Road Centerline (m)	Number of Households/Population in Different Functional Zones (Post-planning)			Environmental Protection Target Details	Relation to Route Position	Sensitive point photos
									Category 4a	Category 1	Category 2			
4	Maxiong Village	Urban Main Road Section	K6+020 ~ K6+840	Roadbed	Left/Right	-3~ -8	22~153	40~173	1/5 (Category 4a); 1/5 (Category 4b)	0	16/62	Houses made of mixed brick structure, relatively scattered, facing south, mainly 2-3 stories. There are artificial forests and farmland between it and the entrance trunk road, with the Lijin Railway nearby, and the surrounding roads are rural.		
5	Shui Jin Dong Village	Urban Main Road Section	K7+660 ~ K8+780	Roadbed	Left	-1~ -8	1~143	23~172	1/5	17/75	0	Houses made of mixed brick structure, relatively scattered, facing south, mainly 2-3 stories. There are artificial forests and farmland between it and the entrance trunk road, with the Lijin Railway nearby, and the surrounding roads are rural.		
6	Hanlin Zunfu Kindergarten	Urban Main Road Section	K9+780	Roadbed	Right	-3	119	146	-	0	1 building/160	Houses made of mixed brick structure, facing south, 3 stories. There is the Lijin Railway and G325 Highway between it and the entrance trunk road, and the surrounding environment is relatively noisy.		

No.	Name	Section	Mileage Range	Route Type	Orientation	Height Difference between Road Surface and Forecast Point (m)	Distance from Road Occupied Land Boundary (m)	Distance from Road Centerline (m)	Number of Households/Population in Different Functional Zones (Post-planning)			Environmental Protection Target Details	Relation to Route Position	Sensitive point photos
									Category 4a	Category 1	Category 2			
7	Tianyuan Hanlin Zunfu	Zicai Street	K9+780	Roadbed	Right	-3	143	174	0	0	48/800	Houses made of mixed brick structure, facing south, 6 stories. There is the Lijin Railway and G325 Highway between it and the entrance trunk road, and the surrounding environment is relatively noisy.		

Note: "+" indicates the road surface is higher than the sensitive point; "-" indicates the road surface is lower than the sensitive point.

Table VII-4 Environmental Protection Targets for the Operation Period of the Dedicated Railway Line (Noise and Vibration)

Protection Target Name	Forecast Point	Administrative Area	Route Type	Mileage Range	Relation to Route Position	Distance from Outer Track Centerline (m)	Height Difference between Road Surface and Forecast Point (m)	Current Functional Area Division	Number of Households/Population		Environmental Protection Target Details	Route Position Relation Map (Purple Line represents the middle line of the railway)	Sensitive Point Photos
									Category 4b	Category 2			
1	Laocun Village 1	Qinbei District, Qinzhou City, Guangxi Zhuang Autonomous Region, Changtian Street	Embankment	K0+000	Left side	84	+4	Category 2	0	4/20	Houses are of mixed brick structure, facing west, 1-3 stories. Located on the east side of the dedicated railway line (84m), Lijin Railway (96m), and Yongbei Line Railway (192m), with vehicle passing causing noise.		
2	Laocun Village 1-1		Embankment	K0+145	Left side	95	+6	Category 2	0	1/5	Houses are of mixed brick structure, facing northwest, 3 stories. Located on the east side of the dedicated railway line (95m), Lijin Railway (124m), and Yongbei Line Railway (226m), with vehicle passing causing noise.		
3	Laocun Village 2		Frame Culvert, Embankment	K0+200 ~250	Left side	29	+6	Category 2	0	4/24	Houses are of mixed brick structure, facing northwest, 2-3 stories. Located on the east side of the dedicated railway line (29m), Lijin Railway (106m), and Yongbei Line Railway (225m), with vehicle passing causing noise.		
4	Laocun Village 3		Embankment	K0+315 ~370	Right side	37	+4	Category 2	0	4/24	Houses are of mixed brick structure, facing northwest, 2-3 stories. Located on the west side of the dedicated railway line (37m), Lijin Railway (142m), and Yongbei Line Railway (279m), with vehicle passing causing noise.		

Protection Target Name	Forecast Point	Administrative Area	Route Type	Mileage Range	Relation to Route Position	Distance from Outer Track Centerline (m)	Height Difference between Road Surface and Forecast Point (m)	Current Functional Area Division	Number of Households/Population		Environmental Protection Target Details	Route Position Relation Map (Purple Line represents the middle line of the railway)	Sensitive Point Photos
									Category 4b	Category 2			
5	Laocun Village 4		Embankment	K0+430~500	Right side	35	+4	Category 2	0	14/75	Houses are of mixed brick structure, facing north, 1-3 stories. Located on the west side of the dedicated railway line (35m), Lijin Railway (266m), and Yongbei Line Railway (420m), with surrounding rural roads and a quiet environment.		
6	Laocun Village 4-1		Embankment	K0+380~470	Right side	98	+4	Category 2	0	6/30	Houses are of mixed brick structure, facing north, 2-3 stories. Located on the west side of the dedicated railway line (98m), Lijin Railway (165m), and Yongbei Line Railway (337m), with surrounding rural roads and a quiet environment.		
7	Laocun Village 5		Embankment	K0+7000	Right side	90	+2.5	Category 2	0	6/28	Houses are of mixed brick structure, facing north, 2-3 stories. Located 308m from Lijin Railway, with surrounding rural roads and a quiet environment.		

Protection Target Name	Forecast Point	Administrative Area	Route Type	Mileage Range	Relation to Route Position	Distance from Outer Track Centerline (m)	Height Difference between Road Surface and Forecast Point (m)	Current Functional Area Division	Number of Households/Population		Environmental Protection Target Details	Route Position Relation Map (Purple Line represents the middle line of the railway)	Sensitive Point Photos
									Category 4b	Category 2			
8	Laocun Village 6		Embankment	K0+200~245	Right side	117	+5	Category 4	3/15	0	Houses are of mixed brick structure, facing south, 2-3 stories. Located between Lijin Railway (30m) and Yongbei Line Railway (27m), with vehicle passing causing noise.		

Note: "+" indicates the road surface is higher than the sensitive point; "-" indicates the road surface is lower than the sensitive point.

Table VII-5 Environmental Protection Targets for the Operation Period of the Intermodal Freight Yard and Logistics and Production Facilities

No.	Protection Target Name	Spatial Position			Distance to the Project Boundary	Direction	Number of Households/Population	Standard/Functional Area Category	Environmental Protection Target Details	Route Position Relation Map	Sensitive Point Photos
		X	Y	Z							
1	Laocun 9	/	/	/	21	West side of the park	11/55	Environmental Quality Standards for Noise Category 2	Houses are of mixed brick structure, facing north, 2-3 stories. Located 308m from Lijin Railway, with surrounding rural roads and a quiet environment.		
2	Laocun 10	/	/	/	43	North side of the park	14/70	Environmental Quality Standards for Noise (GB3096-2008) Category 1	Houses are of mixed brick structure, facing south, 3 stories. Surrounding roads are rural, with a quiet environment.		
3	Laocun 11	/	/	/	69	East side of the park	3/13	Environmental Quality Standards for Noise (GB3096-2008) Category 1	Houses are of mixed brick structure, facing west, 2 stories. Surrounding roads are rural, with a quiet environment.		



Figure VII-2: Environmental Protection Target Distribution Map

B. Construction Period Environmental Impact Analysis and Mitigation Measures

261. The main environmental impacts caused by construction activities include: (1) soil erosion; (2) temporary noise and traffic disturbances to nearby residents and schools; (3) air pollution (mainly dust); (4) impact on surface water; (5) solid waste disposal, including construction waste, workers' domestic waste, and oil-containing waste; (6) impacts on biodiversity; (7) occupational health and safety.

a. Soil Erosion

262. Excavation during the construction phase will damage or disturb the original surface vegetation, soil composition, and topography, leaving the topsoil exposed or forming loose piles that lose their original soil conservation ability. Under the influence of natural factors such as rainfall, this will cause new soil erosion.

263. In actual construction, the temporary land use is controlled within the scope of the land acquisition and does not extend beyond the red line. The following soil erosion control measures will be taken:

i) All sand and gravel materials will be purchased from the Construction Granite Mine Project in Modaoshui Mining Area, Dadong Town, Qinbei District, Qinzhou City. No spoil or waste disposal sites will be set up.

ii) Topsoil will be stripped before construction and stored in a temporary stockpile area. Temporary barriers, drainage, and sedimentation measures will be set up around the stockpile. Considering the long construction period, additional measures like sowing grass seeds and temporary coverings will be implemented to protect the topsoil.

iii) During construction, temporary drainage, sedimentation, and covering measures will be implemented. Water diversion ditches will be installed on slope surfaces. After construction, topsoil will be returned, and grass planting will be used for slope protection.

iv) The central median or side strips of the roadbed will be treated with topsoil restoration, shrub and tree planting, and grass seeding, along with maintenance measures.

v) Drainage pipes will be laid under the roadbed, permeable bricks will be used for sidewalks, and grass bricks will be used for parking lots.

vi) During underground construction, water interception measures will be implemented with sandbags.

vii) Signage and Warning Signs: Soil and water conservation awareness signs and warning signs will be erected at the entrance of the construction and site office area.

264. After implementing the above measures, the impact of soil erosion during the construction period will be minimal.

b. Surface Water

265. During the construction period, wastewater will mainly come from construction production wastewater and domestic wastewater from construction workers. Several ponds are located along the project route, and culverts will be set at intersection points, which may have certain adverse effects on the ponds.

266. Construction Wastewater: Maintenance and cleaning of machinery and vehicles will generate construction wastewater. Wastewater from concrete mixing and curing, as well as water and soil loss during construction, will also affect water quality. During construction, a centralized construction office area will be set up. The estimated amount of construction wastewater generated will be 2.0–5.0 m³/day, containing suspended solids (SS) (approximately 5000 mg/L) and oil (20 mg/L). Improper discharge may affect the surrounding water bodies. Construction wastewater will not be discharged into the surrounding soil or rivers. A sedimentation pool will be installed on-site, and an oil-water separator will be placed before the sedimentation pool for oil-containing wastewater. After sedimentation, the clear liquid will be recycled for dust control on-site, and the dry sludge can be used as backfill.

267. Domestic Wastewater from Construction Workers: The estimated average number of workers is 1272, spread out across the site. The estimated daily domestic wastewater discharge per worker is 0.12 cubic meters. Assuming that the concentrations of COD_{Cr}, BOD₅, and NH₃-N in domestic wastewater are 200 mg/L, 100 mg/L, and 20 mg/L, respectively, the estimated total wastewater volume will be 152.64 m³/day, with COD_{Cr}, BOD₅, and NH₃-N emissions of 30.52 kg/d, 15.26 kg/d, and 3.05 kg/d, respectively. According to domestic environmental assessments, the construction workers will rent houses nearby and will not set up a separate construction camp. Therefore, most of the domestic wastewater will be discharged into the existing sewage network and treated at nearby wastewater treatment plants.

268. Impact on River Water Quality: Several ponds are located along the project route, and culverts will be set at intersections to reduce channel relocation. During construction, the water quality will be disturbed, and suspended solids will increase in the short term. Additionally, excavation and clearing of rivers and ponds will significantly change the water quality and destroy aquatic life and vegetation. Therefore, bridge and culvert construction may have some negative effects on the ponds. The river and ponds along the route are not connected to the Qinjiang River, so the impact on the water hydrology during construction is localized and will gradually disappear after construction is completed.

269. The project will implement the following measures to minimize water

pollution:

i) Set up a sedimentation pool for construction wastewater, which will be treated and then recycled for dust suppression, machinery and vehicle washing, etc. The sludge in the pool will be dried and used as backfill.

ii) Cover soil piles, material storage areas, etc., and set up drainage ditches around the site. Sedimentation pools will be placed in low-lying areas. Surface runoff will be treated through sedimentation and reused. Any wastewater that cannot be reused will be discharged after obtaining the approval of relevant authorities. It is prohibited to discharge wastewater containing a large amount of sediment or untreated wastewater into municipal pipe networks and surface water bodies.

iii) Fuel, engine oil, and other harmful materials should be stored in impervious areas with oil-absorbent materials and cleaning facilities.

iv) Sufficient toilets will be provided near the construction site, and domestic sewage will be treated in septic tanks and regularly transported to the wastewater treatment plant.

v) It is strictly prohibited to randomly dispose of construction waste into rivers. During culvert construction, construction machinery must be maintained to prevent leakage, dripping, or spilling. If any fault occurs, the machinery should be returned to the shore for repair. For immovable machinery, if any leakage is found, it should be collected in containers and taken back to the shore for proper disposal.

vi) A third-party environmental monitoring agency will be responsible for monitoring the water quality of surface water near the construction site as required by the environmental and social management plan.

270. After implementing the above effective measures, the impact of wastewater on the surrounding water environment during the construction period will be minimal.

c. Air Quality

271. During the construction phase of the project, the primary sources of atmospheric environmental impacts are construction - generated dust and exhaust emissions from vehicles and construction machinery. Construction dust is produced during various processes, including earthwork excavation and backfilling, site grading, loading, unloading and stockpiling of building materials, vehicular movement, and concrete mixing. The primary pollutant associated with construction dust is Total Suspended Particulate Matter (TSP). Exhaust emissions from vehicles and construction machinery contain pollutants such as carbon monoxide (CO), hydrocarbons (HC), nitrogen oxides (NO_x), and sulfur dioxide (SO₂). Approximately six adjacent natural villages, one residential

community, and one kindergarten, with a combined population of 1,865, may be affected by dust pollution. (For the precise locations of these sensitive receptors, refer to Section A of this chapter.)

272. **Construction Dust.** Based on empirical data, during earth - excavation operations, when the daily excavation volume reaches 400 tons, the dust - affected area extends approximately 500 meters. Within this immediate vicinity, the concentration of Total Suspended Particulate Matter (TSP) exceeds the Class II standard of *Ambient Air Quality Standard (GB3095 - 2012)* by several to over tenfold. The TSP concentration returns to the Class II standard at a distance of around 600 meters. Dust generated from open - air material stockpiling surpasses the Class II standard within a 150 - meter radius. Vehicle - induced dust, which accounts for approximately 60% of the total dust emissions, impacts an area within 100 meters. Given that the closest residential settlement to the project site is merely 8 meters from the boundary, failure to implement mitigation measures will inevitably result in air pollution..

273. **Vehicle and Construction Machinery Exhaust Emissions.** During construction, a variety of transportation vehicles (e.g., transport trucks, dump trucks) and construction machinery (e.g., excavators, forklifts, bulldozers) operating on - site will emit exhaust gases. These emissions are characterized by dispersed sources, localized and short - term impacts, which dissipate upon project completion..

274. **Air Quality Impact Assessment.** Monitoring data from comparable construction projects indicate that at a distance of 50 meters from machinery operation areas, the 1 - hour average concentrations of carbon monoxide (CO) and nitrogen dioxide (NO₂) are 0.20 mg/m³ and 0.13 mg/m³, respectively, while the daily average concentrations are 0.13 mg/m³ and 0.062 mg/m³. All values comply with the Class II standards specified in *Ambient Air Quality Standard (GB3095 - 2012)*. Post - emission, the exhaust from construction machinery and vehicles rapidly dilutes and disperses in the atmosphere, posing minimal risk to ambient air quality at sensitive receptors..

275. To minimize air pollution during the construction phase, the following control measures are imperative:

i) A phased and progressive construction approach shall be adopted, with each excavation segment limited to a maximum length of 1,000 meters, thereby minimizing the area of exposed soil and ground surfaces.

ii) Coverage of exposed areas (including earthworks). Over 80% of each independent exposed surface must be covered, with the integrity of such covering measures maintained at 90% or higher. Acceptable covering methods include steel plates, dust-proof nets (cloths), vegetation, or other measures of equivalent efficiency.

iii) Construction enclosures with a minimum height of 2.5 meters shall be installed around construction sites adjacent to villages and residential areas;

enclosures in other areas shall be at least 1.8 meters high. A spill-proof base of no less than 20 centimeters in height shall be installed beneath the enclosures to prevent dust leakage. Enclosures must be constructed from rigid materials such as metal, concrete, or plastic. Gaps between adjacent enclosures or between enclosures and spill-proof bases shall not exceed 0.5 centimeters, and enclosures must be free from obvious holes or damage.

iv) Coverage of dust-prone materials. All dust-prone materials, including sand, lime-soil, and mortar, must be fully covered with impermeable dust-proof cloths or stored in enclosed facilities with covers on top and sides. The integrity of dust-proof cloths or enclosures shall be maintained at over 95%, except for small quantities of materials to be used within an 8-hour period.

v) Special personnel shall be assigned to be responsible for cleaning work at the construction site, equipped with sprinkling equipment, and regular sprinkling and cleaning shall be carried out.

vi) The main roads, processing areas, and living and office areas at the construction site shall be hardened. Roads used for vehicle passage shall be paved with concrete to meet the requirements of safe vehicle operation and shall be free from damage. There shall be no obvious dust on the vehicle roads at any time, and sprinkling measures must be taken when cleaning the roads.

vii) Install washing devices for transport vehicles. Special personnel shall be assigned to be responsible for washing and cleaning to ensure that vehicles leave the site without carrying mud. Before transport vehicles leave the construction site, the wheels, vehicle body, and troughs shall be cleaned or washed to ensure that the vehicles are clean on the road. Vehicles transporting earth, muck, and other materials that are prone to dust shall take sealing or covering measures.

viii) When loading and unloading construction waste and building materials that are prone to dust, sprinkling, spraying wet operations, shielding, or other dust removal methods shall be adopted to effectively control dust.

ix) Strengthen the prevention and control of air pollution from engineering machinery. Use non - road mobile machinery that has been registered with information codes in Qinzhou City and meets emission standards; it is strictly prohibited to use high - emission non - road mobile machinery. The use of high - emission engineering machinery with black smoke (including excavators, loaders, graders, pavers, rollers, forklifts, etc.) is prohibited at all construction sites. It is encouraged to give priority to using non - road mobile machinery that meets the fourth - stage emission standards specified in China's *Emission Limits for Exhaust Pollutants from Diesel Engines for Non - Road Mobile Machinery* or new energy non - road mobile machinery.

x) Sign disposal contracts or direct utilization agreements with transportation and construction waste disposal units. It is necessary to use qualified transportation units to transport construction waste, earth, sand, and gravel,

and implement closed - type transportation.

xi) In accordance with the requirements of the project's environmental and social management plan, air quality shall be monitored and inspected in a timely manner during the construction process.

276. The implementation of the above mitigation measures can effectively reduce the overall impact of construction dust on the regional ambient air quality. Measures such as progressive phased construction, coverage of exposed ground, installation of enclosures, coverage of dust - prone materials, regular sprinkling and cleaning, road hardening, vehicle washing, and wet operations can significantly reduce the amount of dust generated. For example, sprinkling dust suppression measures 4 - 5 times a day can reduce dust by about 70%; controlling dust from vehicle transportation can effectively inhibit the diffusion of road dust. The synergistic effect of multiple measures can significantly reduce the TSP concentration in the atmosphere in and around the construction area, and fundamentally control the pollution degree of construction dust to the atmospheric environment.

277. For sensitive points such as villages, residential areas, and kindergartens, the 2.5 - meter - high enclosures (around villages and residential areas) and corresponding spill - proof bases can effectively block the diffusion of dust; measures such as material coverage and vehicle washing reduce the generation and spread of dust; phased construction shortens the exposure time of earthworks and reduces the impact of dust. It is estimated that after the implementation of the measures, the TSP concentration at sensitive points can be controlled within the Class II standard of the *Ambient Air Quality Standard*.

278. In conclusion, after the implementation of the above mitigation measures, the impact on the atmospheric environment during the construction period can be effectively controlled, and there will be no significant deterioration of the ambient air quality at the project site. The impact during the construction period is temporary, and with the completion of construction, the relevant atmospheric environmental impacts will completely disappear. During the construction process, air quality will be continuously monitored in accordance with the environmental and social management plan to ensure that all environmental protection measures are implemented in place.

d. Noise

279. During construction, noise is expected to increase significantly in local areas. Heavy machinery such as excavators, bulldozers, concrete mixing plants, loaders, graders, road rollers, etc., generate noise during construction activities. The transport of construction materials also generates noise. The noise generated by the construction of the pipeline is generated by ditch excavators, rollers and compaction machinery.

280. The construction period can be divided into 4 stages: earthwork stage,

foundation construction stage, structural construction stage and decoration stage:

281. The main noise sources in the earthwork stage are moving sound sources without obvious direction, including excavators, bulldozers, loaders, dump trucks and various transport vehicles.

282. Foundation construction stage: The main noise source in the foundation construction stage is all kinds of pile drivers and some well drilling machines, mobile air compressors, etc. These noise sources are basically stationary sources. Although the foundation construction stage is very short, the noise intensity is very high, generally 90~105dB(A).

283. The structural construction stage is the stage with the longest cycle in building construction, and there are many types of equipment used and many main sound sources, including concrete mixers, heavy machinery, cranes, and transport vehicles.

284. The decoration stage generally accounts for a longer proportion of the total construction time, but the number of sound sources is smaller, and the strong noise sources are fewer, and the main noise sources include grinders, electric drills, elevators, cranes, cutting machines, etc. Most sound sources have low sound power, ranging from 85~95dB(A) to a short duration.

285. The source of noise pollution during the construction period is mainly generated by construction machinery. Table VII-6 lists the noise values of single machines running at full load of construction machinery, and Table VII-7 shows the prediction results of noise impact at different distances when the main construction machinery is running at full load during the construction period.

Table VII-6 Noise Prediction Results for Major Construction Machinery

Serial No.	Machinery Type	Noise Levels at Different Distances from the Construction Point (dB(A))									
		5m	10m	20m	40m	60m	80m	100m	150m	200m	300m
1	Wheel Loader	90	84	78	72	69	66	65	61	58	55
2	Grader	90	84	78	72	69	66	65	61	58	55
3	Vibratory Roller	86	80	74	68	65	62	61	57	54	51
4	Double Drum Vibratory Roller	81	75	69	63	60	57	55	52	49	46
5	Three-Wheel Roller	81	75	69	63	60	57	55	52	49	46
6	Pneumatic Tyre Roller	76	70	64	58	55	52	50	47	44	41
7	Bulldozer	86	80	74	68	65	62	61	57	54	51
8	Tyre-Hydraulic	84	78	72	66	63	60	59	55	52	49

Serial No.	Machinery Type	Noise Levels at Different Distances from the Construction Point (dB(A))									
		5m	10m	20m	40m	60m	80m	100m	150m	200m	300m
	Excavator										
9	Concrete Mixer	65	59	53	47	44	41	39	36	33	30
10	Impact Drilling Machine	73	67	61	55	52	49	47	44	41	38

Note: The noise level at 5m is the measured value.

Table VII-7 Noise Prediction Results for Simultaneous Operation of Multiple Construction Machinery

Serial No.	Machinery Combination	Noise Levels at Different Distances from the Construction Point (dB(A))						
		20m	40m	60m	100m	200m	300m	400m
1	Loader, Bulldozer, Grader, Excavator	82.2	76.2	72.7	68.7	62.2	58.7	56.2
2	Roller, Paver, Concrete Mixer	79.1	73.5	70.0	67.0	66.0	59.5	56.0

286. Single Machinery Operation: During the earthworks phase, the daytime noise level at a distance of 50 meters from the construction machinery will meet the "Noise Limits for Construction Sites" (GB12523-2011), which allows for a maximum daytime noise level of 70 dB(A). During nighttime construction, the noise level at a distance of 300 meters will meet the nighttime standard of 55 dB(A) as per GB12523-2011. During the structural phase, daytime noise at 40 meters from construction machinery will meet the daytime noise standard of 70 dB(A), and nighttime noise at 200 meters will meet the nighttime noise standard of 55 dB(A).

287. Simultaneous Operation of Multiple Machines: During the daytime, noise levels from multiple machines operating together will meet the "Noise Limits for Construction Sites" (GB12523-2011) daytime standard of 70 dB(A) beyond 85 meters from the source. During the nighttime, noise levels will meet the nighttime standard of 55 dB(A) beyond 450 meters.

288. According to the *Environmental Quality Standards for Noise (GB3096-2008)*, Class I standards and the World Bank's Environmental, Health, and Safety (EHS) Guidelines for residential and educational zones, the maximum allowable distance for noise compliance for single-machine operation is 300 meters during the daytime and 500 meters during the nighttime. Since construction sites typically involve multiple machines operating simultaneously, the actual compliance distance will be much greater than the distances listed in the table.

289. The project involves sensitive points such as Hengling Village, Laoba

Village, Qingtang Village, Maxiong Village, Shuijingdong Village, Hanlin Zunfu Community, and Hanlin Zunfu Kindergarten, with many surrounding residents. Among these, the kindergarten and other sensitive areas require special attention. Construction noise during the construction period will cause varying degrees of disturbance to residents. The contractor is required to implement the following noise mitigation measures to comply with domestic and World Bank noise standards and protect sensitive points. Some measures are universal and can be applied to all construction sites and activities, and these measures are also outlined in the World Bank's "Environmental, Health, and Safety Guidelines". During the construction phase, the contractor should:

(i) Special attention will be given to six natural villages, one residential community, and one kindergarten (total population 1,865) located within 200 meters of the construction site. This includes:(a) Consultation with community representatives before any construction begins to clarify the exact construction schedule, nature of the project, equipment used, safety measures, and public access routes during construction;(b) Installing sound barriers to reduce noise emissions as much as possible;(c) Reaching an agreement on the construction period each day.

(ii) Construction should be prohibited between 10:00 PM and 6:00 AM.

(iii) Use low-noise machinery or equipment with soundproofing, ensure regular maintenance and repairs of equipment, and keep noise levels to a minimum.

(iv) Install temporary soundproof barriers or enclosures around noisy equipment.

(v) Provide suitable hearing protection devices (earmuffs) to workers when operating around noisy equipment (e.g., piling).

(vi) Horn use should be prohibited unless absolutely necessary, and whistle use should be minimized.

(vii) High-noise activities (e.g., crushing, concrete mixing) should be carried out more than 1 kilometer away from sensitive areas.

(viii) In construction sites near sensitive locations like schools, extra caution should be taken. If construction activities during the school term are unavoidable, the use of heavy equipment should be restricted to weekends and non-school hours.

(ix) Regular monitoring of noise levels in areas prone to disturbance. If noise exceeds the standards, the equipment and construction conditions should be checked, and mitigation measures should be implemented.

(x) Regular face-to-face meetings with residents near the project to identify noise disturbances. Community feedback will be used to adjust the working hours of noisy machinery.

(xi) Consult with local communities to formulate a construction schedule that places the noisiest activities during the daytime to minimize disturbance.

(xii) Use noise control devices, such as setting up temporary sound barriers or enclosures during impact or crushing activities, and installing silencers on internal combustion engines.

(xiii) Avoid or minimize transportation of materials through community areas.

290. Construction noise impacts will be short-term. Sensitive points will be affected to varying degrees, but the impact will be temporary, localized, and limited. By implementing the mitigation measures outlined above, the potential noise impact during the construction phase can be reduced to an acceptable level.

e. Vibration

291. The main sources of vibration during construction are various construction machinery, heavy transport vehicles, and pile foundation construction. The construction machinery and equipment include excavators, bulldozers, heavy transport trucks, rollers, drilling-grouting machines, air compressors, mobile cranes for loading and unloading, and specialized machinery for plate track operations. According to comparative surveys and monitoring, the vibration values at different distances from major construction machinery and vibration sources are shown in the table below.

Table VII-8 Vibration Values of Construction Machinery (VLz: dB)

Construction Machinery	Distance from Vibration Source (m)			
	5	10	20	30
Diesel Pile Driver	104~106	98~99	88~92	83~88
Vibratory Pile Hammer	100	93	86	83
Pneumatic Drill	88~92	83~85	78	73~75
Excavator	82~94	78~80	74~76	69~71
Roller	86	82	77	71
Air Compressor	84~86	81	74~78	70~76
Bulldozer	83	79	74	69
Heavy Transport Truck	80~82	74~76	69~71	64~66

292. From the table above, it can be seen that the pile driver generates the most intense vibrations among the listed construction machinery. The vibration generated by construction machinery decreases with distance. At 30 meters from the machinery, the vibrations are unlikely to reach the "residential and educational areas" environmental vibration standard.

293. To mitigate the impact of construction machinery vibrations on surrounding residents, measures should be taken to avoid nighttime

construction. If nighttime construction is unavoidable, an application for a nighttime construction permit should be submitted to the environmental protection authority. After approval, construction can proceed, and the construction time and location should be announced to the nearby residents to seek their understanding.

294. The vibration during construction is short-term and intermittent. After the construction period ends, its impact will also cease. It will not have a long-term impact on the environmental noise standards of surrounding areas. With reasonable construction scheduling and proper personnel protection, its impact is minimal.

f. Solid Waste

295. The main sources of solid waste pollution during construction are the construction workers' domestic waste, construction debris, excavated soil and stone, and oil-containing waste generated during construction.

296. After the comprehensive utilization of excavated soil and stone, no waste will be generated. Other construction waste generated by the project should be recycled according to the building waste management regulations. Non-recyclable materials should be entrusted to a qualified construction waste disposal unit to be transported to the Yinyuan Construction Waste Disposal Site. Hazardous waste should be temporarily stored in a hazardous waste storage area at the construction site before being handled by a qualified disposal unit.

297. The construction workers' domestic waste during construction, based on the estimated number of workers as shown in the table below, will generate 1208.52 tons of waste. This will be collected by the local sanitation department and transported to the Hainuoer Urban Domestic Waste Incineration Plant for disposal.

Table VII-9 Construction Workforce Breakdown

Position	Position Type	Logistics & Processing Facilities	Intermodal Freight Yard	Supporting Infrastructure	Total
Temporary Positions during Construction	Technical	432 people	267 people	225 people	924
	Non-technical	120 people	165 people	100 people	385
	Subtotal	505 people	432 people	335 people	1272 people
Construction Period		2 years	3 years		/
Waste Generation		368.65 t	839.87 t		1208.52 t

298. Yinyuan Construction Waste Disposal Site is located in Laohutan Village, Youbu Village Committee, Shabu Town, Qinzhou District, Qinzhou City,

covering an area of 325,167.5 square meters (487.8 mu) with a designed disposal capacity of 4.7 million cubic meters. The disposal site will sort construction waste and use construction waste recycling equipment to crush and process recyclable construction waste (concrete blocks, waste bricks and tiles, gravel blocks) into re-usable sand and gravel aggregates. The entrained muck, mud, sand, waste mortar, etc. will be disposed of by landfilling. The environmental impact assessment of the disposal site was approved in October 2023, and it was put into use in January 2025. As of the end of June 2025, the landfill volume of construction waste reached 100,000 cubic meters..

299. The average transport distance from the construction site to the disposal site is considered to be 26 kilometers. The transportation route is shown in Figure V-3. The dump trucks will use the outer ring road to transport the waste to the disposal site, bypassing the main urban areas, minimizing the impact on surrounding residents.

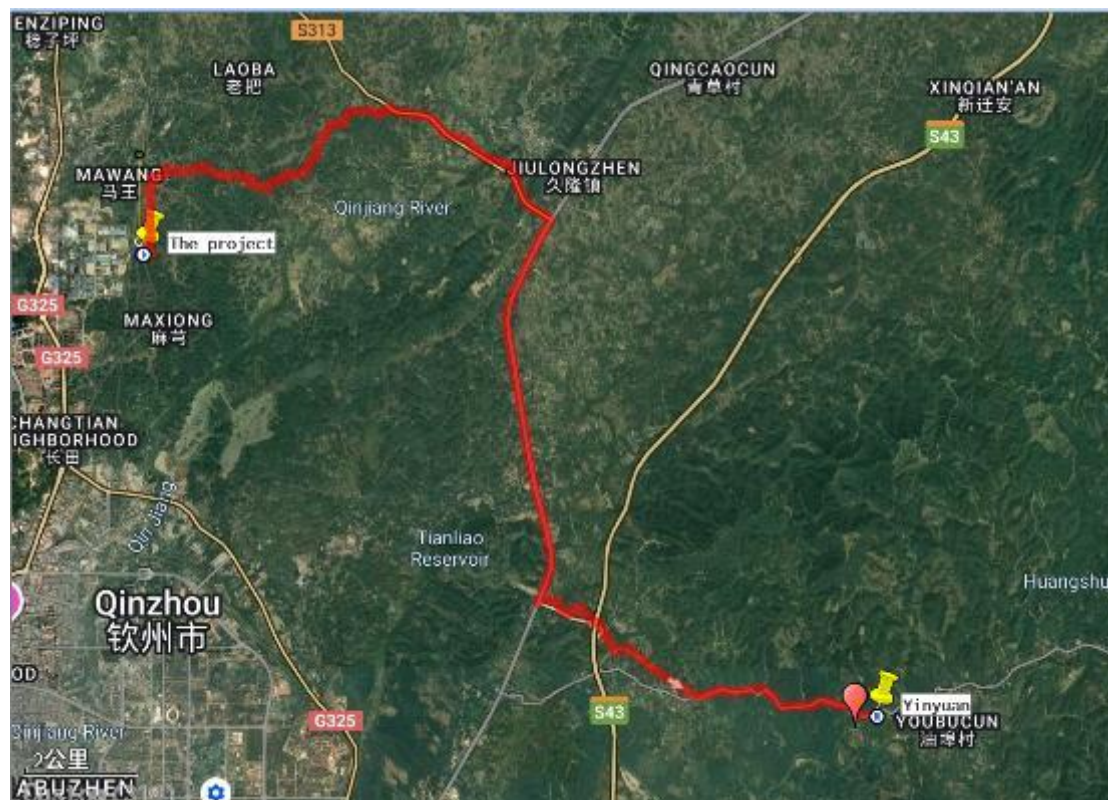


Figure VII-3: Construction Waste Transportation Route

g. Biodiversity

300. A more detailed analysis of the project's impact on biodiversity can be found in the biodiversity investigation and assessment report for this project.

(1) Impact on Plants

301. The impact of construction on plants mainly occurs within the project's

land area. The route passes through an area with frequent human activity, including economic forests, timber forests, and village residential areas. The long-term development activities and vegetation destruction have led to a vegetation cover with clear artificial characteristics and homogeneity within the survey area.

302. The plant types in the construction area mainly consist of common vegetation types such as eucalyptus forests, Chinese pine forests, bamboo forests, and shrublands. The vegetation in the area consists of natural and artificial plants. Natural vegetation is primarily secondary grasslands, such as Five-Section Grass and Cogon Grass, while artificial vegetation includes timber forests, economic forests, and crops, with dominant species being eucalyptus, Chinese pine, Jasmine, corn, tamarisk, and various grasses.

303. The main impact of construction on plants will be the destruction of original vegetation due to excavation, grading, and changes in soil structure, leading to a loss of biomass and productivity.

304. The project will implement the following measures to mitigate the impact on plants during construction:

i) If protected plants such as *Cibotium barometz* are found at the construction site, the project management department should be consulted for protection. If ancient trees or trees protected by local forestry departments are identified, the management department should be notified for protection. These plants should be transplanted to similar environments after conducting a reproduction study to ensure successful transplantation.

ii) Among the trees to be felled, priority should be given to transplanting protected species, followed by young forest trees.

iii) The cutting of trees outside the designated land area is strictly prohibited. Additionally, fire prevention education should be emphasized, fire warning signs should be placed around the construction area, and emergency measures for forest fire management should be prepared.

iv) Permanent and temporary cultivated soil or surface soil should be preserved to provide good soil conditions for vegetation. Topsoil from permanently or temporarily occupied cultivated land or forests should be collected and preserved for later reclamation and vegetation restoration.

v) Excavation for pipelines should avoid rainy days, and the trench width should follow the design specifications. Temporary soil piles on trench sides should be covered, and after pipeline installation, the trench should be backfilled according to regulations. Vegetation should be restored after the construction is completed.

vi) For compensation of permanent forest land occupation, the principle of local

restoration should be followed. Restoration areas should fully utilize existing forest gaps, available forest land, and barren land, and the number of trees restored should not be less than the area of forest land occupied. Vegetation restoration should be carried out under the guidance of the local forestry department.

vii) The selection of tree species for greening should prioritize native species suited to the local climate, consistent with surrounding vegetation. Trees such as Blue Pine, Soybean Tree, and Acacia, shrubs like Gray Berry Tree and Tiger Thorn, and herbs like Five-Section Grass, Cogon Grass, and Bamboo Grass should be chosen. Invasive foreign species like Xanthium and Parthenium should be avoided. The greening design should aim to be completed in a short period to prevent the invasion of alien species and should incorporate a mix of tree, shrub, and grass species to enhance resistance to such species.

305. No national key protected wild plants or ancient trees were found within the project evaluation area. The affected plants are common species in the evaluation area with broad growth ranges and strong adaptability. The construction will not significantly impact the ecological integrity or important species' habitats in the area. There is no risk of plant species extinction due to land occupation. After implementing the mitigation measures, the construction will have a minimal impact on plant biodiversity.

(2) Impact on Animals

306. The impact on animals during construction is mainly the destruction of the ecological environment where the animals feed on the grounds, including the cutting and blasting of agricultural and forestry vegetation in the construction area, the noise generated by blasting, the interference of construction personnel and construction machinery, etc., so that the evaluation area and its surrounding environment are changed.

307. As there are a large number of habitats of the same type distributed in the surrounding area of the proposed project, wild animals can generally find suitable habitats in the surrounding areas after being affected; The affected forest land is mainly arbor woodland, which is frequently disturbed by human activities, and the species and quantity of wild animals distributed in it are limited, and the impact is small. With the completion of the proposed project, the impact of construction period disruption will disappear.

308. The following measures will be taken to minimize the impact of the construction period on the project animals:

i) Publicize wildlife protection regulations, raise construction workers' awareness of protection, and strictly prohibit the hunting of wild animals;

ii) Try to avoid the disturbance of nearby protected birds by mechanical noise, and standardize construction behavior, and prohibit construction personnel from hunting and killing. Most of the wild birds go out to forage in the morning,

dusk or night, noon is the rest time of birds, and the breeding time of birds and fish is generally 4~7 months, so as to reduce the disturbance to wild animals by controlling construction methods and avoiding wild animal activities and key periods of breeding;

iii) Avoid the use of noisy machinery in the evening and at night as far as possible to prevent adverse effects of light and noise on mammals.

309. After the above mitigation measures are taken during the construction period, many migrating mammals will gradually return to their original habitats during the operation period, with the gradual recovery of vegetation, the improvement of the ecological environment, and the reduction of human disturbance. In summary, the impact of engineering construction on animals is in the acceptable range of low impact, and its impact will gradually disappear with the completion of the project.

h. Occupational Safety and Health

310. The construction industry is considered one of the most dangerous industries. Heavy use of heavy construction machinery, tools and materials creates physical hazards, including noise and vibration, dust, handling heavy loads and equipment, falling objects, working on slippery surfaces, fire hazards, and chemical hazards such as toxic fumes and others.

311. To mitigate potential health and safety risks to workers during the construction and operation of the project, the following measures will be taken:

i) Comply with the relevant domestic norms on occupational health and safety, such as the General Code for Safety, Health and Occupational Health in Construction and Municipal Construction Sites, and follow the requirements of the Occupational Exposure Limits for Risk Factors in the Workplace, the Catalogue of Occupational Diseases, the Classification Catalogue of Occupational Hazard Factors, and the Environmental and Health Standards for Construction Sites, and establish a regular monitoring system for occupational diseases and occupational hazards;

ii) Establish and improve the construction supervision and management system, and set up construction safety supervisors at the construction site;

iii) Organize regular training for workers on occupational health and safety and emergency response; Develop an emergency preparedness and response plan for accidents and emergencies with clear reporting procedures. This includes environmental and public health emergencies related to hazardous material spills and similar incidents. Establish an emergency hotline with the People's Hospital of Qinbei District, Qinzhou City, where the demonstration area is located.

iv) Construction site hygiene: (a) provide a clean and adequate supply of fresh

water to the site; (b) Each contractor shall provide good hygiene, adequate toilet facilities and waste management and segregation; (c) Effective site cleaning and disinfection by spraying phenolic water for disinfection during the land formation process. Disinfect toilets and garbage cans to ensure regular removal of solid waste; (d) Conduct at least one rodent control campaign every three months and at least two mosquito and fly control campaigns per year; (e) Provide public toilets in the living areas (if any) of the construction site according to the requirements of the labour administration and health authorities, and employ full-time personnel to be responsible for cleaning and disinfection; (f) Life on the construction site should be discharged to the municipal sewer system or used for on-site treatment using a mobile system.

v) Occupational safety: (a) Provide all construction workers with personal protective equipment (safety helmets and shoes, recognizable vests, and safety belts and protective gear for working in the air) that meet Chinese national standards, and strictly require all workers to wear personal protective equipment; (b) To provide goggles, gloves and breathing masks when workers carry out interior renovation works; (c) Provide earplugs when workers are operating or working around motorized equipment.

vi) Disease prevention, health services: The following disease prevention measures and health services should be adopted: (a) Before coming to the site to work, construction workers should undergo a medical examination. If a patient is found to have an infectious disease, he or she must be isolated and treated immediately to prevent the spread of the disease. (b) In accordance with the requirements of the "Construction Site Environmental and Health Standards", the first-aid equipment that should be equipped on the construction site includes common medicines, tourniquets, bandages, disinfectants, stretchers, etc.; (c) Provide basic training to all workers on hygiene, health and safety matters and construction hazards. A programme on protection against HIV/AIDS and other communicable diseases has been implemented for workers and local communities. Focus on occupational health and safety issues for all staff and post eye-catching publicity materials on construction sites. (d) Establish a records management system that will store and maintain relevant records in case of loss or damage. These records include recording and reporting occupational accidents, illnesses, and incidents. Records will be audited during compliance monitoring and auditing.

312. The project can effectively manage these risks through the implementation of an environmental and social management plan, including mitigation measures, capacity building, inspection, monitoring and reporting.

i. Cultural resources

313. According to the information consulted and the site visits, there are no known cultural heritage or archaeological sites at the project site. However, construction activities may interfere with unknown subterranean cultural remains.

314. Article 5 of the Law of the People's Republic of China on the Protection of Cultural Relics stipulates that all cultural relics remaining in the ground, internal waters and territorial waters within the territory of the People's Republic of China shall belong to the State. Therefore, any unit or individual who discovers cultural relics or cultural relics should immediately report to the county-level cultural relics protection department, and the county-level cultural relics protection department will organize relevant experts to go to the site for investigation as soon as possible; If cultural relics are discovered during the construction of the project, the units and individuals responsible for the construction and construction must immediately stop the construction and protect the site.

315. To address this issue, the following procedures shall be initiated immediately upon the discovery of cultural resources:

(i) If any material or cultural resources are discovered, the construction activities shall be stopped immediately and appropriate protective measures shall be taken;

(ii) In accordance with the laws of the People's Republic of China, it is strictly forbidden to destroy, damage, deface or conceal material and cultural resources;

(iii) The Cultural Relics Protection Bureau shall be notified promptly, and its advice shall be sought.

(iv) Construction activities may only resume after a comprehensive and thorough investigation has been conducted and permission has been obtained from the local Cultural Relics Bureau.

C. Operational Phase Environmental Impact Analysis and Mitigation Measures

316. The main environmental risks during the project's operational phase include: (i) potential groundwater, surface water, and/or soil contamination resulting from project operations; refrigerant leaks; (ii) increased waste generation due to additional personnel; and (iii) noise and vibration disturbances to nearby sensitive receptors. All facilities will be managed by the Project Implementation Unit. The Implementation Unit will develop specific Operation and Maintenance (O&M) procedures for each sub-component and provide relevant O&M training to personnel.

a. Surface Water

317. Water consumption quotas for the storage and logistics buildings and their supporting facilities are determined according to the "Code for Design of

Outdoor Water Supply Engineering" (GB 50013-2006). Fire-fighting water demand (which is not counted as normal water consumption) is calculated based on the "Technical Code for Fire Protection Water Supply and Hydrant Systems" (GB 50974-2014), considering the building with the highest demand and assuming one fire incident occurring at a time. Unforeseen water demand is estimated at 10% of the total calculated water consumption.

318. Details of the project's water use and drainage are provided in the table below.

Table VII-10 Water Consumption and Drainage Overview After Project Completion

Water User	Water Quota	Quantity	Usage Time (h)	Hourly Variation Coefficient	Maximum Daily Water Consumption (m³/d)	Maximum Daily Wastewater Discharge (m³/d)
Office Service Personnel	60L/person • shift	5000	8	2.5	300	240.00
Loading/Unloading Personnel	60L/person • shift	64	8	2.5	3.84	3.07
Temporary Staff	60L/person • shift	500	8	2.5	30	24.00
General Storage Center	5L/m²•d	8640	10	1.2	43.20	38.88
Trade Logistics Center B1	5L/m²•d	5994	10	1.2	29.97	26.97
Trade Logistics Center B2	5L/m²•d	4590	10	1.2	22.95	20.66
Agricultural Logistics & Storage Center 1	5L/m²•d	10030	10	1.2	50.15	45.14
Agricultural Materials Logistics & Storage Center 2	5L/m²•d	5994	10	1.2	29.97	26.97
Cross-border E-commerce Logistics & Storage Center 1	5L/m²•d	5022	10	1.2	25.11	22.60
Cross-border E-commerce Logistics & Storage Center 2	5L/m²•d	5022	10	1.2	25.11	22.60
Cross-border E-commerce Logistics & Storage Center 3	5L/m²•d	5022	10	1.2	25.11	22.60
Cross-border Cold Chain Logistics Center 1	5L/m²•d	8389	10	1.2	41.95	37.76
Cross-border Cold Chain Logistics Center 2	5L/m²•d	8389	10	1.2	41.95	37.76
Cross-border Cold Chain Logistics Center 3	5L/m²•d	8389	10	1.2	41.95	37.76
Green Space Irrigation	3L/(m²•d)	67225	10	1	201.68	181.51
Road Sprinklin	2L/(m²•d)	132942	10	1	265.88	239.29

Unforeseen Water Consumption	10% of the above total water consumption	117.88	106.09
Total		1296.68	1133.65

319. During the operational phase of the project, the volume of domestic wastewater and wastewater from the logistics and storage areas (primarily floor cleaning water) generated is 1,133.65 m³/d. During the project's construction phase, supporting facilities such as grease traps, septic tanks, and a sewage pipeline network will be established. Oily wastewater from the canteen in the Intermodal Freight Yard Comprehensive Building and the hotel in the logistics park service center will be treated by a "grease trap + septic tank" process before entering the park's sewage pipeline network. Domestic wastewater generated in other areas will be treated in septic tanks before being discharged into the park's sewage pipeline network and subsequently sent to the Huangma Wastewater Treatment Plant. The main pollutant concentrations in the domestic wastewater are COD: 400 mg/L, BOD₅ : 140 mg/L, NH₃-N: 35 mg/L, SS: 200 mg/L, and animal/vegetable oil: 45 mg/L. After treatment in septic tanks, the effluent can meet the "Integrated Wastewater Discharge Standard" and the inlet water quality requirements of the Huangma Wastewater Treatment Plant.

320. Waste Transfer Station Wastewater. Wastewater from the transfer station primarily consists of leachate, vehicle wash water, workshop cleaning wastewater, deodorization equipment wastewater, and initial rainwater, with a total generation volume of 6.45 m³/d. This wastewater will be uniformly collected in a leachate collection tank and transported daily via sealed tanker trucks to the Qinbei District Huangma Wastewater Treatment Plant for treatment.

321. According to the survey of relevant facilities in Chapter IV of this report, the spare treatment capacity of the Huangma Wastewater Treatment Plant is 13,000 tons per day, which is sufficient to accept the wastewater generated by this project.

322. The mitigation measures for surface water pollution during the project's operational phase are as follows:

i) Domestic wastewater and wastewater from storage and logistics areas, after treatment in septic tanks, must meet the "Integrated Wastewater Discharge Standard" (GB8978-1996) Level III standards and the inlet water quality requirements of the Qinbei District Huangma Wastewater Treatment Plant, before being ultimately discharged to the Huangma Wastewater Treatment Plant.

ii) Wastewater from the waste transfer station mainly consists of leachate, vehicle wash water, workshop cleaning wastewater, deodorization equipment wastewater, and initial rainwater, with key pollution indicators including pH, COD, SS, and ammonia nitrogen. This wastewater will be uniformly collected in a leachate collection tank and transported daily via sealed tanker trucks to the Qinbei District Huangma Wastewater Treatment Plant for treatment.

iii) Surface runoff resulting from rainfall during the operational period will be discharged into the comprehensive drainage system and, after sedimentation,

released into surface water bodies. Vehicles carrying leaking or unpacked/overloaded cargo are strictly prohibited from using the roads to prevent soil and water pollution along the route caused by spilled materials. Side ditches, catch drains, and rectangular covered gutters along the entire route should be cleaned regularly to ensure the drainage system remains unblocked.

b. Groundwater

323. The path through which pollutants from the source enter the groundwater is known as groundwater pollution pathways. These pathways are diverse. The logistics and production facilities do not involve the storage or transportation of toxic, harmful, or dangerous chemicals, nor do they involve production or processing. The wastewater generated in the project area is primarily domestic sewage and warehouse logistics wastewater (mainly from ground cleaning). The main potential groundwater pollution pathways in the operation phase are the leaching of oil substances from the hazardous waste storage area and wastewater from the septic tanks into the groundwater. The mitigation measures to prevent groundwater pollution during the operation phase are as follows:

(i) All storage areas within the project site will be paved and impermeably treated to prevent seepage. Wastewater will be collected via the pipeline network, treated in septic tanks, and then conveyed through the pipeline network to the final destination, the wastewater treatment plant.

(ii) The temporary hazardous waste storage room will implement measures to prevent leakage, overflow, and corrosion.

(iii) Management will be strengthened by enhancing the technical skills of operational personnel. A regular inspection plan will be established, with designated personnel periodically checking the sewage pipelines and the condition of the ground impermeability measures.

c. Waste Gas

324. Internal Combustion Engine Exhaust Gases. The project's traction locomotives utilize internal combustion engines operating on diesel fuel. During locomotive operation, a small amount of exhaust gases will be produced. All vehicles within the project site will be refueled at external gas stations, as no fuel depot will be established within the project area. Based on current practices for such internal combustion locomotives, there are no auxiliary exhaust gas treatment measures; exhaust is emitted directly via the exhaust outlet on the locomotive roof, at a height of approximately 4-5 meters above ground level. The emission mode is characterized as fugitive and non-stationary. The primary pollutants are soot, THC (Total Hydrocarbons), NO_x (Nitrogen Oxides), and CO (Carbon Monoxide).

325. The project's track length is 1.569 km, and the fuel consumption during the operational phase of internal combustion engines is as follows: Initial phase: 6.787 tons/year, Near-term: 13.542 tons/year, Mid-term: 16.728 tons/year. The atmospheric pollutant emissions from internal combustion engines are shown in the table below:

Table VII-11 Internal Combustion Engine Atmospheric Pollutant Emissions

Pollutant	Smoke (t/a)	THC (t/a)	NO _x (t/a)	CO (t/a)
Initial phase	0.103	0.035	0.129	0.048
Near-term	0.206	0.069	0.257	0.096
Long-term	0.254	0.085	0.318	0.119

326. Internal combustion locomotives are considered mobile sources of pollution. Due to the small traffic volume of the railway dedicated line during the operational phase, with an initial daily operation of 2 pairs of trains, near-term 4 pairs, and long-term 5.5 pairs, the emissions occur intermittently. Since the railway is in an open and wide diffusion space, the pollutants emitted by the internal combustion engine will have a minor impact on the ambient air quality along the railway line. Moreover, the railway dedicated line will replace a significant amount of freight transport by trucks, leading to a substantial reduction in vehicle exhaust emissions, which will effectively alleviate regional air pollution caused by vehicle emissions.

327. Mitigation measures during operation: The impact of internal combustion engine exhaust on the surrounding environment will be further reduced by using low-emission locomotives, improving engine regulation, and enhancing fuel combustion efficiency.

328. **Vehicle exhaust.** The main air pollutant during the operational phase is the exhaust emitted by motor vehicles. The primary pollutants in vehicle exhaust are CO, NO_x, THC, etc. The emission volume is proportional to traffic volume and depends on vehicle type and operating conditions. The influence of vehicle exhaust is mainly concentrated within 30 meters from the centerline of the road, and CO and NO_x emissions do not exceed standards. The total vehicle exhaust emissions for the project are shown in the table below:

Table VII-12 Total Atmospheric Pollutant Emissions

Road Section	Forecast Period	Pollutant Emission (t/a)		
		CO	THC	NO _x
Primary highway section K0+000~K4+530.639	2028	9.0211	0.9347	0.6236
	2034	11.8001	1.2449	0.8288
	2042	15.0157	1.5596	1.0367
Urban main road section K4+530.639~K9+778.849	2028	8.5869	0.6713	0.6641
	2034	0.0836	1.2863	0.8567
	2042	0.0851	2.8186	1.8253
Total	2028	17.6080	1.6060	1.2877

Road Section	Forecast Period	Pollutant Emission (t/a)		
		CO	THC	NO _x
	2034	11.8837	2.5311	1.6855
	2042	15.1009	4.3782	2.8620

329. Mitigation measures during operation: i) Enhance greenery along both sides of the roads by planting trees, shrubs, and grass that can absorb vehicle exhaust pollutants, to control the dispersion of exhaust into the surrounding environment. ii) Improve the overall service level of the roads, strengthen road management and maintenance, maintain smooth road operations, reduce vehicle idle times, and reduce overall vehicle exhaust emissions. iii) Strengthen organizational management by inspecting vehicles and prohibiting poorly maintained, overloaded vehicles, or those with loose or poorly covered loads. iv) Promote clean energy use in transportation, such as adopting clean energy for intermodal freight yard and logistics park cargo transfer vehicles, further reducing the impact on the surrounding air quality. v) Employ road maintenance personnel to regularly clean and spray water on roads to reduce dust.

330. Cooking fumes from the canteen. The number of people dining at the integrated building canteen is approximately 34, with 300 working days per year. Assuming 2 standard stoves and 6 hours of cooking per day. The hotel at the integrated service center serves 820 people for each meal, with 300 working days per year and 20 standard stoves, operating 6 hours per day.

Table VII-13 Canteen Cooking Fumes Emissions Overview

Location	No. of diners	Oil consumption coefficient	Cooking fume emissions	Treatment measures	Fan air volume	Purification efficiency	Emissions	Emission rate	Emission concentration
	person/day	kg/person·day	t/a		m³/h	%	t/a	kg/h	mg/m³
Integrated building	34	0.065	0.663	Oil fume purifier	4000	75%	0.005	0.006	1.381
Logistics park	840	0.065	19.929		16000	90%	0.060	0.027	1.706

331. Mitigation measures during operation: The integrated building canteen will install an oil fume purifier with a purification efficiency of no less than 75%, and an air volume of no less than 4000 m³/h. The cooking fumes will be treated and discharged through a dedicated exhaust pipe outdoors. The hotel canteen at the integrated service center will install an oil fume purifier with a purification efficiency of no less than 90%, and an air volume of no less than 16000 m³/h.

The cooking fumes will be treated and discharged through a dedicated exhaust pipe outdoors.

332. Odor from the Garbage Transfer Station. The main source of odor at the Garbage Transfer Station comes from the unloading and compression processes. The major pollutants in the exhaust are dust, hydrogen sulfide, and ammonia.

333. The designed waste output for this project is 50 tons. The unloading and compression work will be conducted 365 days a year, with 8-hour daily work shifts. The pollutant generation amounts at the Garbage Transfer Station are as follows: NH₃: 1.1879 t/a, H₂S: 0.1132 t/a, Particulate matter: 2.190 t/a.

334. The pollutant generation at the Garbage Transfer Station is detailed in the table below.

Table VII-14 Garbage Transfer Station Exhaust Generation

Location	Pollutant	Emission rate	Emission amount	Treatment measures	Treatment efficiency	Organized collection efficiency	Organized emission		Unorganized emission (kg/h)	
		kg/h	t/a				kg/h	t/a	kg/h	t/a
NH ₃	65.09	0.407	1.1879	Sealing + negative pressure + deodorizing spray	75%	95%	0.097	0.2821	0.0051	0.6088
H ₂ S	6.2	0.039	0.1132		75%		0.009	0.0269	0.0005	0.0580
Particulate matter	120	0.750	2.1900		75%		0.178	0.5201	0.0094	1.1224

335. The organized exhaust emissions at the Garbage Transfer Station are as follows.

Table VII-15 Garbage Transfer Station Organized Exhaust Emissions Overview

Exhaust stack ID	Pollutant	Emission rate (t/a)	Working hours (h/year)	Emission form	Emission rate (kg/h)	Emission form	Treatment measures					Emission rate (kg/h)	Emission amount (t/a)	Emission concentration (mg/m³)
							Name of the measure	Collection efficiency	Capacity m³/h	Exhaust gas treatment efficiency	Whether it is a viable technology			
DA001	NH ₃	0.288	8760	Continuous	0.097	Organized	Dust spraying + biofilter + activated carbon adsorption	95%	20000	95%	yes	0.0049	0.2862	0.243
	H ₂ S	0.027			0.009							0.0005	0.0271	0.023
	Particulate matter	0.520			0.178							0.0089	0.5155	0.445
	Odor concentration (dimensionless)	/			/							/	/	25

Table VII-16 Garbage Transfer Station Odor Emission and Standard Compliance Analysis

Pollution source	Exhaust type	Pollutant	Emission concentration (mg/m ³)	Emission rate (kg/h)	Organized emission standard limit		Compliance status
					Emission concentration (mg/m ³)	Emission rate (kg/h)	
Garbage Transfer Station	Organized exhaust	NH ₃	0.0049	0.243	/	4.9	Compliant
		H ₂ S	0.0005	0.023	/	0.33	Compliant
		Particulate matter	0.0089	0.445	120	1.75	Compliant
		Odor concentration (dimensionless)	/	25	/	1000	Compliant

Table VII-17 Garbage Transfer Station Unorganized Exhaust Emissions Overview

Type	Pollutant	Emission rate (kg/h)	Emission amount (t/a)	Treatment measures	Purification efficiency	Emission rate (kg/h)	Emission amount (t/a)
Unorganized exhaust	NH ₃	0.005	0.609	Plant liquid deodorization	60%	0.0020	0.2435
	H ₂ S	0.000	0.058		60%	0.0002	0.0232
	Particulate matter	0.009	1.122		60%	0.0038	0.4490

336. Odor mitigation measures for the Garbage Transfer Station:

i) Install atomization nozzles above the spaces, hoppers, and compression devices in the waste unloading halls, using natural plant-based deodorizing liquids; a sealed negative pressure ventilation system will be installed with a set of negative pressure deodorization and dust removal systems (dust spraying + biofilter + activated carbon adsorption). The processed dust and odor gases will be discharged through a 15-meter high exhaust stack with a fan volume of 20,000 m³/h.

ii) Deodorizing agents will be sprayed multiple times around the transfer station every day to further remove odors, especially during waste transport and compression operations. Special personnel will be assigned to spray deodorizing agents around the station entrances and exits.

iii) This project includes a freight yard with an area of 252,616.25 sqm for use by logistics companies. Operations within the freight yard primarily involve container storage, loading/unloading, and vehicle transfer. The associated environmental impacts are characterized as "long-term, continuous, and localized," with a key focus required on controlling dust and exhaust emissions. The movement of container trucks and forklifts within the yard can raise ground dust, affecting local air quality, particularly during dry and windy conditions. Exhaust emissions from vehicles primarily contain pollutants such as CO, NO_x, and THC, with emission levels generally proportional to traffic volume.

337. Mitigation measures during operation include: Paving the entire yard surface and implementing regular cleaning and water spraying; deploying mist cannon machines for immediate dust suppression when needed; installing windbreak and dust suppression nets around container storage areas to reduce lateral dust dispersion; promoting the use of new energy vehicles or those meeting China's National VI emission standards for yard forklifts and transfer vehicles; enhancing traffic management to avoid congestion, reduce idling, and minimize exhaust emissions.

d. Noise

338. The project may have an impact on noise levels due to the proximity of the entrance trunk road, railway spur line, intermodal freight yard, and logistics and processing facilities to residential areas and schools. After the project is operational, it could be affected by road noise, railway noise, operational noise from the intermodal freight yard, and noise from the garbage transfer station.

1. Noise Prediction and Mitigation Measures for Entrance Trunk Road and Internal Road Network

339. The traffic flow conditions upon the completion of the Entrance Avenue and the park road network are shown in Table VII-18. A schematic diagram of the predicted point distribution is provided in Figures VII-5 to VII-8, and the predicted noise levels at sensitive points are detailed in Tables VII-19 to VII-21.

Table VII-18 Road Traffic Noise Source Strength Survey List

Road Segment		Period	Traffic Volume / (vehicles/h)								Vehicle Speed / (km/h)						Noise Source Intensity / /dB(A)					
			Small Vehicles		Medium Vehicles		Large Vehicles		合计		Small Vehicles		Medium Vehicles		Large Vehicles		Small Vehicles		Medium Vehicles		Large Vehicles	
			Day	Night	Day	Night	Day	Night	Day	Night	Day	Night	Day	Night	Day	Night	Day	Night	Day	Night	Day	Night
Entrance trunk road	First - Class Highway Section	Short-term	340	81	49	12	189	45	578	138	57	57	45	45	45	45	71.7	71.7	68.4	68.4	77.4	77.4
		Medium-term	436	105	64	15	263	63	763	184	57	57	45	45	45	45	71.7	71.7	68.4	68.4	77.4	77.4
		Long-term	535	130	75	18	340	82	950	231	57	57	45	45	45	45	71.7	71.7	68.4	68.4	77.4	77.4
	Urban Arterial Road Section	Short-term	360	86	54	13	201	48	615	147	57	57	45	45	45	45	71.7	71.7	68.4	68.4	77.4	77.4
		Medium-term	450	108	70	17	269	64	788	188	57	57	45	45	45	45	71.7	71.7	68.4	68.4	77.4	77.4
		Long-term	558	134	84	20	350	84	992	239	57	57	45	45	45	45	71.7	71.7	68.4	68.4	77.4	77.4
Inter-gate	Hen-gu	Short-term	70	34	10	5	39	19	118	57	47.5	47.5	42.5	42.5	42.5	42.5	69.2	69.2	67.6	67.6	76.8	76.8

rnal Ro ad Net wor k	Ro ad	Medi um- term	72	35	10	5	43	21	126	61	47. 5	47.5	42. 5	42.5	42. 5	42.5	69. 2	69.2	67. 6	67.6	76. 8	76.8
		Long- term	77	38	11	5	49	24	137	67	47. 5	47.5	42. 5	42.5	42. 5	42.5	69. 2	69.2	67. 6	67.6	76. 8	76.8
	Hen gliu Ro ad	Short -term	25	11	20	9	11	5	56	25	28. 5	28.5	25. 5	25.5	25. 5	25.5	62. 0	62.0	48. 7	48.7	71. 9	71.9
		Medi um- term	25	11	21	9	11	5	57	25	28. 5	28.5	25. 5	25.5	25. 5	25.5	62. 0	62.0	48. 7	48.7	71. 9	71.9
		Long- term	26	11	22	10	12	5	60	26	28. 5	28.5	25. 5	25.5	25. 5	25.5	62. 0	62.0	48. 7	48.7	71. 9	71.9
	Hen gqi Ro ad	Short -term	56	25	46	20	26	11	128	56	38	38	34	34	34	34	66. 0	66.0	64. 5	64.5	74. 7	74.7
		Medi um- term	60	27	52	23	28	12	140	61	38	38	34	34	34	34	66. 0	66.0	64. 5	64.5	74. 7	74.7
		Long- term	66	29	58	25	31	14	155	68	38	38	34	34	34	34	66. 0	66.0	64. 5	64.5	74. 7	74.7
	Hen gba Ro ad	Short -term	25	11	20	9	11	5	56	25	28. 5	28.5	25. 5	25.5	25. 5	25.5	62. 0	62.0	48. 7	48.7	71. 9	71.9
		Medi um- term	25	11	20	9	12	5	57	25	28. 5	28.5	25. 5	25.5	25. 5	25.5	62. 0	62.0	48. 7	48.7	71. 9	71.9
		Long-	26	11	21	9	12	5	59	26	28.	28.5	25.	25.5	25.	25.5	62.	62.0	48.	48.7	71.	71.9

		term									5		5		5		0		7		9	
	Hen gjiu Roa d	Short -term	28	13	32	14	44	20	104	47	47. 5	47.5	42. 5	42.5	42. 5	42.5	69. 2	69.2	67. 6	67.6	76. 8	76.8
		Medi um- term	30	14	35	16	48	21	113	51	47. 5	47.5	42. 5	42.5	42. 5	42.5	69. 2	69.2	67. 6	67.6	76. 8	76.8
		Long- term	33	15	37	17	54	24	124	56	47. 5	47.5	42. 5	42.5	42. 5	42.5	69. 2	69.2	67. 6	67.6	76. 8	76.8
	Zon gyi Roa d	Short -term	27	12	19	8	12	5	58	25	28. 5	28.5	27	27	27	27	62. 0	62.0	61. 2	61.2	72. 5	72.5
		Medi um- term	27	12	20	9	12	5	59	26	28. 5	28.5	27	27	27	27	62. 0	62.0	61. 2	61.2	72. 5	72.5
		Long- term	28	12	22	9	12	5	62	27	28. 5	28.5	27	27	27	27	62. 0	62.0	61. 2	61.2	72. 5	72.5
	Zon ger Roa d	Short -term	40	18	25	11	47	21	112	49	47. 5	47.5	42. 5	42.5	42. 5	42.5	69. 2	69.2	67. 6	67.6	76. 8	76.8
		Medi um- term	44	19	28	12	51	22	122	54	47. 5	47.5	42. 5	42.5	42. 5	42.5	69. 2	69.2	67. 6	67.6	76. 8	76.8
		Long- term	47	20	33	14	56	24	136	59	47. 5	47.5	42. 5	42.5	42. 5	42.5	69. 2	69.2	67. 6	67.6	76. 8	76.8

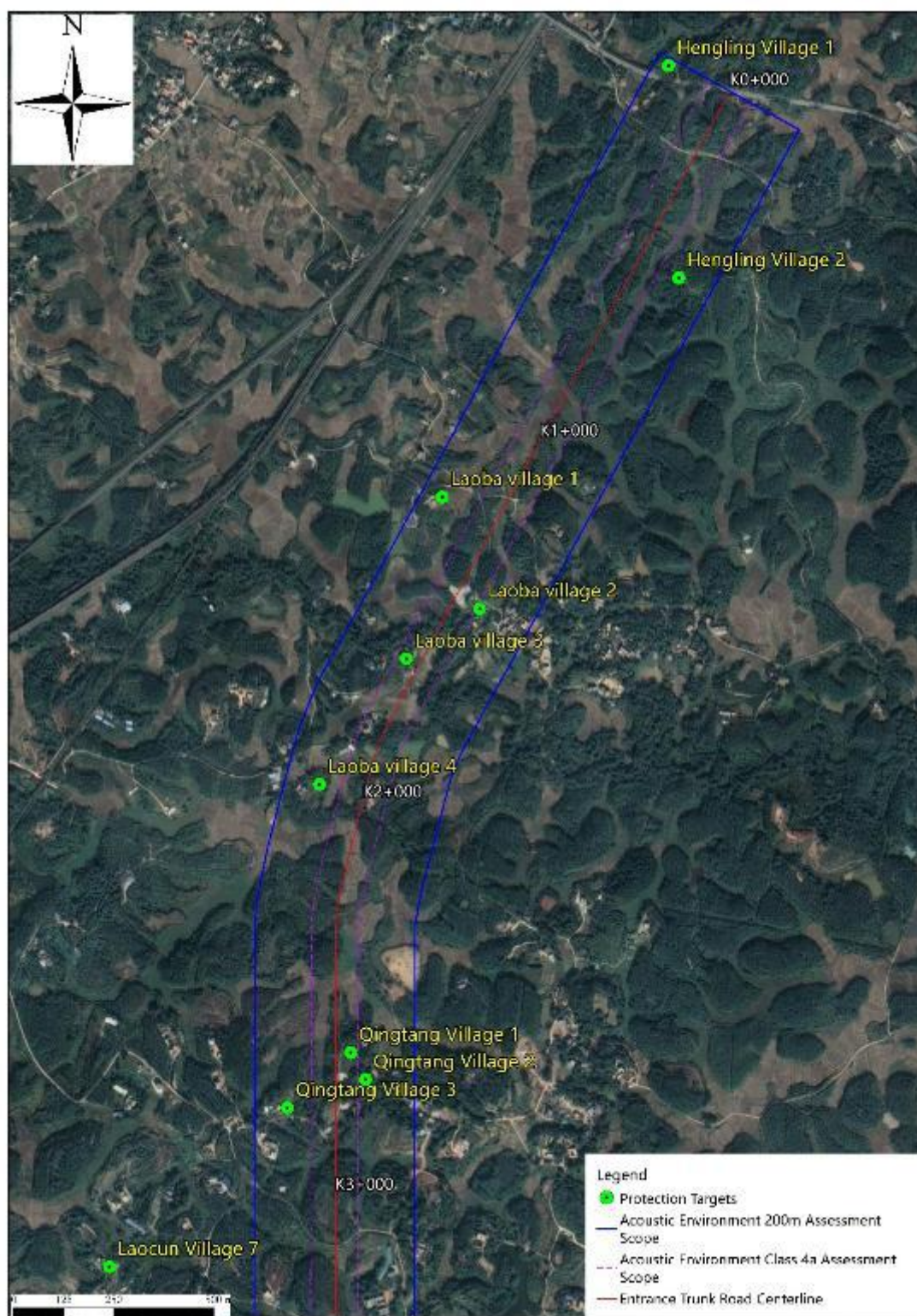


Figure VII-5:Schematic diagram of the distribution of prediction points on the Entrance Trunk Road (1)



Figure VII-6: Schematic diagram of the distribution of prediction points on the Entrance Trunk Road (2)

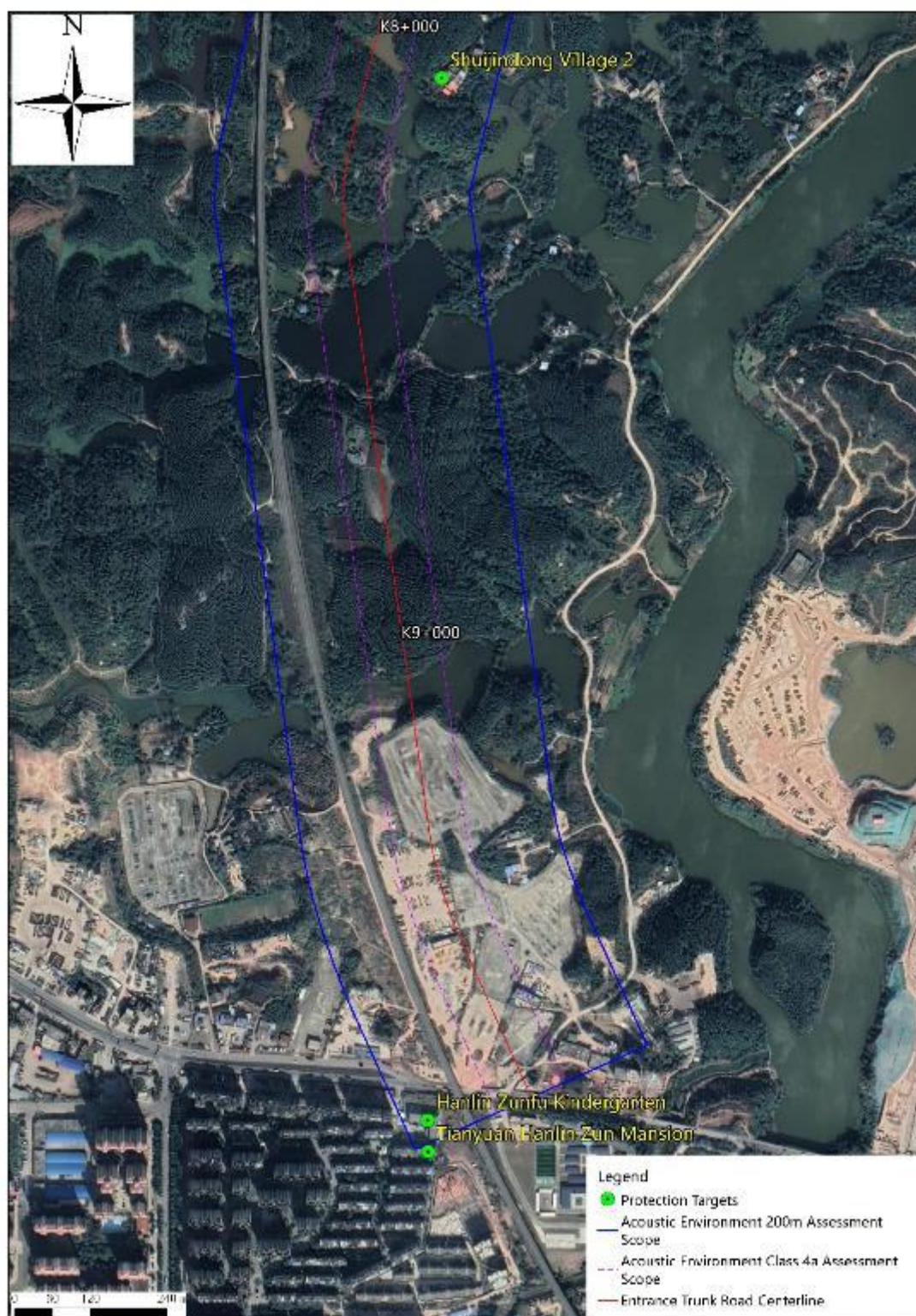


Figure VII-7: Schematic diagram of the distribution of prediction points on the Entrance Trunk Road (3)

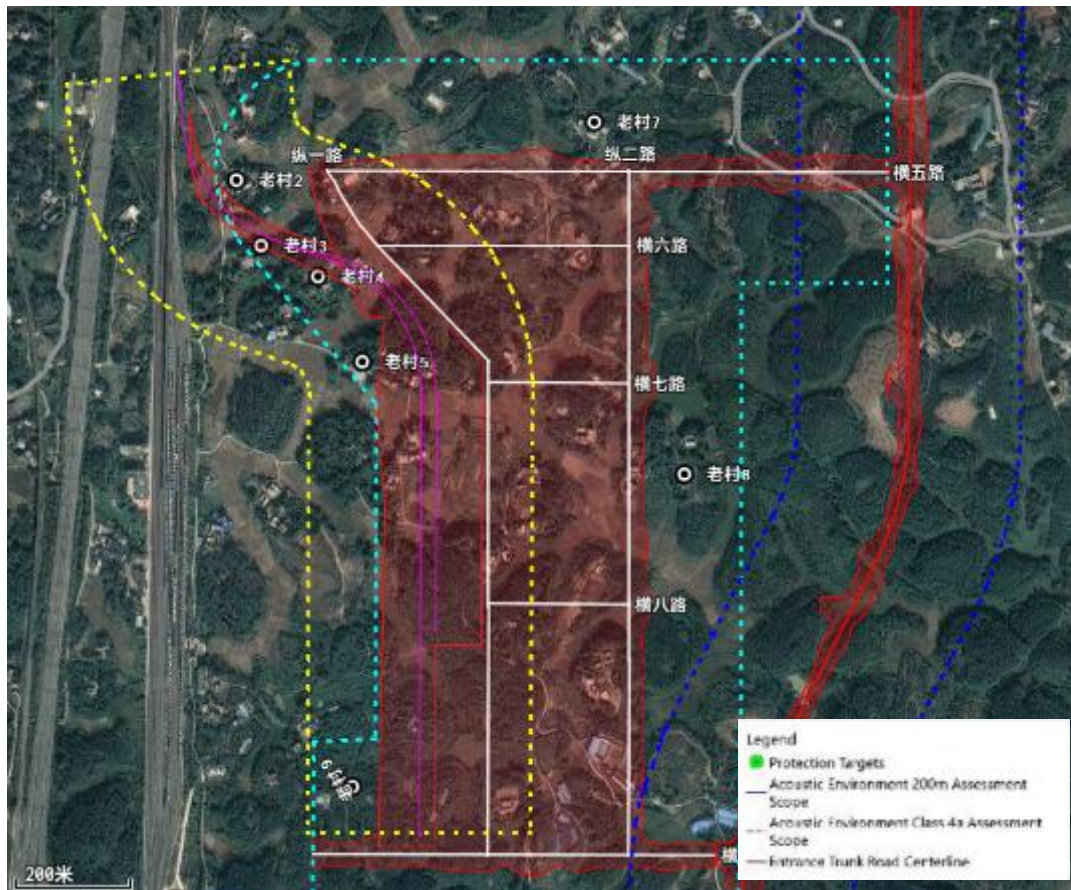


Figure VII-8: Schematic Diagram of the Distribution of Prediction Points for the Road Network within the Park

Table VII-19 Recent Noise Prediction Results for Environmental Protection Targets

No.	Environmental Protection Target	Prediction Point	Planned Function Area	Road Section	Distance from Center line (m)	Height Difference from Noise Source (m)	Current Noise Level (dB(A))		Noise Standard (dB(A))		Noise Contribution (dB(A))		Predicted Noise Level (dB(A))		Increment Compared to Current (dB(A))		Compliance Status		Excess Noise (dB(A))	
							Daytime	nighttime	Daytime	nighttime	Daytime	nighttime	Daytime	nighttime	Daytime	nighttime	Daytime	nighttime	Daytime	nighttime
1	Hengling Village 1	1st Floor	Type 4a	Primary Road	152	0	55	45.5	55	45	27.6	15.0	55.0	45.5	0.0	0.0	compliance	Exceeded	/	0.5
	Hengling Village 2	1st Floor	Type 1		100	-1	49	40.5	55	45	49.8	37.9	52.5	42.4	3.5	1.9	compliance	compliance	/	/
2	Laoba Village 1	1st Floor	Type 1		143	-3	49	41.5	55	45	47.2	35.0	51.2	42.4	2.2	0.9	compliance	compliance	/	/
	Laoba Village 2	1st Floor	Type 1		66	0	49	41.5	55	45	55.6	44.8	56.4	46.5	7.4	5.0	Exceeded	Exceeded	1.4	1.5
	Laoba Village 3	1st Floor	Type 4a		28	4	49	41.5	55	45	62.4	53.9	62.6	54.2	13.6	12.7	Exceeded	Exceeded	7.6	9.2
	Laoba Village 4	1st Floor	Type 1		99	7	49	41.5	55	45	52.1	41.2	53.8	44.4	4.8	2.9	compliance	compliance	/	/
3	Qingtang Village 1	1st Floor	Type 4a		26	5	49	40.5	55	45	55.3	44.5	56.2	45.9	7.2	5.4	Exceeded	Exceeded	1.2	0.9
	Qingtang	1st	Type		70	5	49	40.5	55	45	55.6	44.8	56.5	46.2	7.5	5.7	Exceeded	Exceeded	1.5	1.2

No.	Environmental Protection Target	Prediction Point	Planned Function Area	Road Section	Distance from Center line (m)	Height Difference from Noise Source (m)	Current Noise Level (dB(A))		Noise Standard (dB(A))		Noise Contribution (dB(A))		Predicted Noise Level (dB(A))		Increment Compared to Current (dB(A))		Compliance Status		Excess Noise (dB(A))	
							Daytime	nighttime	Daytime	nighttime	Daytime	nighttime	Daytime	nighttime	Daytime	nighttime	Daytime	nighttime	Daytime	nighttime
	Village 2	Floor	1														ed	ed		
	Qingtang Village 3	1st Floor	Type 1		111	3	49	40.5	55	45	50.2	38.5	52.7	42.6	3.7	2.1	compliance	compliance	/	/
4	Maxiong Village 1	1st Floor	Type 1	Main Urban Road	173	-8	50	40.5	55	45	45.4	32.8	51.3	41.2	1.3	0.7	compliance	compliance	/	/
	Maxiong Village 2	1st Floor	Type 1		56	-5	50	40.5	55	45	56.7	46.8	57.5	47.7	7.5	7.2	Exceeded	Exceeded	2.5	2.7
	Maxiong Village 3	1st Floor	Type 4a		40	-6	52.5	41.5	55	45	59.6	50.5	60.4	51.0	7.9	9.5	Exceeded	Exceeded	5.4	6
	Maxiong Village 4	1st Floor	Type 2		70	-8	53.5	42.5	55	45	54.4	44.2	57.0	46.4	3.5	3.9	Exceeded	Exceeded	2	1.4
5	Shuijindong Village 1	1st Floor	Type 1		172	-1	50.5	40.5	55	45	45.1	32.1	51.6	41.1	1.1	0.6	compliance	compliance	/	/
	Shuijindong Village 2	1st Floor	Type 1		134	-3	50.5	40.5	55	45	48.8	36.5	52.8	42.0	2.3	1.5	compliance	compliance	/	/
6	Hanlin	1st	Type		146	-3	56.5	45	55	45	51.0	39.1	57.6	46.0	1.1	1.0	Exceeded	Exceeded	2.6	1

No.	Environmental Protection Target	Prediction Point	Planned Function Area	Road Section	Distance from Center line (m)	Height Difference from Noise Source (m)	Current Noise Level (dB(A))		Noise Standard (dB(A))		Noise Contribution (dB(A))		Predicted Noise Level (dB(A))		Increment Compared to Current (dB(A))		Compliance Status		Excess Noise (dB(A))	
							Daytime	nighttime	Daytime	nighttime	Daytime	nighttime	Daytime	nighttime	Daytime	nighttime	Daytime	nighttime	Daytime	nighttime
7	Zunfu Kindergarten	Floor	2														ed	ed		
		3st Floor	Type 2				54.5	43.5	55	45	51.3	39.4	56.2	44.9	1.7	1.4	Exceeded	compliance	1.2	/
	Tianyuan Hanlin Zunfu	1st Floor	Type 2		174	-3	55.5	44.5	55	45	49.5	37.2	56.5	45.2	1.0	0.7	Exceeded	Exceeded	1.5	0.2
		3st Floor	Type 2				54	44	55	45	49.7	37.4	55.4	44.9	1.4	0.9	Exceeded	compliance	0.4	/
		5st Floor	Type 2				53.5	42.5	55	45	50.2	37.9	55.2	43.8	1.7	1.3	Exceeded	compliance	0.2	/

Note: "+" means that the pavement is higher than the sensitive point, and "-" means that the pavement is lower than the sensitive point.

Table VII 20 Mid-Term Noise Prediction Results for Environmental Protection Targets

No.	Environmental Protection Target	Prediction Point	Planned Function Area	Road Section	Distance from Center line (m)	Height Difference from Noise Source (m)	Current Noise Level (dB(A))		Noise Standard (dB(A))		Noise Contribution (dB(A))		Predicted Noise Level (dB(A))		Increment Compared to Current (dB(A))		Compliance Status		Excess Noise (dB(A))	
							Daytime	nighttime	Daytime	nighttime	Daytime	nighttime	Daytime	nighttime	Daytime	nighttime	Daytime	nighttime	Daytime	nighttime
1	Hengling Village 1	1st Floor	Type 4a	Primary Road	152	0	55	45.5	55	45	28.9	16.5	55.0	45.5	0.0	0.0	compliance	Exceeded	/	0.5
	Hengling Village 2	1st Floor	Type 1		100	-1	49	40.5	55	45	51.2	39.3	53.2	43.0	4.2	2.5	compliance	compliance	/	/
2	Laoba Village 1	1st Floor	Type 1		143	-3	49	41.5	55	45	48.5	36.5	51.8	42.7	2.8	1.2	compliance	compliance	/	/
	Laoba Village 2	1st Floor	Type 1		66	0	49	41.5	55	45	56.9	46.2	57.6	47.5	8.6	6.0	Exceeded	Exceeded	2.6	2.5
	Laoba Village 3	1st Floor	Type 4a		28	4	49	41.5	55	45	63.8	55.4	63.9	55.6	14.9	14.1	Exceeded	Exceeded	8.9	10.6
	Laoba Village 4	1st Floor	Type 1		99	7	49	41.5	55	45	53.5	42.3	54.8	45.0	5.8	3.5	compliance	compliance	/	/
3	Qingtang Village 1	1st Floor	Type 4a		26	5	49	40.5	55	45	56.7	45.9	57.4	47.0	8.4	6.5	Exceeded	Exceeded	2.4	2
	Qingtang	1st	Type		70	5	49	40.5	55	45	56.9	46.2	57.6	47.3	8.6	6.8	Exceeded	Exceeded	2.6	2.3

No.	Environmental Protection Target	Prediction Point	Planned Function Area	Road Section	Distance from Center line (m)	Height Difference from Noise Source (m)	Current Noise Level (dB(A))		Noise Standard (dB(A))		Noise Contribution (dB(A))		Predicted Noise Level (dB(A))		Increment Compared to Current (dB(A))		Compliance Status		Excess Noise (dB(A))	
							Daytime	nighttime	Daytime	nighttime	Daytime	nighttime	Daytime	nighttime	Daytime	nighttime	Daytime	nighttime	Daytime	nighttime
4	Village 2	Floor	1														ed	ed		
	Qingtang Village 3	1st Floor	Type 1		111	3	49	40.5	55	45	51.6	40.0	53.5	43.3	4.5	2.8	compliance	compliance	/	/
	Maxiong Village 1	1st Floor	Type 1	Main Urban Road	173	-8	50	40.5	55	45	46.6	34.1	51.6	41.4	1.6	0.9	compliance	compliance	/	/
	Maxiong Village 2	1st Floor	Type 1		56	-5	50	40.5	55	45	57.9	48.2	58.5	48.8	8.5	8.3	Exceeded	Exceeded	3.5	3.8
	Maxiong Village 3	1st Floor	Type 4a		40	-6	52.5	41.5	55	45	60.8	51.8	61.4	52.2	8.9	10.7	Exceeded	Exceeded	6.4	7.2
	Maxiong Village 4	1st Floor	Type 2		70	-8	53.5	42.5	55	45	55.6	45.5	57.7	47.2	4.2	4.7	Exceeded	Exceeded	2.7	2.2
	Shuijindong Village 1	1st Floor	Type 1		172	-1	50.5	40.5	55	45	46.3	33.4	51.9	41.3	1.4	0.8	compliance	compliance	/	/
	Shuijindong Village 2	1st Floor	Type 1		134	-3	50.5	40.5	55	45	50.0	37.8	53.3	42.4	2.8	1.9	compliance	compliance	/	/
	Hanlin	1st	Type		146	-3	56.5	45	55	45	52.2	40.4	57.9	46.3	1.4	1.3	Exceeded	Exceeded	2.9	1.3

No.	Environmental Protection Target	Prediction Point	Planned Function Area	Road Section	Distance from Center line (m)	Height Difference from Noise Source (m)	Current Noise Level (dB(A))		Noise Standard (dB(A))		Noise Contribution (dB(A))		Predicted Noise Level (dB(A))		Increment Compared to Current (dB(A))		Compliance Status		Excess Noise (dB(A))	
							Daytime	nighttime	Daytime	nighttime	Daytime	nighttime	Daytime	nighttime	Daytime	nighttime	Daytime	nighttime	Daytime	nighttime
7	Zunfu Kindergarten	Floor	2														ed	ed		
		3st Floor	Type 2				54.5	43.5	55	45	52.5	40.7	56.6	45.3	2.1	1.8	Exceeded	Exceeded	1.6	0.3
	Tianyuan Hanlin Zunfu	1st Floor	Type 2		174	-3	55.5	44.5	55	45	50.7	38.5	56.7	45.5	1.2	1.0	Exceeded	Exceeded	1.7	0.5
		3st Floor	Type 2				54	44	55	45	50.9	38.7	55.7	45.1	1.7	1.1	Exceeded	Exceeded	0.7	0.1
		5st Floor	Type 2				53.5	42.5	55	45	51.4	39.2	55.6	44.2	2.1	1.7	Exceeded	compliance	0.6	/

Note: "+" means that the pavement is higher than the sensitive point, and "-" means that the pavement is lower than the sensitive point.

Table VII-21 Noise prediction results for long-term acoustic environmental protection targets

No.	Environmental Protection Target	Prediction Point	Planned Function Area	Road Section	Distance from Center line (m)	Height Difference from Noise Source (m)	Current Noise Level (dB(A))		Noise Standard (dB(A))		Noise Contribution (dB(A))		Predicted Noise Level (dB(A))		Increment Compared to Current (dB(A))		Compliance Status		Excess Noise (dB(A))	
							Daytime	nighttime	Daytime	nighttime	Daytime	nighttime	Daytime	nighttime	Daytime	nighttime	Daytime	nighttime	Daytime	nighttime
1	Hengling Village 1	1st Floor	Type 4a	Primary Road	152	0	55	45.5	55	45	27.6	15.0	55.0	45.5	0.0	0.0	compliance	Exceeded	/	0.5
	Hengling Village 2	1st Floor	Type 1		100	-1	49	40.5	55	45	49.8	37.9	52.5	42.4	3.5	1.9	compliance	compliance	/	/
2	Laoba Village 1	1st Floor	Type 1		143	-3	49	41.5	55	45	47.2	35.0	51.2	42.4	2.2	0.9	compliance	compliance	/	/
	Laoba Village 2	1st Floor	Type 1		66	0	49	41.5	55	45	55.6	44.8	56.4	46.5	7.4	5.0	Exceeded	Exceeded	1.4	1.5
	Laoba Village 3	1st Floor	Type 4a		28	4	49	41.5	55	45	62.4	53.9	62.6	54.2	13.6	12.7	Exceeded	Exceeded	7.6	9.2
	Laoba Village 4	1st Floor	Type 1		99	7	49	41.5	55	45	52.1	41.2	53.8	44.4	4.8	2.9	compliance	compliance	/	/
3	Qingtang Village 1	1st Floor	Type 4a		26	5	49	40.5	55	45	55.3	44.5	56.2	45.9	7.2	5.4	Exceeded	Exceeded	1.2	0.9
	Qingtang	1st	Type		70	5	49	40.5	55	45	55.6	44.8	56.5	46.2	7.5	5.7	Exceeded	Exceeded	1.5	1.2

No.	Environmental Protection Target	Prediction Point	Planned Function Area	Road Section	Distance from Center line (m)	Height Difference from Noise Source (m)	Current Noise Level (dB(A))		Noise Standard (dB(A))		Noise Contribution (dB(A))		Predicted Noise Level (dB(A))		Increment Compared to Current (dB(A))		Compliance Status		Excess Noise (dB(A))	
							Daytime	nighttime	Daytime	nighttime	Daytime	nighttime	Daytime	nighttime	Daytime	nighttime	Daytime	nighttime	Daytime	nighttime
	Village 2	Floor	1														ed	ed		
	Qingtang Village 3	1st Floor	Type 1		111	3	49	40.5	55	45	50.2	38.5	52.7	42.6	3.7	2.1	compliance	compliance	/	/
4	Maxiong Village 1	1st Floor	Type 1	Main Urban Road	173	-8	50	40.5	55	45	45.4	32.8	51.3	41.2	1.3	0.7	compliance	compliance	/	/
	Maxiong Village 2	1st Floor	Type 1		56	-5	50	40.5	55	45	56.7	46.8	57.5	47.7	7.5	7.2	Exceeded	Exceeded	2.5	2.7
	Maxiong Village 3	1st Floor	Type 4a		40	-6	52.5	41.5	55	45	59.6	50.5	60.4	51.0	7.9	9.5	Exceeded	Exceeded	5.4	6
	Maxiong Village 4	1st Floor	Type 2		70	-8	53.5	42.5	55	45	54.4	44.2	57.0	46.4	3.5	3.9	Exceeded	Exceeded	2	1.4
5	Shuijindong Village 1	1st Floor	Type 1		172	-1	50.5	40.5	55	45	45.1	32.1	51.6	41.1	1.1	0.6	compliance	compliance	/	/
	Shuijindong Village 2	1st Floor	Type 1		134	-3	50.5	40.5	55	45	48.8	36.5	52.8	42.0	2.3	1.5	compliance	compliance	/	/
6	Hanlin	1st	Type		146	-3	56.5	45	55	45	51.0	39.1	57.6	46.0	1.1	1.0	Exceeded	Exceeded	2.6	1

No.	Environmental Protection Target	Prediction Point	Planned Function Area	Road Section	Distance from Center line (m)	Height Difference from Noise Source (m)	Current Noise Level (dB(A))		Noise Standard (dB(A))		Noise Contribution (dB(A))		Predicted Noise Level (dB(A))		Increment Compared to Current (dB(A))		Compliance Status		Excess Noise (dB(A))	
							Daytime	nighttime	Daytime	nighttime	Daytime	nighttime	Daytime	nighttime	Daytime	nighttime	Daytime	nighttime	Daytime	nighttime
7	Zunfu Kindergarten	Floor	2														ed	ed		
		3st Floor	Type 2				54.5	43.5	55	45	51.3	39.4	56.2	44.9	1.7	1.4	Exceeded	compliance	1.2	/
	Tianyuan Hanlin Zunfu	1st Floor	Type 2		174	-3	55.5	44.5	55	45	49.5	37.2	56.5	45.2	1.0	0.7	Exceeded	Exceeded	1.5	0.2
		3st Floor	Type 2				54	44	55	45	49.7	37.4	55.4	44.9	1.4	0.9	Exceeded	compliance	0.4	/
		5st Floor	Type 2				53.5	42.5	55	45	50.2	37.9	55.2	43.8	1.7	1.3	Exceeded	compliance	0.2	/

Note: "+" means that the pavement is higher than the sensitive point, and "-" means that the pavement is lower than the sensitive point.

340. According to the prediction results, all prediction points will meet the standards in the short-term operation period. In the medium-term operation period, one prediction point will exceed the standard: Laoba Village 3, with a nighttime exceedance of 0.6 dB(A), while all other prediction points will meet the standards. In the long-term operation period, one prediction point will exceed the standard: Laoba Village 3, with a nighttime exceedance of 0.6 dB(A), and all other prediction points will meet the standards..

341. According to the World Bank's EHS Guidelines: "At the most sensitive receptor locations, the predicted noise from project facilities or activities should not exceed the relevant noise standards (Table III-6 Noise Standards), or the background noise level should not increase by more than 3 dB at those locations. Otherwise, noise prevention and control measures should be implemented." These measures include: "Improving the sound insulation of buildings by installing soundproof measures; installing soundproof panels with a minimum continuous surface density of 10 kg/m² to reduce sound transmission. To achieve good soundproofing, the panels should be placed as close as possible to the sound source or the receptor. Limiting the operation time of specific equipment or activities, especially for mobile noise sources passing through residential areas. Relocating noise sources to areas with lower sensitivity to benefit from distance attenuation and terrain shielding. Minimizing the passage of project vehicles through residential areas."

342. This report compares several noise reduction measures applicable to the project, taking into account factors such as the height, orientation, and distance of buildings at sensitive points along the route, as well as the feasibility of noise reduction measures, economic costs, and cost-effectiveness (Table VII-22). Based on this, the engineering measures for noise control at sensitive points exceeding the standards are determined (Table VII-23).

Table VII-22 Comparison of Common Noise Control Measures

Measure Name	Noise Reduction Effect	Investment	Remarks
Noise Reduction Green Belt	Dense planting of evergreen trees and shrubs, with a height of over 4.5m, can reduce noise by 1–1.5 dB per 10m width, with a maximum reduction of 10 dB.	Varies by road location, generally 80-200 RMB/meter.	Provides additional benefits like dust prevention and environmental improvement, but requires significant land area.
Noise Barrier	Significant effect for low-level sensitive points within 50m of the road center line, generally reducing noise by 12 dB.	1,000 - 3,000 RMB/linear meter, depending on acoustic materials used.	Types include vertical wall, thin panel, T-shape, angled top, earth berm, and full enclosure; requires little land.
Soundproof	Significant noise reduction	600 - 1,600	Can be customized;

Measure Name	Noise Reduction Effect	Investment	Remarks
Windows	effect; average sound insulation of 43 dB when windows are closed, 25 dB when ventilated.	RMB/m ² , depending on materials and design.	suitable for brick-concrete structures on both sides of the road.
Wall	Heightening or constructing a wall can generally reduce noise by 3–5 dB.	—	Requires available space between residences and the road for construction.
Low Noise Pavement	Reduces noise by 3–6 dB at the early stage, but the effect diminishes over time.	High cost	Preserves the original landscape along the route, but has poor durability.
Changing Building Usage	Can fundamentally solve noise disturbance issues.	Varies based on the change of function.	Depends on residents' environmental awareness and economic factors; difficult to implement.
Reducing Vehicle Noise	Significant noise reduction effect, but costs increase substantially after a certain noise level is reached.	—	Difficult to control and implement effectively.

343. Since the sensitive points in the project area are widely distributed and the installation of sound barriers would hinder residents' travel, soundproof windows will be installed at the sensitive points with exceedances. After the installation of soundproof windows, the noise at these sensitive points will meet the standards.

Table VII-23 Traffic Noise Control Measures for Exceedance Sensitive Points

No.	Sensitive Point	Exceedance Status	Number of Households	Location	Area per Household (m ²)	Total Area (m ²)	Investment (RMB 10,000)
1	Laoba Village	Laoba Village 3 exceeds standards during medium and long-term night periods by 0.6-1.7 dB(A).	8	K1+640, K1+820, K1+960	30	240	19.2
2	Qingtang Village	Qingtang Village 1: Predicted levels meet post-construction Class 4a standards but exceed	4	K2+640, K2+780, K3+560	30	120	9.6

No.	Sensitive Point	Exceedance Status	Number of Households	Location	Area per Household (m ²)	Total Area (m ²)	Investment (RMB 10,000)
		the current Class 1 standard by 0.9-3.3 dB(A). Qingtang Village 2: Predicted levels meet post-construction Class 2 standards but exceed the current Class 1 standard by 1.2-3.5 dB(A).					
3	Maxiong Village	Maxiong Village 2: Predicted levels meet post-construction Class 2 standards but exceed the current Class 1 standard by 2.5-4.8 dB(A). Maxiong Village 3: Predicted levels meet post-construction Class 4a standards but exceed the current Class 1 standard by 4.6-8.2 dB(A). Maxiong Village 4: Exceeds standards during near, medium, and long-term day/night periods by 2.0-3.4 dB(A).	3	K6+520	30	190	7.2
Total			15	/	30	450	36.0



Figure VII-9: Schematic diagram of soundproof window measures (K1+640 & K1+820 & K1 + 960, Laoba Village)



Figure VII-10: Schematic diagram of sound insulation window measures (K2+640 & K2+780, Qingtang Village)

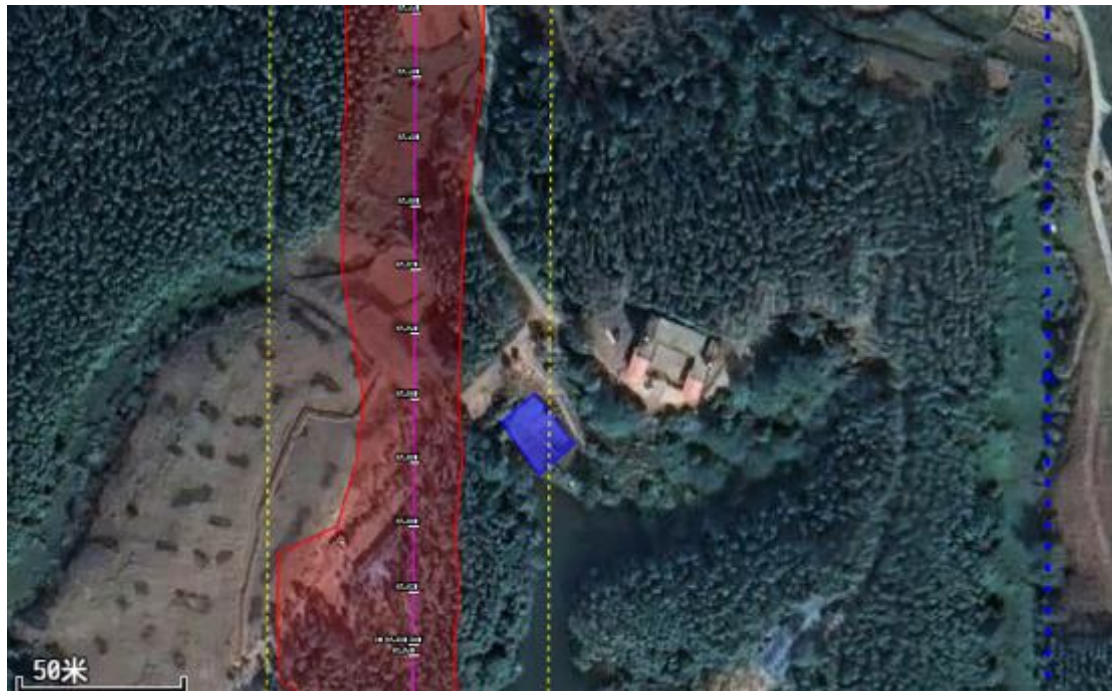


Figure VII-11: Schematic diagram of sound insulation window measures (K3+560, Qingtang Village)

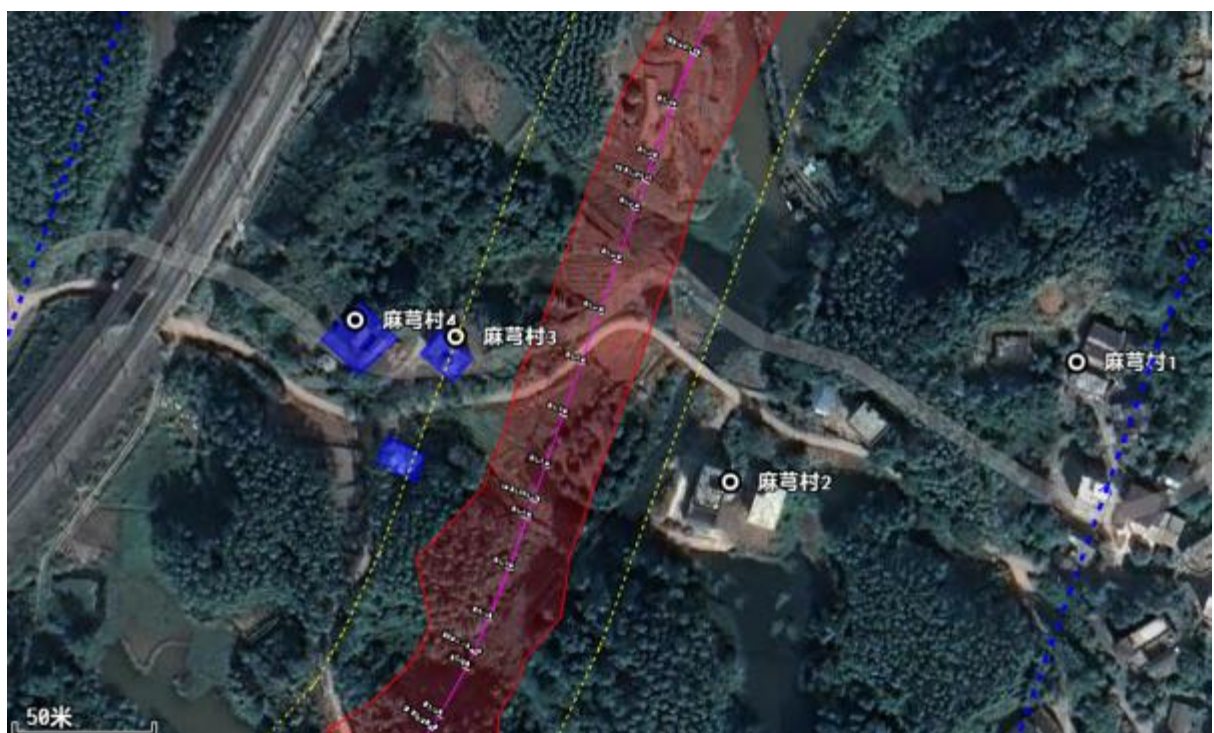


Figure VII-12: Schematic diagram of soundproof window measures (Maxiong Village K6+520\K6+677)

344. In addition, the following management measures should be implemented for the Entrance Trunk Road during the operation phase:

(i) The road management department should maintain the road surface regularly to reduce highway traffic noise.

(ii) The construction unit should cooperate with the traffic management department to implement measures such as prohibiting honking and limiting vehicle speed along sensitive points on the highway, and reasonably control the flow and speed of large trucks to reduce traffic noise.

(iii) Strengthen traffic management on the highway, increase maintenance, and strictly control vehicles that do not meet the required standards to reduce noise levels caused by severe overload and poor vehicle condition.

(iv) Strengthen monitoring of the acoustic environment at sensitive points along the route during operation and take effective noise reduction measures based on monitoring results.

2. Railway Line Noise Prediction and Mitigation Measures

345. After the project is completed and operational, the primary sources of noise from the dedicated railway line will include locomotive traction noise, wheel-rail interaction noise, and braking noise.

346. The main track and station tracks of the dedicated railway line will use 25.0m long 50kg/m rails, and different rail types will be connected with special-shaped joints. A list of railway traffic noise sources is provided in Tables VII-24~VII-25. Noise prediction results can be found in Tables VII-26~VII-28.

Table VII-24 Railway Traffic Noise Source Investigation List

Vehicle Type	Speed (km/h)	Track Form (Bridge/Embankment/Tunnel)	Ballasted/Non-ballasted Track	Jointed/Seamless	Crash Wall/Panel Height	Noise Source Level
DF4B Model	40 km/h	Embankment/Culvert	Ballasted Track	Seamless	0	76.7 dB

Table VII-25 Railway Traffic Volume/Vehicle Type List

Design Year	Day-Night Traffic Ratio	Number of Trains (pairs/day)
		The DF4B model
Initial (2030)	No operation at night	2
Near-Term (2035)	No operation at night	4
Long-Term (2045)	No operation at night	5.5

Table VII-26 Early Operation Phase Railway Noise Prediction Results

serial number	The name of the sensitive point	Line form	Distance from the centerline of the prediction point/m	The difference between the height of the sound source and the predicted point/m	Predict the location of the point	Source Strength (dB)	Train speed (km/h)	Diurnal Contribution (dBA)	Daytime Background (dBA)	Daytime predicted value (dBA)	Daytime standard (dBA)	Super scalar (dBA)	Whether the standard is met
1	Laocun Village 1	embankment	84	4	1st floor	76.7	40	33.4	51.5	51.6	55	/	compliance
2	Laocun Village 2	Frame culverts, embankments	29	6	1st floor	76.7	40	38.2	51.0	51.2	55	/	compliance
3	Laocun Village 3	embankment	37	4	1st floor	76.7	40	37.4	50.5	50.7	55	/	compliance
4	Laocun Village 4	embankment	35	4	1st floor	76.7	40	37.5	50.5	50.7	55	/	compliance
5	Laocun Village 5	embankment	90	2.5	1st floor	76.7	40	32.6	50.5	50.6	55	/	compliance
6	Laocun Village 6	embankment	117	5	1st floor	76.7	40	31.7	52.0	52.0	55	/	compliance

Table VII-27 Recent Forecast Results for Railway Operations

serial number	The name of the sensitive point	Line form	Distance from the centerline of the prediction point/m	The difference between the height of the sound source and the predicted point/m	Predict the location of the point	Source Strength (dB)	Train speed (km/h)	Diurnal Contribution (dBA)	Daytime Background (dBA)	Daytime predicted value (dBA)	Daytime standard (dBA)	Super scalar (dBA)	Whether the standard is met
1	Laocun Village 1	embankment	84	4	1st floor	76.7	40	36.4	51.5	51.6	55	/	compliance
2	Laocun Village 2	Frame culverts, embankments	29	6	1st floor	76.7	40	41.2	51.0	51.4	55	/	compliance
3	Laocun Village 3	embankment	37	4	1st floor	76.7	40	40.4	50.5	50.9	55	/	compliance
4	Laocun Village 4	embankment	35	4	1st floor	76.7	40	40.5	50.5	50.9	55	/	compliance
5	Laocun Village 5	embankment	90	2.5	1st floor	76.7	40	35.6	50.5	50.6	55	/	compliance
6	Laocun Village 6	embankment	117	5	1st floor	76.7	40	34.7	52.0	52.1	55	/	compliance

Table VII-28 Long-term Forecast Results for Railway Operations

serial number	The name of the sensitive point	Line form	Distance from the centerline of the prediction point/m	The difference between the height of the sound source and the predicted point/m	Predict the location of the point	Source Strength (dB)	Train speed (km/m)	Diurnal Contribution (dBA)	Daytime Background (dBA)	Daytime predicted value (dBA)	Daytime standard (dBA)	Super scalar (dBA)	Whether the standard is met
1	Laocun Village 1	embankment	84	4	1st floor	76.7	40	38.2	51.5	51.7	55	/	compliance
2	Laocun Village 2	Frame culverts, embankments	29	6	1st floor	76.7	40	42.9	51.0	51.6	55	/	compliance
3	Laocun Village 3	embankment	37	4	1st floor	76.7	40	42.2	50.5	51.1	55	/	compliance
4	Laocun Village 4	embankment	35	4	1st floor	76.7	40	42.3	50.5	51.1	55	/	compliance
5	Laocun Village 5	embankment	90	2.5	1st floor	76.7	40	37.3	50.5	50.7	55	/	compliance
6	Laocun Village 6	embankment	117	5	1st floor	76.7	40	36.5	52.0	52.1	55	/	compliance

347. Noise levels at sensitive points near the railway are within standard during the day, and there is no nighttime operation.

348. To further mitigate the impact of the railway line on nearby residents, the following measures will be taken:

(i) Strengthen source control. The railway construction and operation units will enhance track maintenance, vehicle servicing, regular repairs, and avoid using old, noisy equipment to reduce overall noise.

(ii) Green shelterbelts will be planted on both sides of the railway line.

349. Through the implementation of the above-mentioned mitigation measures, the noise impact of the railway line on nearby residents during the operation phase is within an acceptable range.

3. Noise prediction and mitigation measures in freight yards and garbage transfer stations

350. During the operation period of the freight yard of this project, there are mainly container gantry cranes, electronic truck scales and other mechanical equipment and transport vehicles; The noise during the operation of the garbage transfer station mainly comes from the noise of loading and unloading operations, compressor operation and exhaust gas treatment fan, among which the garbage handling and compression equipment does not run at night. Compared with the noise source intensity data of similar projects, the environmental noise of each equipment in the intermodal freight yard is 65~95dB (A).

351. The forecast results of the intermodal freight yard are shown in Table VII-29, according to the forecast results, it can be seen that after the freight yard is completed, the project boundary meets the standard during the day and does not run at night; The environmental quality of the surrounding sensitive points is also up to standard.

Table VII-29 Multimodal Yard Daytime Noise Prediction Results

Prediction points	Contribution Stack Value dB(A)		Background value dB(A)		Predicted value dB(A)		Standard dB(A)		Whether the standard is met
	Day	Night	Day	Night	Day	Night	Day	Night	
East Boundary	38.4	25.5	49	41.5	49.4	41.6	60	50	compliance
South Boundary	50.5	34.5	49	41.5	52.8	42.3	60	50	compliance

									ance
West Boundary	47.7	30.4	50.5	41.5	52.3	41.8	60	50	compliance
North Boundary	30.7	13.4	48.5	41.5	48.6	41.5	60	50	compliance
Laocun Village 9 (West Boundary Residence)	39.7	16.5	50.5	41.5	50.9	41.5	55	45	compliance
Laocun Village 10 (North Boundary Residence)	29.5	13.0	48.5	41.5	48.6	41.5	55	45	compliance
Laocun Village 11 (East Boundary Residence)	33.0	17.8	49	41.5	49.1	41.5	55	45	compliance
Laocun Village 12 (West Boundary Residence)	38.7	26.7	50.5	41.5	50.8	41.6	55	45	compliance

352. In order to further mitigate the impact of noise from freight yards and refuse transfer stations on nearby residents, the following measures will be taken:

(i) Select equipment with ultra-low noise and low operating vibration, and take measures such as base vibration reduction, rubber vibration reduction joints and vibration reduction pads during installation.

(ii) Set up soundproof operation rooms to reduce noise pollution in workshops where equipment is concentrated, reverberation is serious and sound insulation measures are not easy to take.

(iii) In the overall layout of the plant, the overall planning and rational layout should be carried out, and attention should be paid to the noise prevention spacing.

(iv) Greening of the available open space around the multimodal cargo yard and refuse transfer station according to the actual situation.

(v) Regular maintenance of equipment to ensure the normal operation of equipment; Strengthen the management of the vehicle transportation process, strictly prohibit honking, and limit the speed in the field.

353. Through the implementation of the above-mentioned mitigation

measures, the noise impact of the railway line on nearby residents during the operation phase is within an acceptable range.

e. Vibration

354. The environmental protection target for vibration along the railway line in this project is the village of Lao Village, with residential points scattered along the route. There are three residential points within 60 meters of the center line of the railway, with a total of nine households, including one household within 30 meters from the center line of the railway. As shown in Figure VII-12, this evaluation predicts the vibration compliance distance and the vibration levels at the three residential points based on their relative position to the track, engineering design conditions, and vehicle operational status. According to the prediction, the compliance distance for the embankment section of the railway line is 7 meters, while the compliance distance for the bridge section is 3 meters. The predicted values for the operation period range from 67.0 to 69.1 dB, all meeting the standards specified in the "Urban Area Environmental Vibration Standards" (GB10070-88) for "railway trunk lines." The vibration compliance distance is listed in Table VII-30. The prediction results for sensitive points are shown in Table VII-31.

355. To control the impact of railway vibrations on the environment, seamless track and other engineering measures have been incorporated into the design. The roughness of the wheel-rail interface is the fundamental factor in causing wheel-rail interaction, and reducing the surface roughness can effectively reduce this interaction, thus lowering vibration levels. Good wheel-rail conditions, such as smooth tracks and well-rounded wheels, can reduce vibrations by 5 to 10 dB compared to standard conditions. Therefore, during operation, maintenance and regular cleaning of the tracks, wheel grinding, and wheel rotation should be carried out to ensure optimal operational status and minimize additional vibration. The operating entity should follow the environmental monitoring plan outlined in this report and conduct vibration monitoring along sensitive areas. Based on monitoring results, further measures should be implemented to reduce the impact of railway vibrations.

Table VII-30 Railway Vibration Compliance Distance Overview

Section	Geological Conditions	Track Type	Embankment/Bridge	Predicted Speed (km/h)	Vibration Level (dB)					Compliance Distance (m)
					5m	15m	30m	45m	60m	
Main Line	Alluvial Layer	Ballasted	Embankment	40	81.1	76.4	73.4	69.8	67.3	7
			Bridge	40	78.1	73.4	70.4	68.6	67.3	4



Figure VII-13: Predicted Point Location Map

Table VII-31 Vibration Environmental Protection Target Prediction Results

Protection Target Name	Line Mileage	Prediction Point Number	Prediction Point Location	Building Type	Position Relationship to the Railway Line				Prediction Value (dB)		Standard Value (dB)		Recent Exceedance (dB)	
					form	azimuth	Distance (m)	Height difference (m)	Daytime	Daytime	nighttime	nighttime	Daytime	nighttime
Laocun Village	C1K0+200~C1K0+560	1#	First row of houses on the left side of the proposed railway	Class II	Embankment	Left side	25m	+3.5	69.1	69.1	80	80	-	-
			30m from the center line of the railway	Class II	Embankment	Left side	30m	+1.5	68.4	68.4	80	80	-	-
		2#	First row of houses on the right side of the proposed railway	Class II	Embankment	Right side	32m	+2.5	67.8	67.8	80	80	-	-
		3#	First row of houses on the right side of the proposed railway	Class II	Embankment	Right side	35m	+2.5	67.0	67.0	80	80	-	-

f. Solid Waste

356. The solid waste generated during the operation phase of the park includes domestic waste, waste machine oil from equipment maintenance, discarded solar photovoltaic panels, waste transformer oil, oil-soaked cloths, etc. A garbage transfer station will be set up at the southwest corner of the logistics park. The station will have a dedicated hazardous waste storage area, which will be managed in accordance with the "Hazardous Waste Storage Pollution Control Standards" (GB 18597-2023), ensuring measures for leakage prevention, rain protection, and sun shielding, with regular disposal by a qualified unit.

357. Domestic Waste: The project will generate 5,676.22 tons of domestic waste annually. The domestic waste from the intermodal freight yard and storage and processing facilities will be collected daily, compressed at the garbage transfer station, and transported to a waste incineration plant by the local sanitation department using a specialized sealed garbage truck. Kitchen waste will be collected in designated containers, kept in good condition, and categorized separately from other waste. It will be collected by the local sanitation department for daily disposal.

358. Waste Solar Photovoltaic Panels: Normally, the lifespan of polycrystalline silicon solar panels is no less than 15 years, with a maximum of about 25 years. The estimated annual waste generated is approximately 0.14 tons. According to the "National Hazardous Waste List" (2021 version), the solar photovoltaic panels used in this project are not classified as hazardous waste. Damaged panels will be directly returned to the manufacturer for recycling and will not be temporarily stored on-site.

359. Waste Oil: The project will generate 0.5 tons of waste oil annually due to maintenance work at stations and equipment such as cranes, pumps, transformers, and garbage transfer station equipment. This oil will be collected, temporarily stored in a hazardous waste storage area, and disposed of by a qualified unit. Used oil-soaked rags (approximately 0.01 tons annually) will be collected in specialized containers and stored temporarily before being disposed of by a qualified unit. Waste hydraulic oil (300L or 0.26 tons) generated from compression equipment at the garbage transfer station will be collected and stored in the hazardous waste storage area before disposal.

360. Waste Activated Carbon: The dust and odor removal system at the project will use activated carbon fibers, which will need to be replaced periodically. The estimated waste amount will be approximately 0.5 tons annually. As hazardous waste, it will be stored in dedicated containers and disposed of by a qualified unit.

361. Waste Lead-Acid Batteries: The photovoltaic system, the park's

electricity supply, and electric vehicles may generate 0.1 tons of waste batteries annually, which will be classified as hazardous waste and disposed of by a qualified unit.

362. Logistics Packaging Waste: This waste mainly consists of plastics and wood and is estimated to be 2 tons annually. This waste will be collected and sold to a recycling station without being temporarily stored on-site.

363. In summary, all domestic waste, general solid waste, and hazardous waste generated during the operation phase of the project will be properly handled, with minimal impact on the surrounding environment.

Table VII-32 Solid Waste Generation and Disposal

serial number	Solid Waste Name	Hazardous Waste	Waste Category	General Waste Category	Generation (t/a)	Disposal (t/a)	Disposal Method
1	Domestic Waste	No	/	Category 1	5,676.22	5,676.22	Collected at park transfer station, compressed, then disposed of by waste incineration plant
2	Waste Solar Panels	No	/	Category 1	0.14	0.14	Recycled directly by manufacturer, not stored on-site
3	Waste Machine Oil	Yes	HW08	/	0.5	0.05	Collected, temporarily stored in hazardous waste area, disposed of by qualified unit
4	Waste Oil-soaked Cloths	Yes	HW49	/	0.01	0.01	
5	Waste Activated Carbon	Yes	HW49	/	0.5	0.5	
6	Packaging Waste	No	/	Category 1	2	2	Sold to recycling station, not stored on-site
7	Waste Hydraulic Oil	Yes	HW08	/	0.26	0.26	Collected, temporarily stored in hazardous waste area, disposed of by qualified unit
8	Waste Batteries	Yes	HW49	/	0.1	0.1	

g. Ecology

364. The project will result in the loss of some terrestrial vegetation and a reduction in terrestrial animal habitats, leading to habitat fragmentation. However, due to the abundance of similar habitats in the surrounding area, wildlife is expected to find suitable habitats elsewhere. The project area and its vicinity mainly consist of low hilly terrain with minimal elevation change. For amphibians and reptiles, habitat destruction may cause horizontal migration to similar habitats farther away. For birds and mammals, although a small portion of their habitat will be destroyed, due to their high migratory capacity and diverse food sources, the project's operation will not pose significant threats to their habitats. The project's construction will have a relatively larger impact on artificial forests and farmland habitats, which are frequently disturbed by human activities and host limited wildlife species.

365. To mitigate the impact of the operation phase on biodiversity, the following measures will be taken:

i) Strengthen vegetation management during the initial growth phase to ensure high survival rates and shorten the recovery time of greenery, compensating for the vegetation loss caused by construction. Regularly inspect the greenery to maintain vegetation growth, which will help improve the local ecological environment and prevent the development of invasive species.

ii) Monitor the distribution dynamics of invasive alien species during operation. Any invasive alien species found within the project site shall be removed.

366. For a more detailed analysis of the project's impact on biodiversity, please refer to the project's specific Biodiversity Investigation and Assessment Report.

h. Light Pollution

367. The design utilizes monocrystalline silicon solar panels. These panels employ low-iron, specially tempered glass with a light transmittance of approximately 93% - 94.5% and a reflectivity that can be controlled below 8%. Furthermore, the surface of monocrystalline silicon modules is typically frosted or textured, causing reflection to be primarily **diffuse reflection**, which further scatters the energy of reflected light and reduces interference caused by concentrated local light intensity. The photovoltaic modules will be installed tilted at a 15-degree angle facing south, optimized for the solar azimuth in Qinzhou City. This orientation directs most reflected light to scatter upwards into the sky rather than directly towards ground-level sensitive areas such as residential buildings or roads, thus preventing significant light pollution. The panel surfaces will be cleaned regularly to remove contaminants like dust and bird droppings, avoiding the creation of a "local mirror" effect that could intensify

reflected light in specific spots. Should residents in the vicinity report glare interference, on-site inspections will be conducted promptly, and measures such as adjusting the panel angle or adding simple shading facilities (e.g., installing shading strips on the edges) will be implemented.

i. Environmental Risks

368. In accordance with the current project feasibility study, hazardous chemicals are not stored in the project's warehouses, which house conventional cargo including auto parts, electronic products, mechanical products, daily necessities, rubber, metal ores, chemical products (excluding hazardous chemicals), new energy materials and products, textile raw materials and products, timber and processed timber products, grain, fruits and vegetables, meat and seafood, general merchandise, experimental materials, non-standard industrial parts, special handicrafts and exhibition props. Based on identification in the Catalogue of Hazardous Chemicals (2022 Revised Version), the project's environmental risks mainly stem from diesel leakage of diesel generators and NH₃ refrigerant leakage. Potential risks also include: the addition of toxic chemicals such as pesticides and solvents in warehouse storage in the follow-up; leaks, fires and other accidents during the storage and use of hazardous chemicals; and improper disposal of non-hazardous waste chemical products and their packaging. All the above may cause soil, water and atmospheric pollution, leading to ecological damage, human poisoning and secondary pollution.

369. To mitigate environmental risks, the following prevention and control measures are proposed:

- (i) Source Control: Optimize the storage and use processes of hazardous chemicals to reduce leakage; select compliant non-hazardous chemical raw materials and conduct strict quality control.
- (ii) Zoned Protection: Locate the hazardous cargo functional area away from other functional areas and office-living facilities on the leeward side of the dominant wind direction, and maintain a safe distance from surrounding facilities; install emergency collection facilities such as anti-leakage, anti-seepage and cofferdam facilities for hazardous chemicals, and equip basic protection facilities in the storage area of non-hazardous chemical products; adopt targeted protective measures for equipment involving flammable and explosive media based on their characteristics.
- (iii) Signage and Accessways: Install safety signs and apply safety colors in accident-prone areas; set up eye-catching signs for emergency accessways and exits in production and operation areas.
- (iv) Monitoring and Early Warning: Install real-time monitoring and alarm equipment for hazardous chemicals, and conduct regular hidden danger

inspections for the storage of non-hazardous chemicals.

- (v) Emergency Response: Formulate special emergency plans, equip complete emergency supplies and organize regular drills.
- (vi) Compliant Disposal: Entrust qualified entities with the standardized disposal of waste hazardous chemicals and strictly implement environmental protection requirements.

j. Occupational Health and Safety

370. According to the characteristics of production activities during the operation period of the project, the main occupational health and safety risks come from the potential safety risks of personnel brought about by the operation of logistics and processing equipment, and the potential health risks of personnel caused by equipment noise and exposure to hazardous waste.

371. In order to mitigate potential health and safety risks to workers, the following measures are proposed:

(1) Prepare an environmental and social management plan for the operational phase and provide regular training to workers.

(2) Provide workers with personal protective equipment, including goggles, gloves and safety shoes, free of charge; Soundproofing equipment for workers in noisy environments.

(3) Develop emergency preparedness and response plans for accidents and emergencies and clarify reporting procedures. This includes environmental and public health emergencies related to hazardous material spills and similar incidents. Establish an emergency hotline with the hospital where the project area is located.

(4) Workers shall be trained in occupational health and safety and emergency response, and special occupational health and safety training shall be carried out for personnel engaged in positions that come into contact with hazardous wastes.

(5) The area of project operation will restrict access to the public.

D. Environmental Benefits

372. This project will construct a multimodal transport hub integrating "highway-railway-river/sea" transportation. Upon completion, it will enhance the regional cargo collection, distribution and transshipment capacity, improve multimodal transport efficiency, and reduce logistics turnover costs. Railway

freight and river-sea freight represent alternative transportation modes. Compared with the equivalent transportation volume by highway, once put into operation, this project will generate global public benefits by avoiding annual carbon dioxide emissions. These emission reductions are reflected in the project's climate mitigation and adaptation assessment report.

E. Indirect Impacts and Cumulative Impacts

373. In addition to construction works, this project also includes several research activities, such as the research on reducing the logistics costs of sea-rail intermodal transport in the Pan-Beibu Gulf Economic Zone. These activities themselves do not have direct environmental impacts. However, the implementation of research results may trigger downstream construction activities (e.g., construction or upgrading of transportation and logistics-related facilities), thereby causing indirect environmental impacts of varying degrees. The significance of such risks and impacts depends on the type, location and scale of downstream activities.

374. The terms of reference formulated for such activities shall require the research undertaking entities to screen and assess potential downstream environmental risks and impacts during the implementation of the research, put forward mitigation measures and suggestions, and describe the implemented stakeholder engagement activities and their outcomes. These contents shall be reflected in the relevant chapters of the output report.

375. Cumulative impacts during the construction period. The Second Line Construction Project of the Nanning-Fangchenggang Railway (Qinzhou-Fangchenggang Section) will renovate Mahuang Station, which is scheduled to be completed by the end of 2025; the Pinglu Canal Project is expected to be put into operation in 2026. This project is scheduled to start construction in December 2026, by which time both the Second Line Construction Project and the Pinglu Canal Project will have been completed. Therefore, the Second Line Construction Project and the Pinglu Canal Project will not be under construction simultaneously with this project, and there will be no cumulative impacts during the construction period.

376. Analysis of cumulative impacts on the atmospheric environment during the operation period. According to the Environmental Impact Assessment Report of the Pinglu Canal Project, after the completion of the project, the concentration distribution of SO₂, NO₂, PM₁₀ and PM_{2.5} emitted by ships will basically diffuse from the central area of the canal to the surrounding areas, with the diffusion range mainly concentrated within the waterway. The impact on the ambient air protection targets on both sides of the canal will be minimal. According to the *Environmental Impact Assessment Report on the Second Line Construction Project of the Qinzhou-Fangchenggang Railway for the New Western Land-Sea Corridor* (hereinafter referred to as the "Second Line EIA Report"), the main air pollution caused by the Second Line Construction Project to the surrounding environment during operation will be coal dust from coal-

carrying trains and cooking fumes from canteens. All coal-carrying trains will adopt the measure of spraying dust suppressant. After the dust suppressant is sprayed on the surface of the coal seam, a solidified layer will be formed, preventing coal dust from scattering during transportation and thus avoiding impacts on the ambient air quality along the line. A small amount of cooking fumes will be generated from the kitchen of the canteen along the line. The kitchen is equipped with a dedicated flue, and the cooking fumes will be treated by an oil fume purification device with a treatment efficiency of over 85%. After purification by the oil fume purification device, the emission concentration can be reduced to below 2.0 mg/m³, meeting the relevant requirements of the *Emission Standard for Cooking Fumes from Catering Services (Trial)* (GB18483-2001). Therefore, the cumulative impact of the Pinglu Canal Project and the Second Line Construction Project on the surrounding atmospheric environment will be negligible.

377. Analysis of cumulative impacts on the acoustic environment during the operation period. According to the Environmental Impact Assessment Report of the Pinglu Canal Project, there are no sensitive points distributed in the overlapping area of the project's evaluation scope and that of this project. Therefore, the Pinglu Canal Project will have no cumulative impacts on this project. In addition, the ship navigation noise at 20m on both sides of the Pinglu Canal can meet the day and night limit values of Category 4a in the *Ambient Noise Standard* (GB3096-2008), and the daytime noise can meet the Category 2 standard.

378. The acoustic environment protection targets subject to the overlapping impacts of this project and the Second Line Construction Project are Laocun Village and Maxiong Village, with their specific locations shown in Figure VII-14 and Figure VII-15 below. The superposition results of the contribution values of this project and the Second Line Construction Project at Laocun Village and Maxiong Village are presented in Table VII-33 and Table VII-34 below (since the prediction period of the Second Line Construction Project only covers 2035 and 2045, this superposition impact analysis is limited to the short-term and long-term periods only). According to the superposition results: the nighttime acoustic environment at the sensitive points of Laocun Village 1 and Laocun Village 2 exceeds the standard, mainly due to the relatively large contribution value of the Second Line Construction Project. According to the EIA Report, sound insulation windows will be installed for all 33 households near Laocun Village under the Second Line Construction Project, and after the installation of sound insulation windows, all the standard-exceeding sensitive points will meet the standard requirements. The EIA Report of the Second Line Construction Project obtained the *Approval of the Department of Ecology and Environment of Guangxi Zhuang Autonomous Region on the Environmental Impact Assessment Report of the Second Line Construction Project of the Qinzhou-Fangchenggang Railway for the New Western Land-Sea Corridor* (Gui Huan Shen [2023] No.17) on January 30, 2023. The approval clearly stipulates that sound insulation windows shall be installed for 59 acoustic environment protection targets along the line during the operation period. The EIA Report has clearly specified the fund arrangement for environmental protection

measures such as sound insulation windows. According to the on-site survey results conducted by the consulting firm in September 2025, the sound insulation window measures along the Second Line Construction Project have been implemented. The project started construction in December 2022 and is expected to be completed in December 2025.

379. Analysis of cumulative impacts on the vibration environment during the operation period. The evaluation scope of railway vibration environment covers the area within 60m on each side of the center line of the outer rail. There are no sensitive points distributed in the overlapping area of the evaluation scope of this project and that of the Second Line Construction Project. Therefore, the cumulative impact of the Second Line Construction Project on the vibration of sensitive points of this project will be minimal.

Table VII-33 Short-term Superposition Impact Prediction Results of Sensitive Points Unit: dB(A)

Predicti on Point	Background Value		Contribution Value of This Project		Contribution Value of the Second Line Construction Project		Predicted Value after Superposition		Standard Value		Exceedance Value		Measures and Effects
	Dayti me	Nightti me	Dayti me	Nightti me	Dayti me	Nightti me	Dayti me	Nightti me	Dayti me	Nightti me	Dayti me	Nightti me	
Laocun Village 1	51.5	41.5	36.4	/	54.2	52.4	56.1	52.7	60	50	/	2.7	Sound insulation window measures are adopted for the Second Line Constructio n Project, and the standard requirement s are met after the
Laocun Village 2	51.0	42.5	42.6	33.9	54.2	52.4	56.1	52.9	60	50	/	2.9	

													implementat ion of this measure.
Laocun Village 6	52.0	42.5	34.7	/	58.3	56.6	59.2	56.8	70	60	/	/	/
Maxiong Village 3	52.5	41.5	60.8	51.8	44.6	42.8	61.5	52.7	70	55	/	/	/
Maxiong Village 4	53.5	42.5	55.6	45.5	51.1	49.4	58.6	51.5	70	60	/	/	/

Table VII-34 Long-term Superposition Impact Prediction Results of Sensitive Points Unit: dB(A)

Predicti on Point	Background Value		Contribution Value of This Project		Contribution Value of the Second Line Construction Project		Predicted Value after Superposition		Standard Value		Exceedance Value		Measures and Effects
	Dayti me	Nightti me	Dayti me	Nightti me	Dayti me	Nightti me	Dayti me	Nightti me	Dayti me	Nightti me	Dayti me	Nightti me	
Laocun Village 1	51.5	41.5	38.2	/	54.6	52.9	56.4	53.2	60	50	/	3.2	Sound insulation window measures are adopted for the Second Line Constructio n Project, and the standard requirement
Laocun Village 2	51.0	42.5	44.0	34.3	54.6	52.9	56.4	53.3	60	50	/	3.3	

													s are met after the implementat ion of this measure.
Laocun Village 6	52.0	42.5	36.5	/	58.8	57.0	59.7	57.2	70	60	/	/	/
Maxiong Village 3	52.5	41.5	61.9	52.9	44.6	42.8	62.4	53.6	70	55	/	/	/
Maxiong Village 4	53.5	42.5	56.7	46.6	51.1	49.4	59.4	51.8	70	60	/	/	/

VIII. Social Impact Assessment and Mitigation Measures

A. Social Impact Assessment

380. According to the AIIB Environmental and Social Framework (ESF), the objective of the social impact assessment is to identify, evaluate, and manage the potential social risks and impacts of the project, aiming to avoid or minimize adverse environmental and social risks and impacts while enhancing positive benefits. When impacts are unavoidable, corresponding mitigation and management measures shall be formulated and implemented based on relevant Chinese laws and regulations as well as AIIB's environmental and social policy provisions.

381. The SIA conducted for this project aims to identify its positive and negative impacts through social participatory methods, including literature review, field surveys, household questionnaires, discussion meetings, in-depth interviews, and institutional consultations. Furthermore, it seeks to mitigate potential social risks through a Social Management Plan, optimize project design, safeguard the fundamental rights and interests of all stakeholders, and promote their equitable participation in the project.

382. Mainly includes:

(i) Identify project stakeholders and, through extensive public participation and information disclosure, understand their (including EMs) interests, concerns, and attitudes towards the project, with particular attention to vulnerable groups such as women, the elderly, and low-income groups.

(ii) Analyze the potential positive and negative impacts of the project, identify potential social risks, and provide a basis for formulating the Social Management Plan.

(iii) Focus specifically on impacts related to project land acquisition and resettlement, employment and income generation, community health and safety, labor management, gender equality, OHS, and emergency management; and identify key environmental and social sensitive points and the concerns of vulnerable groups.

(iv) Integrate environmental and social considerations into project design and implementation, proposing measures to mitigate adverse impacts and enhance positive benefits; propose measures to avoid or reduce negative impacts.

(v) Establish information disclosure, public participation, and a GRM to ensure the affected groups' right to information, participation, and monitoring, thereby enhancing project transparency and inclusiveness.

(vi) Formulate and implement the ESMP, establish a monitoring and evaluation framework for continuous tracking, and ensure the smooth achievement of project objectives. Concurrently, utilize sex-disaggregated data to strengthen inclusive project design, promote gender equality, and empower women.

B. Object and Scope

a. Social Impact Assessment Object

383. The social impact assessment objects of this project are the primary stakeholders and the secondary of the project.

384. Primary Stakeholders refer to groups and individuals directly affected by the project, including: (1) Residents within the project's area of influence, specifically in Huangma Community, Chengbei Community, Longwan Community, Hengling Village, and Jiangbiao Community under Changtian Sub-district and Dadong Town, including EMs (Zhuang); (2) Residents near environmental sensitive points and persons directly affected by land acquisition and house demolition; (3) Vulnerable groups requiring specific attention, such as the elderly, women, low-income families, female-headed households, and students; (4) Various workers involved during the project's construction and operation phases, including directly hired workers, contractor workers, and supplier workers.

385. Secondary Stakeholders refer to institutions and organizations indirectly related to the project or responsible for management, coordination, and service provision, including: (i) The Qinbei District Development and Reform Bureau (PMO) and QHAMG (PIU); (ii) The Qinbei District Bureaus of Finance, Natural Resources, Land and Housing Expropriation Center, Human Resources and Social Security, Transportation, Ecology and Environment, Civil Affairs, Women's Federation, Health Commission, and Ethnic and Religious Affairs Bureau; (iii) Contractors, and design and monitoring units.

b. Scope of Social Impact Assessment

386. The social impact assessment scope for this project covers the project construction and operational areas, as well as the surrounding affected areas, primarily including:

(1) Direct Affected Area: This includes Huangma Community, Longwan Community, Chengbei Community, Hengling Village, and Jiangbiao Community within the administrative areas of Changtian Subdistrict and Datong Town. It encompasses major environmental and social sensitive points, such as Laoba Village, Qingtang Village, Maqiong Village, Shuijindong Village, Hanlin Zunfu, and Hanlin Zunfu Kindergarten.

This delineation is consistent with the "Project Impact Area and Sensitive Receptors" section in the Environment Chapter, incorporating: the 200-meter zone from the project boundary for noise and air impacts during construction and operation; the 300-meter ecological impact zone from the boundary; the

rectangular impact area with a side length of 5 kilometers centered on the Waste Transfer Station; and the 200-meter corridor on either side of the Entrance Trunk Road. Within this defined scope, the social impact assessment area corresponds to the environmentally sensitive receptors, mainly covering residential areas, schools, kindergartens, other public service facilities, and the surrounding ecological environment and agricultural land.

(2) Indirect Affected Area: This includes surrounding communities and villages within the administrative boundaries of Changtian Subdistrict and Datong Town, areas along transportation routes, public service facilities, and the associated populations.

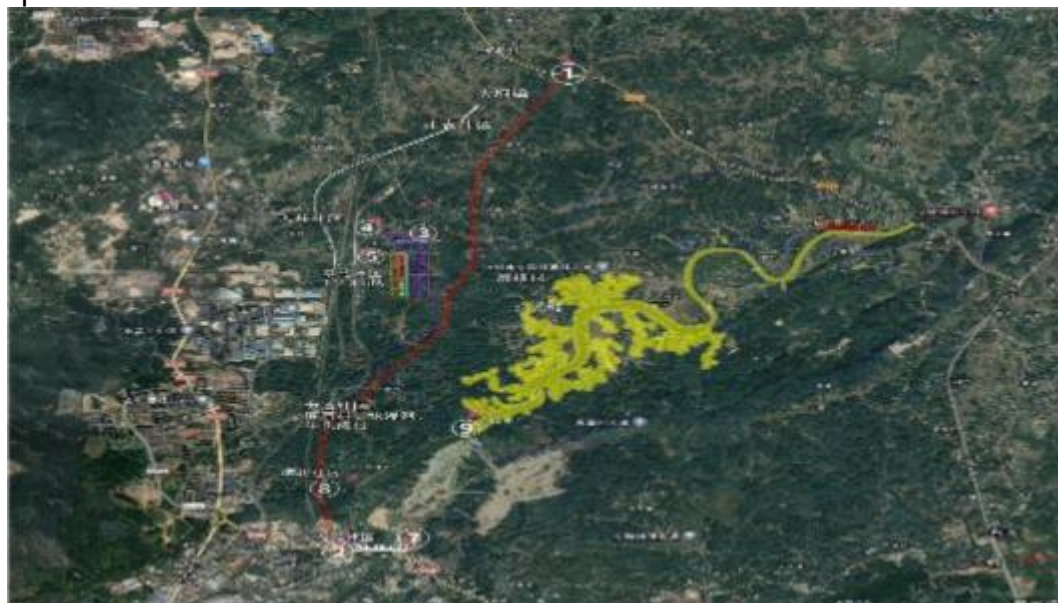


Figure VIII- 1 Location of communities/villages within the scope of project investigation

C. Methods for Social Impact Assessment

387. The SIA for this project employs a participatory evaluation approach that integrates both qualitative and quantitative methods. Primarily through literature review, field surveys, household questionnaires, FGDs, KIs, and institutional meetings, it systematically identifies and analyzes the primary social impacts potentially arising during the project's construction and operation phases, thereby providing a basis for formulating corresponding mitigation and management measures.

388. From May 8th to 20th, 2024, the environmental and social consulting team conducted on-site investigations on resettlement and land acquisition work, social impact assessment, etc. within the scope of the project's impact, in close cooperation with QHMG in Qinzhou, relevant government functional departments in Qinbei District, Changtian Street Office, Dadong Town People's Government, community and village committee village cadres. From May 8 to 20, 2024, with the coordination of relevant functional departments of Qinbei District, the Changtian Sub-district Office, the People's Government of Dadong Town, and the project company, the E&S consultants conducted the SIA field

survey within the project's area of influence. The survey covered 8 communities/villages across Changtian Sub-district, Dadong Town, and Hongting Sub-district, focusing on collecting baseline data on the project area's demographic structure, socio-economic conditions, land use, and key social concerns, which provided fundamental data for identifying and analyzing social impacts.

(1) Field survey

389. The ESIA team conducted on-site inspections of the project site and surrounding towns, communities, and villages to understand the social and environmental sensitive points in the project area. They gained a more practical and objective understanding of the sub project site selection and its impact on the production and life of surrounding residents, as well as the impact of LA and HD.



Figure VIII-2: Field survey

(2) Focus group discussion

390. In order to gain a more comprehensive understanding of the needs and suggestions of the project-affected people in the project area (including urban and rural residents, women, impoverished and other vulnerable groups), and in response to the evaluation of the current living environment by the project beneficiaries and the construction of the center park and the entrance trunk road, as well as their willingness, main concerns and demands for project construction, land acquisition and demolition, etc. The environmental and social consultant adopted a focus group discussion approach during the on-site investigation. The survey covered 8 communities/villages (Huangma Community, Chengbei Community, Longwan Community, Hengling Village, Jiangbiao Community, Dajing Community, Shantang Community, Dadong Village) in 3 townships/streets (Changtian Street, Dadong Town, Hongting Street) in Qinbei District. A total of 16 focus group discussions were conducted, with about 240 participants, including about 84 women (35%) and 14 EMs (5.83%).



An institutional symposium was held at the Women's Federation to understand women's support policies and employment, as well as opinions and suggestions on projects



An institutional symposium was organized by the Qinbei District Human Resources and Social Security Bureau to understand the situation of social security payment, labor security, and employment skills training



Figure VIII- 3: Focus group discussion

(3) Interview with key informants

391. The consultant conducted interviews with key informants in the towns, streets, villages/communities affected by the project to gain a more comprehensive understanding of stakeholders' attitudes towards the project and provide better recommendations for project design and implementation. And visited the responsible personnels of the Qinbei District Natural Resources Bureau, Land Acquisition Center, Women's Federation, Civil Affairs Bureau, Ethnic and Religious Committee and other institutions in the project area, as well as the heads of related facility units, to collect relevant basic data and materials; And interviews were conducted with community/village committees and village representatives involved in the project. A total of 45 key informants were interviewed, including 15 females, accounting for 33%.



A meeting was held at QHAMG to coordinate and arrange institutional investigation work



Understood the social security situation in the project area at the Qinbei District Civil Affairs Bureau



Learned about the project policies and compensation and resettlement information at the Qinbei District Acquisition Center



Understood the ethnic minority population and other situations in the project area at the Qinbei District Ethnic Bureau

1. Interviews with relevant government agencies





2. Basic information was collected from the village/community (residential) committee



3. Interview with residents in the project area



Guangtong gas station



Hexi Sewage Treatment Plant



Mahuang Water Supply Plant



Mahuang Marshalling Yard



Hainuoer Urban Household Waste Incineration Plant



Linhu converting station

4. Existing facilities social survey

Figure VIII-4: Interview with key informants

(4) Questionnaire investigation

392. After holding a unit symposium with relevant institutions in the project county, the social evaluation team conducted a social evaluation questionnaire survey in towns, communities/village groups, and street shops affected by the project construction.

393. The survey scope of the social evaluation team covers 8 communities/villages (Huangma Community, Chengbei Community, Longwan Community, Hengling Village, Jiangbiao Community, Dajing Community, Shantang Community, Dadong Village) in 3 townships/streets (Changtian

Street, Dadong Town, Hongting Street) in Qinbei District. 400 social impact assessment survey questionnaires were distributed, and a total of 380⁴ social impact assessment survey questionnaires were collected, accounting for 95% of the effective rate. Among them, 176 were female, accounting for 46%; 20 ethnic minorities (Zhuang), accounting for 5.3%; 42 low-income individuals, accounting for 11.05%.



Figure VIII-5: On-site questionnaire survey

394. For details, see Table below.

⁴ Among a total of 380 valid questionnaires, 193 were completed by residents directly affected by LA and HD, accounting for 51% of the total. The remaining 187 questionnaires were from non-LA-and-HD residents within the project impact area, representing 49%.

Table VIII- 1 Stakeholder Participation Activities Conducted

Investigati on time	Investigation methods	Participants	Number of participant s	Among them, the number of women	Among them, ethnic minorities	Among them, low- income individual s
May 8-20, 2024	Key informant interview (KII)	Officials and village (residential) representatives from the Housing and Land Acquisition Center, Natural Resources Bureau, Human Resources and Social Security Bureau, Women's Federation, Civil Affairs Bureau, Ethnic and Religious Affairs Bureau, relevant town and village institutions, and related facility units	45	15	—	—
	Focus Group Discussion (FGD)	Stakeholders from 6 communities/villages in Changtian Street and Dadong Town within the project scope, including those affected by land acquisition and demolition, residents of the project area, project office staff, and relevant government agency staff	240 (16)	84	14	21
	Resettlement Questionnaire Survey	Land acquisition and demolition households directly affected by the project	225	108	11	11
	Social evaluation questionnaire survey	Stakeholders from 6 communities/villages in Changtian Street and Dadong Town within the project scope	380	176	20	42
Total			890	383	45	74

Data source: Environmental and Social Survey (2024.05)

395. Following the completion of the field surveys, the consultants continued subsequent assessments and public participation activities. They fully communicated and confirmed risk mitigation measures, plan optimization, and the sequencing of action implementation with the PIU to further refine the social impact assessment and the dynamic improvement of management measures. These activities included: In October 2024, an online meeting was held to discuss the relocation of the Tudimiao in Hengling Village. From March to April 2025, meetings were organized to discuss land acquisition compensation, support for vulnerable groups, and social security measures. In July 2025, an online meeting was held with the PMO and the Qinbei District Expropriation Center to verify the project's area of impact and physical assets. Discussions also covered compensation standards, resettlement plans, implementation schedules, and detailed revisions to the report. On September 15–16, 2025, online meetings were conducted with local potential photovoltaic enterprises to carry out due diligence on occupational health and labor management. On September 23, 2025, the AIIB mission, together with the PMO, the E&S team, and local government representatives, conducted a site visit. They interviewed villagers potentially affected by railway noise and vibration, inspected the current condition and proposed new site of the Tudimiao in Hengling Village, as well as the status of the resettlement community. Discussions were held on the resettlement plan and the relocation of the Tudimiao. In November 2025, based on the updated FSR (October 31, 2025), the E&S consultants updated the ESIA report, ESMP, SEP, GAP, and RP. In February 2026, based on the review comments from the AIIB E&S consultants, the aforementioned documents were further supplemented and optimized in a targeted manner. This ensured their compliance, professionalism, and practicality aligned with AIIB's principles and standards, as well as the actual needs of the project.

D. Social Impact Analysis

396. In accordance with the requirements of the AIIB's ESF and its ESS, and based on the project's construction content and scale, findings from field surveys, and stakeholder engagement feedback, potential social risks and impacts, as well as positive impacts, have been identified and analyzed. The effectiveness and comprehensiveness of existing management measures were assessed, leading to the proposal of corresponding risk mitigation and benefit enhancement measures. This process aims to facilitate the smooth achievement of project objectives while minimizing adverse social impacts.

397. The E&S consultants have engaged in consultations with the PMO and the PIU regarding the mitigation measures proposed in this report. These discussions have clarified the responsibilities of relevant departments and the implementation arrangements, ensuring the measures are tailored to the project's context and can be effectively implemented. Furthermore, the relevant actions and measures will be dynamically adjusted and continuously optimized based on the actual progress of the project.

398. The main social risks and potential benefits identified and analyzed,

along with their corresponding measures, are as follows:

a. Risks of Land Acquisition and House Demolition

399. According to the red line scope of project construction and on-site visits, the required land area for the project (3 subprojects) is relatively large, involving a large number of project-affected people. At the same time, the project-affected people also has different demands for resettlement, which need to be handled properly. Therefore, there are certain risks involved in the land acquisition and demolition activities of this project.

400. According to the preliminary investigation of the project, the affected area of this project involves 2 townships and streets (Changtian Street, Dadong Town), and affects 5 villages/communities (Huangma Community, Chengbei Community, Longwan Community, Hengling Village, Jiangbiao Community); A total of 691 Affected HHs comprising 3,459 project-affected people will be impacted by LA and/or HD, including 1,694 female and 11 EMs (0.3%). Specifically: (a) 584 HHs (2,909 project-affected people) are impacted by land acquisition only; (b) 34 HHs (139 project-affected people) are impacted by housing demolition only; (c) 73 HHs (411 project-affected people) are impacted by both LA and HD. The total project land area is approximately 1,705.75 mu (1,641.40 mu of collective land and 64.35 mu of state-owned land). The permanent acquisition of collective land amounts to 1,641.40 mu, affecting 657 HHs (3,320 project-affected people), which includes the 73 HHs (411 project-affected people) impacted by both LA and HD. The demolition of rural residential houses affects 107 HHs (550 project-affected people), with a total demolition area of 32,625 m². This includes the 73 HHs (411 project-affected people) impacted by both LA and HD. Additionally, the project will involve the removal of scattered trees⁵, approximately 600 grave sites, and one simple Tudimiao. All TLO will be confined within the project's designated redline boundary, with no additional TLO required.

401. Field surveys and interviews revealed that affected individuals primarily expressed concerns and suggestions regarding land acquisition compensation standards and proper resettlement. Key recommendations include: (1) optimizing the project design to minimize displacement; (2) disclosing compensation policies and procedures, and signing legally binding agreements to ensure fairness; (3) prioritizing the employment of affected people, women, and vulnerable groups during construction and operation, and promptly restoring rural roads and productive assets post-construction; (4) incorporating remnant land plots into the acquisition scope; and (5) establishing a transparent and efficient GRM while prioritizing local procurement. All recommendations have been incorporated into the ESIA and RP reports.

402. In response to identified land acquisition risks and stakeholder requirements, the PMO and PIU, with input from resettlement advisors, have

⁵ The scattered fruit trees involved in this project are primarily individual fruit trees planted in villagers' courtyards and trees used for landscaping purposes; they do not involve contiguous fruit orchards. Detailed species identification and quantity verification will be conducted during the DMS stage.

developed a Livelihood Restoration and Compensation Strategy. This strategy ensures adequate compensation, restoration of living standards, and protection of rights. Aligned with AIIB's ESS 2 and national laws, a RP has been prepared detailing corresponding compensation, resettlement, and livelihood restoration measures. Refer to the RP for specifics.

b. Risks of Ethnic Minority Development

I. Participation Process of Ethnic Minorities during Project Preparation

403. From May 8 to 20, 2024, the environmental and social consulting team conducted field surveys in the project impact area. To ensure the survey process respected and adapted to the linguistic and cultural characteristics of the local Zhuang residents, the team employed multiple methods including key informant interviews, focus group discussions, and questionnaires to conduct in-depth communications with Zhuang residents. The survey strictly adhered to the principle of "Free, Prior and Informed Consent" (FPIC). In consideration of the linguistic and cultural characteristics of the local Zhuang residents, the environmental and social consulting team engaged a local bilingual assistant proficient in both the Zhuang language and Mandarin to facilitate the surveys and interviews throughout the process.

404. During the household interviews, the engaged local bilingual assistant used everyday language easily understood by residents. They first introduced the project content, potential impacts, and the purpose of the survey in detail to the respondents, and clearly informed them of the voluntary nature of their participation and their right to express opinions. During the survey process, the bilingual assistant provided on-site interpretation and supplementary explanations of key information as needed to ensure respondents could fully and accurately comprehend the relevant content.

405. The survey found that all interviewed Zhuang residents were proficient in Mandarin communication and possessed the ability to read Chinese characters. In focus group discussions, Zhuang villagers of different genders and ages fully expressed their support for the project and raised specific views and demands on topics such as land acquisition compensation, resettlement measures, and livelihood restoration. Furthermore, interviews with the Qinbei District Ethnic and Religious Affairs Bureau and Dadong Town Government revealed that most Zhuang residents in the project impact area moved there through marriage, have lived alongside Han and other ethnic groups for extended periods, exhibit a high degree of cultural integration, and generally possess good Mandarin communication skills and Chinese reading ability.

406. This survey covered 34 Zhuang residents who participated as key informants in interviews and questionnaires, including 21 women, accounting for 62%. All 11 Zhuang residents affected by project land acquisition participated in discussions related to land acquisition, compensation, and livelihood restoration, ensuring their right to know and right to participate were fully protected.

407. The environmental and social consulting team strictly adhered to the principle of "Free, Prior and Informed Consent" (FPIC). In all survey activities, the team fully explained the project content, survey purpose, and participants' related rights in an easy-to-understand manner, ensuring participants could voluntarily decide whether to participate based on complete information. Survey results show that 100% of the ethnic minority respondents support the project construction, generally expecting the project to drive employment growth and income improvement; 100% of the affected ethnic minority residents understand and support the project land acquisition. The above practices and results demonstrate that during the project preparation phase, through culturally adaptive communication methods and strict adherence to the FPIC principle, the rights to know, participate, and express opinions of ethnic minority groups were fully respected and effectively implemented.

408. While expressing strong support for the project, ethnic minority (Zhuang) representatives of different genders put forward the following suggestions regarding project construction and implementation:

409. Zhuang male representatives primarily focused on the following aspects: the rationality of land acquisition compensation standards and the transparency of procedures, the effective implementation of livelihood restoration measures (such as training and skills enhancement) after land loss, control of environmental impacts such as noise and dust during construction, and traffic safety management during the construction period. Meanwhile, they expressed the hope to obtain priority access to employment opportunities during project construction and subsequent operation phases.

410. Zhuang female representatives, while concerned about the above aspects, placed greater emphasis on the stability of household income, skills training opportunities, and balancing family care responsibilities with off-farm employment. They suggested that the project party publish project information in a timely manner through village (community) bulletin boards, WeChat groups, and other channels, especially progress on land acquisition compensation and job recruitment information, ensuring women can access and participate in a timely manner. At the same time, they expressed the desire for more participation opportunities in land acquisition compensation negotiations and other related decision-making processes, suggesting relevant meetings explicitly invite female representatives and provide non-technical positions suitable for women. Furthermore, they recommended fully respecting ethnic minority cultural customs during construction, such as reasonably arranging construction schedules or suspending construction during traditional ethnic festivals like "Sanyuesan", to reflect respect for and inclusion of local culture.

411. The project team has incorporated the above opinions into the ESIA, ESMP, RP, and SEP. This ensures that ethnic minority men and women effectively participated during project preparation and that their legitimate concerns are addressed and implemented.

412. During project implementation period, the PMO and PIUs will continue to conduct meaningful public participation activities, with a focus on ensuring

the effective participation of ethnic minorities and women: timely disclosure of construction arrangements, compensation progress, and employment information through bulletin boards, WeChat groups, in-home notifications, and residents' representative meetings; during land acquisition compensation, livelihood restoration, and construction phases, regularly organize discussions and consultation meetings, specifically inviting affected ethnic minority men and women representatives to provide opinions on compensation implementation, construction impacts, employment arrangements, and respect for cultural customs, and track implementation; regarding employment and livelihood restoration, prioritize recruitment of local labor through contract provisions and park enterprise requirements, and provide free skills training targeting ethnic minorities and women; concerning cultural sensitivity and safety management, provide training to construction personnel on respecting ethnic customs and preventing gender-based violence, and reasonably arrange construction schedules during important ethnic festivals; regarding grievance mechanisms, publicize complaint contact persons and methods through multiple channels, provide assistance to ethnic minority families in need, process grievances according to procedures, and inform them of the possibility to seek independent review through the AIIB's PPM. The above arrangements have been incorporated into the ESIA, ESMP, RP, and SEP, and will be tracked and evaluated through internal and external monitoring mechanisms to ensure ethnic minority groups derive fair, inclusive, and substantive benefits throughout the entire project cycle.

II. Analysis of Impacts on Ethnic Minorities

i. Positive Impacts of the Project

413. The main construction content of this project includes a multimodal transport freight yard, logistics and production facilities, the Entrance Trunk Road, and associated pipeline networks. Upon completion, the project will: (i) Significantly improve infrastructure such as roads and drainage, and enhance environmental sanitation and public safety in Changtian Subdistrict and Dadong Town. This will increase regional land value and promote industrial development, generating positive benefits for all village/community residents in the project impact area, including the 60 Zhuang individuals. (ii) During the construction and operation phases, the project will provide employment opportunities through contractors, the operating entity, and park enterprises. These opportunities will include non-technical positions (such as security, cleaning, greening) and various technical roles. Under the principles of fairness, voluntariness, and equality, priority will be given to hiring local labor. In coordination with the Human Resources and Social Security Bureau and the Women's Federation, free vocational skills training will be implemented. This will create sustainable income-generating channels for all local laborers, including the 60 Zhuang residents (including the 11 affected Zhuang residents) and women. (iii) Through the implementation of the Resettlement Plan (RP), the Environmental and Social Management Plan (ESMP), and the Stakeholder Engagement Plan (SEP), the project will ensure that ethnic minority families enjoy fully equal treatment compared to Han residents in terms of resettlement, compensation standards, access to public services, and employment

opportunities. This will effectively enhance the social security level and resilience of ethnic minority groups, including the Zhuang, enabling them to share equitably in the benefits of the project's development.

ii. Adverse Impacts and Potential Risks of the Project

414. The adverse impacts and potential risks of this project on ethnic minorities are generally consistent with those on Han residents. The main adverse impacts and potential risks include:

415. The land acquisition and demolition for this project will affect 5 villages and communities across 2 towns and subdistricts, impacting a total of 691 households and 3,459 people. This includes 11 individuals from the ethnic minority (Zhuang), accounting for 0.3% of the total affected population. Some of their household-contracted land will be subject to acquisition. Survey results indicate that the expected loss does not exceed 5% of their agricultural income, suggesting an overall limited impact on livelihoods. However, without transparent compensation and adequate support for livelihood restoration, concerns about their future livelihoods may be exacerbated.

416. Other negative impacts and potential risks arising from project-related activities include: (1) Impacts from noise, dust, and solid waste generated during construction will temporarily affect the daily lives of residents (including women) in the project impact area, including the Zhuang. (2) The influx of a non-local workforce may pose a risk of disease transmission. (3) The movement of large vehicles may impact surrounding traffic and transportation safety. (4) Contractors and non-local construction workers may lack sensitivity towards ethnic minority cultures. For instance, ethnic minority residents have suggested suspending construction during ethnic festivals such as "Sanyuesan". (5) If there is insufficient participation of affected Zhuang individuals and females, in key information disclosure and consultation processes related to land acquisition compensation, livelihood restoration, recruitment, and construction scheduling, they may face challenges in timely expressing their concerns, accessing employment opportunities, and benefiting from project gains.

III. Inclusive Development Measures for Ethnic Minorities under the ESS3 Framework

417. To fully implement the requirements of ESS3 of the AIIB's ESF and ensure the legitimate rights and interests of the Zhuang ethnic minority groups in the project area are fully protected, the project has systematically identified the distribution characteristics and potential impacts on ethnic minorities during the preparation phase. Based on this, a culturally appropriate, gender-sensitive, and inclusive Ethnic Minority Development Measures Table has been formulated to avoid or mitigate adverse impacts. These measures have been integrated into the ESIA, the ESMP, the RP, and the SEP and will be incorporated into the project's implementation and monitoring system throughout its lifecycle.

418. During the project preparation phase, the project team conducted culturally appropriate and gender-inclusive meaningful consultations with Zhuang groups, systematically collecting and fully incorporating their opinions and concerns. Based on this, an inclusive Ethnic Minority Development Measures Table has been formulated. These focus on six key areas: Resettlement and Livelihood Restoration, Public Participation and Information Disclosure, Equal Employment Opportunities, Occupational Health and Safety, Community Health and Safety and Cultural Respect, and the Grievance Mechanism. The details are as follows:

(1) Resettlement and Livelihood Restoration: The project strictly adheres to the Resettlement Plan, ensuring that affected Zhuang families receive full and transparent compensation. The 11 Zhuang residents affected by land acquisition will have 100% participation in the compensation negotiation process. Concurrently, the project will implement targeted livelihood restoration measures, including skills training, prioritized job referrals, and assistance with pension insurance enrollment. Regular monitoring and evaluation of their income restoration and improvement will be conducted to effectively ensure that the living standards of the affected population are not diminished.

(2) Public Participation and Rights Protection: The project guarantees the right to know and the right to participate of ethnic minority groups through various channels. At key stages such as land acquisition and demolition, resettlement scheme formulation, construction scheduling, and operation management, information on compensation policies, construction plans, and job recruitment will be disclosed proactively and timely via village (community) bulletin boards, WeChat groups, and in-home notifications. This ensures that the 60 Zhuang residents (including women) can fully access relevant information.

(3) Employment: The project mandates through construction contracts that priority be given to hiring local labor, including Zhuang individuals and women, under equal conditions. In collaboration with the Human Resources and Social Security Bureau and the Women's Federation, free vocational skills training will be organized to ensure that Zhuang laborers willing to work, particularly women, have fair access to job information and training opportunities.

(4) Occupational Health and Safety: The project requires all contractors to sign labor contracts with workers, enroll them in work-related injury insurance in accordance with the law, and provide qualified personal protective equipment. Specialized training on occupational health and safety and the prevention of gender-based violence will be provided to all ethnic minority workers. Gender-segregated sanitation facilities will be installed at construction sites, aiming for zero recorded incidents of gender-based violence in the workplace.

(5) Community Health, Safety, and Cultural Respect: Measures for noise and dust reduction and traffic management will be strictly implemented to minimize disruption to the daily lives of the 60 Zhuang residents during construction. To respect Zhuang cultural customs, construction will be suspended during the construction period, particularly during traditional festivals like "Sanyuesan". Contractors will be required to provide cultural sensitivity training to their

personnel to ensure respect for local ethnic customs.

(6) **Grievance Mechanism:** The project has established a multi-tiered grievance mechanism open to all residents. The established project grievance mechanism is open to all community members, offering options for anonymity and confidentiality. This ensures that all affected individuals, including Zhuang residents, can use this channel equally and conveniently to express their concerns and protect their legitimate rights and interests. Furthermore, the project will disclose information to the public, including the Zhuang, regarding the AIIB's Project-affected People's Mechanism (PPM). Project-affected People who are dissatisfied with the outcome of the project-level grievance process can seek independent review and recourse through the PPM.

419. During project implementation, Qinzhou Huangma Assets Management Group Co., Ltd., as the implementing entity, will coordinate with the Qinbei District Ethnic and Religious Affairs Bureau, the Human Resources and Social Security Bureau, the Women's Federation, the Dadong Town People's Government, and relevant village (community) committees to comprehensively advance the implementation of Ethnic Minority Development Measures Table. Contractors and supervision units will also have corresponding responsibilities clearly defined in their contracts to ensure the continuous and effective execution of all measures during the construction and operation phases. The costs required for the above-mentioned actions and measures have been incorporated into the overall project budget. Detailed action content, monitoring indicators, responsible entities, and funding sources have been specified, providing adequate assurance for the implementation and sustainable advancement of these measures.

420. The aforementioned measures will be coordinated, organized, and supervised by the PIU (QHAMG). Specific details have been stipulated in Annex 6 of the ESMP. During project implementation, the relevant measures will be monitored concurrently with the ESMP, and the PIU will conduct whole-process tracking and evaluation of their implementation status. The project will strictly safeguard the legitimate rights and interests of all EMs, including the Zhuang, ensuring they achieve substantive, equitable, and inclusive benefits throughout the entire project lifecycle.

c. Impact Analysis of Vulnerable Groups

421. In accordance with the requirements of AIIB's ESF, the project must uphold the principles of non-discrimination and inclusiveness, ensuring that affected vulnerable groups have equal access to project benefits and are protected from unfair adverse impacts.

422. The vulnerable groups are often more susceptible to project-related impacts, such as land acquisition, construction, and operational risks like dust, noise, vibration, traffic hazards, and disease transmission, due to relative disadvantages in economic status, physical capacity, access to information, and social participation. They are also less likely to engage in public

consultations, leading to potential marginalization in project design and decision-making.

423. The identified vulnerable groups primarily include the elderly, women, children, low-income populations, and ethnic minorities.

424. (1) The project's permanent land acquisition and house demolition collectively affect 691 households (3,459 individuals). This includes 11 low-income households comprising 46 individuals, who represent 1.33% of the total affected population. (2) Within a 200-meter radius of project construction and operational activities, there are 6 natural villages, 1 residential community, and 1 kindergarten (approximately 1,865 individuals). Among these, the elderly, women, and student groups are more sensitive to environmental risks such as noise and vibration. This is particularly noticeable for elderly residents in old villages located along the dedicated rail line. No low-income households are located within this 200-meter radius. (3) Within the broader project area in Changtian Sub-district and Dadong Town, there are 278 low-income households totaling 693 individuals. Apart from the groups only affected by land acquisition (11 households, 46 individuals), other low-income families may experience indirect impacts related to traffic safety and the environment. Conversely, they may also benefit from job opportunities and infrastructure improvements generated by the project.

425. During the ESIA surveys, 21 low-income individuals participated in FGDs, and 48 took part in the household surveys. Representatives from townships (sub-districts), villages (communities), the elderly, and women also participated in the discussions, ensuring a wide representation of opinions and concerns from various vulnerable groups. The survey results indicate that vulnerable groups are generally concerned about issues such as land acquisition compensation, fair resettlement, employment opportunities, construction impacts, and information disclosure. Most interviewees expressed a desire to secure stable employment through the project, aiming for increased income and improved living standards. Specific demands include: (1) Ensuring full compensation and proper resettlement; (2) Enhancing the participation and voice of vulnerable groups in the project; (3) Prioritizing the provision of employment and labor opportunities; (4) Offering free vocational skills training; and (5) Effectively controlling dust, noise, vibration, and traffic safety impacts during construction.

426. To prevent the project from exacerbating regional poverty or creating new low-income populations, and to ensure low-income populations benefit equally and achieve income growth, the project has formulated an Assistance Plan for Vulnerable Groups. This includes: (1) Implementing the SEP to conduct meaningful public consultations, safeguarding the interests of vulnerable groups throughout the project cycle, and enhancing project information transparency and dissemination; (2) Formulating compensation and resettlement schemes, implementing livelihood restoration measures, including necessary skills training and support; (3) Giving priority to the employment of low-income individuals, women, and other vulnerable groups in project construction, operation, and related services during both the construction and

operational phases; and (4) Establishing an effective GRM to promptly record and resolve issues encountered by vulnerable groups during project implementation.

d. Social and Gender Analysis

427. In accordance with the requirements of AIIB's ESS1, projects must identify and address adverse impacts resulting from gender factors, and promote equal opportunities and the socio-economic empowerment of women in project design. This section will focus on identifying and analyzing gender-based differences and potential risks, recognizing the project's positive impacts and social risks for women, and proposing feasible risk mitigation and gender equality promotion measures. The objective is to ensure that women's rights and needs are fully considered in the project's design and implementation, thereby promoting gender equality and social inclusion.

428. To understand the development status of women in the project area, the environmental and social consultants conducted public participation activities, including field visits, discussion meetings, KIIs, and household surveys, to comprehensively reflect the opinions and demands of women from different groups. A total of 16 meetings/consultation sessions were held, involving 240 participants (84 women, 35%); 45 KIIs were conducted (15 women, 33%); and 380 questionnaires were completed (176 women, 46.3%). The assessment will specifically focus on women's practical needs and potential impacts concerning employment and livelihoods, participation in public affairs, access to information, as well as safety and health.

(1) Age composition: Based on the age distribution of the overall survey sample, the largest proportion of respondents falls within the 36-54 age group, accounting for 49.47%. Within this age group, the male proportion is 49.51% and the female proportion is 49.43%. The next largest group is age 55 and above, representing 27.11% of the sample, while the proportion of respondents age 35 and below is relatively smaller at 23.42%. For details, please refer to Figure VIII-6 below.

Table VIII-2 Composition of the Respondents

Age	Male		Female		Total	
	Number of people	Proportion	Number of people	Proportion	Number of people	Proportion
18-27	15	7.35%	11	6.25%	26	6.84%
28-35	34	16.67%	29	16.48%	63	16.58%
36-54	101	49.51%	87	49.43%	188	49.47%
Above 55	54	26.47%	49	27.84%	103	27.11%
Total	204	100.00%	176	100.00%	380	100.00%

Data source: ESIA Survey (2024.05)

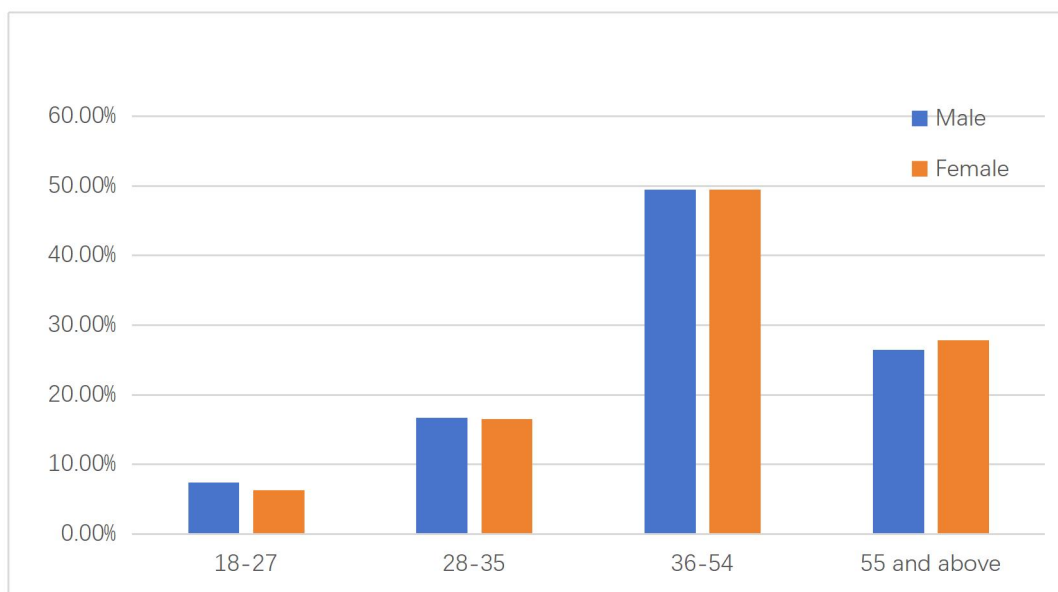


Figure VIII-6: Gender and age distribution

(2) **Degree of education:** From the distribution of education levels among the surveyed individuals, the cultural level of the survey subjects is mainly concentrated in junior high school, accounting for 43.42%, with males accounting for 43.63% and females accounting for 43.18%. The difference in education level between males and females in junior high school is not significant; the proportion of women with high school/vocational education level is 27.27%, while that of men is 28.43%. Among those with college education level or above, the proportion of women and men is 10.23% and 11.27% respectively. Among those with high school/vocational education level or above, men have slightly higher education level than women, and they have more opportunities to obtain higher education in the local area. Overall, at the junior high school level and below, gender differences are minimal. At the high school level and above, across all education levels, the proportion of females is slightly lower than that of males by approximately 1 to 1.5 percentage points; however, the overall disparity is not significant. See table below for details.

Table VIII-3 Educational level of the surveyed subjects

Educational level	Male		Female		Total	
	Number of people	Proportion	Number of people	Proportion	Number of people	Proportion
Illiteracy	1	0.49%	2	1.14%	3	0.79%
Primary school	33	16.18%	32	18.18%	65	17.11%
Junior high school	89	43.63%	76	43.18%	165	43.42%
High school/vocational school	58	28.43%	48	27.27%	106	27.89%
College degree or above	23	11.27%	18	10.23%	41	10.79%
Total	204	100.00%	176	100.00%	380	100.00%

Data source: ESIA Survey (2024.05)

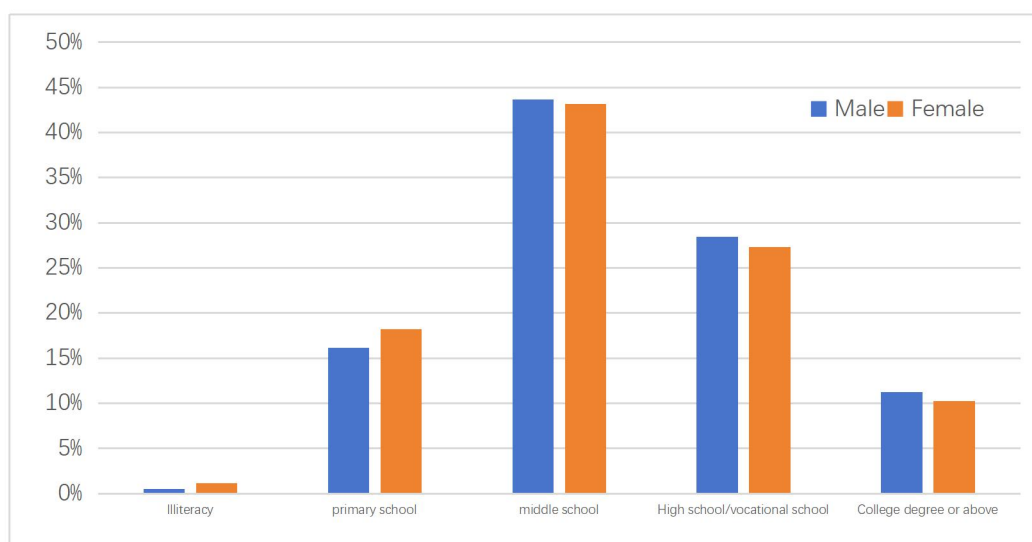


Table VIII-7: Educational level

(3) Occupation: In terms of occupational distribution, the residents in the project area are primarily engaged in agriculture and migrant work. Agriculture accounts for 33.16%, with men at 33.33% and women at 32.95%, indicating a roughly equal gender distribution in this sector. This is followed by migrant workers, who make up 25.26% of the workforce. Within this category, men constitute 26.96%, slightly higher than women at 23.30%. Furthermore, other occupational groups account for 20.79%, with women comprising 24.43% of this segment—higher than men at 17.65%. This group includes elderly individuals without labor capacity and women primarily engaged in household duties, among others. In the industrial employment sector, the proportion of men is higher than that of women, with men accounting for 12.75% and women only 8.52%. Employment in enterprises and public institutions shows little difference between men and women, with proportions of 6.86% and 6.25%, respectively. In small-scale individual businesses, the proportion of women is 4.55%, higher than men at 2.45%.

429. From the perspective of gender role division, men typically shoulder the primary responsibility as the family's economic breadwinners, predominantly engaging in migrant work and employment away from home. In addition to participating in agricultural production, women also undertake family care and household duties. They are mostly engaged in sporadic or seasonal work near their residences, such as temporary employment in local brick kilns, wood processing plants, and pharmaceutical factories, allowing them to simultaneously care for the elderly and children. Details are provided in Table VIII-4.

Table VIII-4 Occupational Distribution of the Respondents

Occupation	Male		Female		Total	
	Number of people	Proportion	Number of people	Proportion	Number of people	Proportion
Farmer	68	33.33%	58	32.95%	126	33.16%

Industry	26	12.75%	15	8.52%	41	10.79%
Enterprises and institutions	14	6.86%	11	6.25%	25	6.58%
Individual business owners	5	2.45%	8	4.55%	13	3.42%
Migrant work	55	26.96%	41	23.30%	96	25.26%
Other	36	17.65%	43	24.43%	79	20.79%
Total	204	100.00%	176	100.00%	380	100.00%

Data source: ESIA Survey (2024.05)

430. Women show a relatively high level of support for the project.

(1) The enthusiasm of women in supporting the project is higher than that of men. In the survey regarding support for the project construction, 76.70% of women indicated support, compared to 68.63% of men. Based on field visits and interviews, women believe that the project's construction can stimulate the economic development of the surrounding area and that industrial growth will create more employment opportunities, showing great interest in employment for women. A small number of interviewees maintained a neutral stance or declined to comment. Overall, their primary concerns relate to land acquisition, compensation for house demolition, and potential adverse impacts on daily life from dust, noise, and vibration during the construction phase. The level of support for the project among surveyed individuals is shown in Figure VIII-8 below.

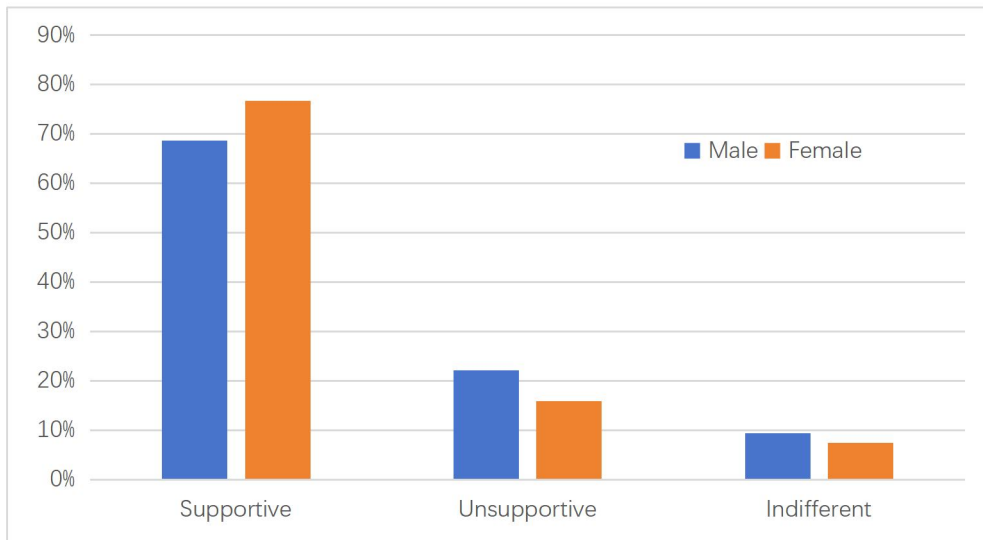


Figure VIII-8: The level of support from surveyed women for the project

(2) Women's Expectations Regarding Employment and Skills Enhancement. The survey reveals that 55.68% of female respondents hope the project will prioritize hiring local workers, especially women; 45.45% desire access to vocational skills training. Most women expressed a preference for local and flexible employment opportunities that would allow them to balance family and agricultural responsibilities. They expect the project to provide job opportunities

and training support suited to women's characteristics, enabling them to achieve increased income and skill development.

Interview Case 2: Ms. Jiang (49 years old), Jiangbiao Community

Ms. Jiang has heard about the project and is quite supportive of it. She hopes that it will bring many employment opportunities, such as in catering, cleaning, and landscaping—jobs that do not have high cultural or educational requirements. She believes these positions can help increase her family's income, provide more living expenses for her children, and improve their living conditions.

1. Gender Difference Analysis and Risk Management

431. To gain a deeper understanding of the status and role of women in socio-economic activities within the project area, the E&S consultant team used questionnaires and interviews to analyze their situations regarding household decision-making, public affairs, employment, income, and access to information. This process identified potential gender-related risks, along with women's primary attitudes and concerns towards the project. Corresponding management and mitigation measures have been proposed to ensure women's equal participation and benefit, thereby fostering inclusive and sustainable project development.

(1) Insufficient Participation in Public Decision-Making. The survey reveals that in major household decision-making, 36.36% of women reported making decisions jointly with their husbands, 32.39% stated decisions were led by their husbands but they were consulted, while 17.61% rarely or never participated in decisions. In community public affairs, only 21.59% of women act as key participants, and 34.66% participate regularly but mostly as listeners. For details, see Table VIII-5. Notably, 73.86% of surveyed women considered project information disclosure and public consultation very important. Figure VIII-9 indicates that women's willingness to participate in public decision-making is higher than men's. However, in practice, opportunities for greater female participation in public decision-making are often overlooked. Consequently, this lack of adequate participation may result in their legitimate concerns and risk considerations being insufficiently reflected in project planning and decision-making.

Table VIII-5: Analysis of Differences in Decision-Making Participation among Surveyed Women

Question	Option	Frequency	Proportion
Participation in major household decision-making (e.g., education, children)	Makes decisions solely	24	13.64%
	Makes decisions jointly with partner	64	36.36%
	Partner primarily decides, but seeks their opinion	57	32.39%
	Rarely participates in decisions	21	11.93%
	Never participates in decisions	10	5.68%
Participation in public	Participates frequently as a key participant	38	21.59%

affairs/decision-making meetings	Participates regularly, but primarily as a listener	61	34.66%
	Participates occasionally, with low engagement	47	26.70%
	Rarely or never participates	30	17.05%

Data source: ESIA Survey (2024.05)

Interview case 3: Ms. Zhang (43 years old), a resident of Longwan Community;



Usually, my husband attends notices and meetings in the village, and I rarely attend. On the one hand, I am busy with housework. On the other hand, I can't make decisions about some important things. My husband usually has the final say in family affairs. He would sometimes tell me when he came back after attending, and sometimes he wouldn't say it because he felt it was unnecessary. Occasionally, while chatting with female neighbors, I can learn about some major events in the village.

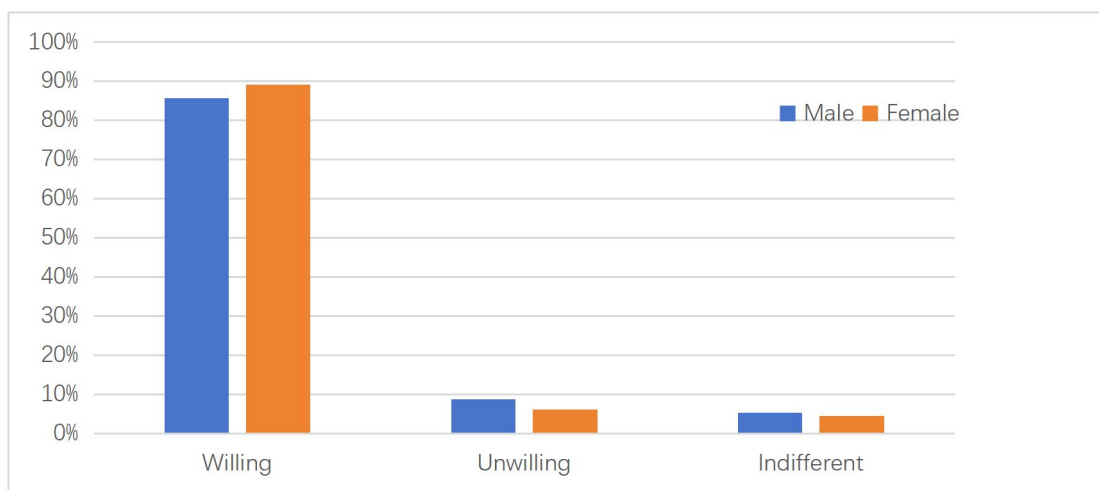


Figure VIII-9: Surveyed Women's Willingness Regarding Information Disclosure and Public Participation

Mitigation Measures: (a) During the land acquisition and demolition compensation consultation and resettlement plan formulation process, ensure that women participate in consultation activities and ensure that the proportion of female representatives is no less than 40% (baseline: 20%); (b) Proactively and timely disclose key information, such as land acquisition compensation and construction progress, through channels like village and community notice boards and WeChat groups, using easily understandable language to ensure women are fully informed and can participate effectively.

(2) Employment and Income Gap. As shown in Table VIII-4 regarding female occupational distribution, surveyed women are primarily engaged in farming (32.95%) and temporary/casual jobs nearby (23.30%), while also bearing the responsibility for domestic and care duties for the elderly, children, and household chores. According to the survey results in Table VIII-6, 48.86% of women stated that men's income is significantly higher than women's, and 42.05% of respondents believed it is relatively difficult for women to obtain

employment opportunities. Interviews with women further revealed that, as women need to shoulder more domestic and care responsibilities and often lack relevant job skills, men tend to secure employment opportunities more easily.

Table VIII-6: Analysis of Differences in Employment and Income among Surveyed Women

Question	Option	Frequency	Proportion
In the current social context, women's access to employment opportunities within the household is:	Yes, employment faces many difficulties	74	42.05%
	No, have equal rights and opportunities as men	57	32.39%
	Uncertain	45	25.57%
Disparity in household economic income between genders:	Male income is higher than female income	86	48.86%
	Male and female income are comparable	26	14.77%
	Contribute jointly/collectively	43	24.43%
	Uncertain	21	11.93%

Data source: ESIA Survey (2024.05)

Mitigation Measures: (a) During the land acquisition and demolition compensation consultation and resettlement plan formulation process, ensure that women participate in consultation activities and ensure that the proportion of female representatives is no less than 40% (baseline: 20%); Furthermore, within the logistics park, focus will be placed on new forms of employment such as couriers, truck drivers, warehouse operatives, and e-commerce/livestreaming roles, promoting women's equal access to and benefit from these emerging employment sectors. The target of female employment ratio in the park is set to no less than 30% (baseline: 0%); (b) During both construction and operation phases, ensure all female employees participate in vocational skills, OHS, gender equality, and the prevention of GBV, SEA and SH training; (c) Conduct equal employment awareness campaigns, strengthen supervision of equal pay for equal work, effectively protect women's labor rights, and promote their economic empowerment. (d) Regularly disseminate project recruitment and training information to women in the community through community notices, online groups, and coordination with the Women's Federation, ensuring information accessibility and promoting women's equal access to employment resources.

(3) Land Acquisition, House Demolition, and Livelihood Restoration Risks. The project's LA and HD activities affect a total of 691 households (3,459 individuals), of whom 49% are women (1,649). Survey results indicate that women are generally concerned about compensation standards, the resettlement location, accessibility of public services, and subsequent livelihood security. They expect compensation payments to be made fully and promptly in accordance with compensation policies, and to be properly resettled. Simultaneously, they seek supportive measures such as prioritized access to employment opportunities and skills training for women, to mitigate income loss

and family economic pressure caused by land acquisition and resettlement, thereby ensuring livelihood restoration and life stability.

Interview Case 4: Ms. Wei (48 years old), Hengling Village

"I usually stay at home to take care of the children, cook, and do housework. Sometimes when there are community meetings where signatures are required, it's always my husband who goes. Previously, we also had some land taken for the railway, and my husband made all the decisions during that process. Later, when a friend asked me about the procedures and compensation policies regarding the land acquisition, I realized I didn't know anything about it. I feel like I understand too little about these important matters around me, and when I try to engage in discussions, I don't even know what to say."

Mitigation Measures: (a) During the land acquisition and demolition compensation consultation and resettlement plan formulation process, ensure that women participate in consultation activities and ensure that the proportion of female representatives is no less than 40% (baseline: 20%); (b) Timely announcement of project information to women through bulletin boards, WeChat groups, community announcements, etc., including proactive disclosure of key information such as compensation, resettlement, and livelihood restoration, ensures that information is conveyed comprehensively and effectively, and increases women's awareness rate to 75% (baseline: 40%); (c) During project construction and operation, prioritize providing employment positions to women affected by LA and HD, such as in cleaning and landscaping roles. Enhance women's employment and entrepreneurship skills and opportunities by organizing vocational training and knowledge lectures in coordination with relevant departments and communities, such as the Qinbei District Women's Federation and the Bureau of Human Resources and Social Security.

(4) Risk of Inadequate Grievance Channels. The survey indicates that regarding grievance mechanisms, only 60.80% of women reported being aware of existing channels (e.g., hotlines, public notice boards), while approximately 39.20% were unaware. Furthermore, 82.95% of surveyed women stated they would resort to grievance channels if their rights or interests were infringed. However, if these channels are not effectively publicized to women, or if the mechanism itself is unsound, women may find it hard to access help promptly when issues arise, potentially undermining their ability to voice concerns and protect their rights.

Mitigation Measures: (a) Establish multiple channels for information disclosure and public participation targeting women, using common platforms like notice boards, WeChat groups, and the Women's Federation to promptly publicize key project information, including compensation, resettlement, construction schedules, and the grievance mechanism. (b) Ensure women's effective participation in project consultations and decision-making activities, such as through public meetings, achieving a participation rate of no less than 40% (Baseline: 20%). (c) Establish a robust grievance mechanism with designated personnel for handling cases, guaranteeing anonymity and privacy. Enhance women's awareness and ability to use these channels through community outreach and training sessions organized with the Women's Federation.

(5) Community Health and Safety. During project construction and operation, impacts such as noise, dust, vibration, and traffic are inevitable and will directly affect the quality of life of surrounding residents. Women, who often bear the

primary responsibility for family care, are typically more sensitive to issues concerning daily commuting, children's safety, and residential environmental hygiene. The survey shows that 67.61% of women expressed concern about traffic safety, dust, and noise issues, fearing potential inconveniences and safety risks for their children's commute to school during project implementation. Additionally, 86.93% of surveyed women recommended strengthening community safety awareness and protective training. Failure to implement effective mitigation and management measures could increase their travel safety risks and negatively impact the quality of life for women and their families.

Mitigation Measures: (a) Develop and implement a Community Health and Safety Management Plan for the construction phase, specifying measures for traffic, dust, noise, and vibration control. (b) Regularly organize awareness and training sessions on traffic, safety, and environmental protection for community residents, with particular focus on women. (c) Utilize channels such as village and community notice boards and WeChat groups to promptly disclose construction progress, potential impacts, and safety reminders, enhancing public awareness and precautionary measures. (d) Install safety warning signs, lighting, and speed limit signs around construction roads and adjacent sensitive areas to effectively ensure resident travel safety.

(6) Risk of GBV/SEA/SH. During project implementation and operation, the workforce is often predominantly male, which may pose potential GBV/SEA/SH risks. Employers must be urged to prevent and address sexual harassment against female employees and, when handling related complaints, legally protect the personal privacy of the affected women.

Mitigation Measures: (a) Incorporate clauses explicitly prohibiting GBV/SEA/SH into all contractor contracts. Conduct code of conduct training and awareness sessions on preventing GBV/SEA/SH for all workers and management staff. (b) Establish a coordination mechanism with institutions such as the Women's Federation, Public Security, and Judicial departments to ensure professional and rapid response to incidents. (c) Establish confidential, anonymous, and dedicated grievance channels with assigned personnel responsible, ensuring these channels are clearly visible and easily accessible to all workers and community members, and that complaints are handled safely and promptly. (d) Strengthen labor safety management, conduct regular OHS training, and ensure contractors strictly implement the OHS management system.

To better address the needs of women within the park regarding employment, rights protection, and the prevention of gender-based violence (GBV), the project intends to leverage the park management body and the local Women's Federation to promote the establishment of a women-centric, friendly community within the logistics park. This will involve forming a women's organization and establishing a supporting "Women's Home" to serve as a gender-friendly service platform. The Women's Home will collaborate with departments such as human resources and social security authorities and the Women's Federation to regularly provide female employees in the park and women from surrounding communities with employment information dissemination, vocational skills training, and legal and policy counseling, helping women enhance their employability and income levels. Concurrently, by conducting awareness and educational activities on gender equality, anti-

domestic violence, and sexual harassment prevention, a dedicated channel for confiding and referral will be established. This will offer confidential and safe counseling and support to women experiencing GBV/SEA/SH, and assist in connecting them with professional institutions such as the Women's Federation, public security, and judicial authorities when necessary. By establishing the Women's Home and improving its supporting mechanisms within the park, a safer, more inclusive, and gender-friendly working and living environment can be created for women, promoting their equal participation and full benefit-sharing in the project.

Institutional Forum 1: Women's Federation Joint Committee

Meeting Date: May 16, 2024

Meeting Location: Conference Room, Qinbei District Women's Federation

Attendees: PMO, Social Consultation Team, Women's Federation Staff (13 participants)

Discussion Topics:

First, the social consulting expert introduced the project content and the Asian Infrastructure Investment Bank's (AIIB) requirements regarding gender equality. The expert also inquired about the current support activities of the Women's Federation, seeking opinions and suggestions from a gender perspective on aspects such as project construction and employment opportunities.



The chairperson of the Women's Federation stated that currently, 100% of the leadership teams in villages and communities in Qinbei District include female cadres, and 100% of the Women's Federation chairpersons are part of the village/community leadership teams. This signifies that women are playing an increasingly important role in grassroots governance, bringing more diverse perspectives and voices to the decision-making process. Additionally, through projects like the "Leading Role (Model Women Representatives)" training, not only have women's personal abilities and overall qualities been

enhanced, but it has also established role models for them in the community, inspiring more women to engage in public affairs.

Economic support activities include: Microloan Benefits: Offering preferential microloan policies for women, such as interest-free or subsidized loans, effectively alleviates the financial pressure they face when starting or expanding their businesses, thereby promoting women's economic independence and self-development.

Support for Rural Industries: Through activities such as policy explanations and recognition programs, women are encouraged and supported to participate in the development of rural industries. This not only promotes the diversification of the local economy but also enhances women's economic status and social influence.

Technology Demonstration Base: Establishing technology demonstration bases provides women with technical training and support for purchasing feed and other resources. This initiative helps improve their production skills and product quality, enhancing their market competitiveness.

Regarding women's vocational skills training and employment promotion, we will regularly conduct awareness campaigns and vocational skills training using a combination of online and offline methods. This approach broadens employment channels for women and enhances their competitiveness in the job market. Notably, the establishment of the online platform "Qinbei Release" provides women with more convenient learning opportunities. Currently, we have a professional teaching staff of 15 people, conducting approximately 150 lectures every six months on topics such as service rights protection, traffic education, and employment, with a total participation of 200-300 people. This initiative not only improves women's vocational skills but also boosts their confidence in seeking employment.

Regarding women's health protection, measures have been implemented such as conducting screenings for cervical and breast cancers, purchasing health insurance, and providing vaccinations. These initiatives offer essential health safeguards for women and reduce their risk of falling into poverty due to illness. Additionally, awareness campaigns and training activities on topics such as HIV, sexual harassment, and sexual exploitation have been organized to enhance women's health awareness and self-protection capabilities. Through regular follow-ups and care activities, we can timely assess

women's health status and needs, providing them with necessary assistance and support.

Suggestions for the project include providing women with flexible work hours for certain positions, ensuring that the work environment meets environmental standards, and taking into account women's physical needs. Additionally, organizing family care activities could help promote family harmony.

2. Gender Action Plan

432. Based on the findings from gender-disaggregated surveys, questionnaires, discussion meetings, and field investigations, the project has systematically analyzed its potential impacts on women and has fully integrated a gender equality perspective into its full-cycle management. By identifying women's specific needs in areas such as employment opportunities, participation in public decision-making, access to information, grievance channels, and capacity building, the project has developed targeted action measures and monitoring indicators. These aim to narrow gender gaps, promote women's economic empowerment, and ensure women's equal participation and benefit-sharing.

433. The project will set minimum quotas for female employment and participation across all stages, ensuring women's active involvement in project management, construction, and operation, including consultations during the resettlement process. Key actions and outcome indicators include: (1) Establishing a dedicated gender focal point position within the project implementation agency and establishing a women's organization within the park; (2) Ensuring female representation constitutes no less than 40% (Baseline: 20%) in project consultations, information disclosure, and decision-making activities; (3) Ensuring that women fill no less than 20% of the jobs created during the project construction phase (Baseline: 0), and setting a target of no less than 30% female employment within the project park/zone (Baseline: 0); (4) Ensuring that the proportion of women participating in vocational skills, occupational safety, and gender equality training reaches no less than 90% during the construction and operation phases (Baseline: 50%). (5) Establishing a safe, confidential, and accessible grievance mechanism with designated personnel responsible for receiving and following up on complaints, fully protecting the privacy and safety of complainants.

434. Through the aforementioned measures, the project will effectively enhance women's participation and benefit-sharing in key areas such as employment, decision-making, and capacity building, thereby promoting gender equality and socially inclusive development. The project has formulated a GAP, which is integrated into the ESMP, and has established a periodic monitoring and evaluation framework to ensure the continuous implementation and improvement of relevant measures throughout the project cycle. For details, refer to the Gender Action Plan Matrix in Appendix 2.

e. Analysis of Working Conditions and Worker Health and Safety

435. In accordance with the requirements of the AIIB's ESF and ESS, and referencing the IFC and EHS Guidelines, this project will adhere to AIIB's environmental and social management standards throughout its planning, construction, and operation phases. Through interviews and data collection involving key stakeholders such as QHMG, the Qinbei District Bureau of Human Resources and Social Security, and potential suppliers, the environmental and social consultants have identified the main categories of workers for the project. Based on the survey and analysis results, an assessment of their working conditions and OHS risks has been conducted, leading to the proposal of targeted prevention and mitigation measures. These aim to strengthen labor management, reduce social risks, and ensure smooth project implementation.

436. The main categories of workers involved during the construction and operation phases are classified into three types: (1) **Direct Workers:** Staff directly employed by the PMO and the PIU, specifically working on project-related tasks; includes maintenance personnel during the operation phase. (2) **Contractor Workers:** Laborers employed and provided by third parties (contractors or subcontractors), primarily engaged in direct or auxiliary construction work such as civil works and related engineering. According to the updated FSR (October 31, 2025), approximately 1,309 contractor workers are anticipated during the construction phase, comprising 924 skilled and 385 unskilled jobs. The project will prioritize hiring local labor to promote local employment and income generation; if local labor is insufficient, non-local workers may be appropriately recruited. The project will not establish separate construction camps but will centrally set up one construction production and office area. Non-local construction personnel will rent housing nearby. (3) **Supplier Workers:** Workers employed by agents or manufacturers supplying procured goods and equipment (e.g., for photovoltaic system installation).

437. Considering the project's engineering content, preliminary stakeholder survey results, and lessons from similar projects, potential labor management risks during construction and operation primarily involve two aspects: protection of workers' rights and OHS. The following analysis details the main labor management risks and their impacts, categorized into the construction and operation phases.

(1) Project Construction Phase. This phase primarily involves labor management risks related to direct workers and contractor workers. Based on the project's activities, scale, and nature, the main potential risks include:

- **Construction Safety and Machinery Operation Risks:** Workers operating large machinery (excavators, cranes, etc.) and tools face risks of falls from height, mechanical injury, and electric shock due to non-standard

procedures, inadequate safety measures, or fatigue.

- **Occupational Health and Environmental Exposure Risks:** Chronic exposure to noise, dust, and hazardous gases may lead to hearing loss, respiratory diseases, while high-noise environments can reduce concentration and increase accident risks.

- **Sudden and Emergency Incident Risks:** Inadequate on-site safety management, extreme weather, or improper material storage may trigger emergencies such as fires and collapses.

- **Heat Stress Risks:** Working in summer or high-temperature environments without proper protection and rest protocols can easily lead to heat-related illnesses like heatstroke.

- **Labor Contract and Wage Payment Risks:** Failure to formally sign labor contracts, wage arrears, or non-payment of social insurance will infringe upon workers' rights, potentially leading to labor disputes and unlawful labor practices (such as forced labor or child labor).

- **Remuneration and Working Condition Risks:** Unreasonable pay, excessive overtime, or insufficient rest leading to worker fatigue can increase safety hazards.

- **Infectious Disease and Public Health Risks:** Given the project's scale, the large and mobile workforce poses a potential risk of infectious disease transmission.

- **Transportation Safety Risks:** Construction requires transporting materials and earthwork using large-tonnage trucks. Frequent vehicle movement in and out of the site creates road traffic accident risks, especially at night or in adverse weather conditions.

- **Gender Discrimination and Sexual Harassment Risks:** The predominantly male workforce on-site creates a gender imbalance. Lack of gender equality awareness training and management systems may lead to gender discrimination or sexual harassment incidents, affecting the physical and mental safety of female workers.

- **Inadequate Grievance Channels:** If project workers cannot defend their rights timely and effectively when facing unfair treatment, it may lead to disputes and other adverse social impacts.

(2) Project Operation Phase. This phase primarily involves worker management risks related to direct workers and supplier workers. The main potential risks include:

- **Operational Safety Risks:** Potential for injuries from forklift collisions, falling objects, and equipment operation errors during warehousing and logistics activities.

- **Occupational Health and Safety Risks:** Prolonged work in low-temperature storage environments can easily lead to occupational diseases affecting nerves, blood vessels, and rheumatism. Furthermore, if protective measures are inadequate, staff handling imported cold-chain goods during storage, transportation, and loading/unloading may face health and safety hazards, including exposure to foreign viruses.

- **Risks of GBV/SEA/SH:** The project implementation process may involve risks such as gender discrimination, unfair treatment of women in recruitment and promotion, and insufficient protection of statutory rights related to pregnancy and maternity leave. Concurrently, ineffective implementation of management systems could lead to issues like verbal or behavioral harassment of female employees.

- **Inadequate Grievance Channels:** If project workers cannot defend their rights timely and effectively when facing unfair treatment, it may lead to disputes and other adverse social impacts.

438. To identify potential labor risks before project implementation and ensure working conditions and the OHS system comply with national laws and AIIB requirements, the E&S consultant team systematically assessed the labor management system during project preparation. The assessment focused on protecting workers' legitimate rights, OHS management, and prohibiting child and forced labor, laying the groundwork for the Labor Management Plan (LMP).

439. To understand the local labor management system and OHS measures/risks, the consultants, assisted by the PIU and the Qinbei District Human Resources and Social Security Bureau, held online meetings with potential builders and suppliers. Discussions covered labor contracts, social insurance, safety training, worker rights protection, grievance mechanisms, and risks of child/forced labor.

440. The local regulatory system, managed by the Qinbei District Human Resources and Social Security Bureau, is well-developed. Since 2023, it has disseminated over 2,000 policy/legal notices online, held 37 legal awareness events, and distributed 50,000+ legal pamphlets, targeting migrant and flexible workers. An online-offline service mechanism (Hotline: 0777-12333) effectively handles wage and labor dispute cases.

441. During both the construction and operation phases, this project will introduce a significant number of workers engaged in new forms of employment within the logistics park. This workforce primarily includes: (1) In the e-commerce and cross-border logistics sectors, the park will directly recruit workers such as on-demand delivery personnel, truck drivers, and couriers, responsible for "last-mile" delivery, long-distance transportation, and warehouse and distribution operations; (2) Within the park's e-commerce enterprises and live-streaming bases, a large number of positions will emerge, such as internet marketing specialists, online hosts, live-streaming operations managers, as well as roles responsible for overseas market promotion. This new forms of employment group commonly exhibits characteristics such as

flexible labor relations, a younger age structure, high-intensity workloads, and high-frequency job mobility. The system for protecting their rights and interests is currently at a critical stage.

442. To ensure the lawful rights and interests of these workers, this project will undertake a specialized study and practical exploration. First, based on the regulatory frameworks of the Labor Management Plan and the Labor Law, the project will conduct a "Pilot Study on the Protection of Rights and Interests of Workers in New Forms of Employment" within the logistics park. This study will systematically monitor and analyze key labor indicators—such as labor contracts, social insurance, wages and working hours, and occupational safety—for groups including couriers, freight platform drivers, and online hosts within the park. It aims to accurately assess the gap between their actual employment conditions and the requirements of current regulations. The study is designed to provide a practical basis for constructing a rights and interests protection system suited to their occupational characteristics. Through this pilot, the project will promote standardized management among tenant enterprises, exploring and demonstrating a set of actionable and sustainable safeguard mechanisms, with the goal of enabling workers in new forms of employment to achieve decent work and safe development within the project. Ultimately, the practical experience and research findings from this project will also provide valuable references for China's efforts to improve relevant regulations and policies, and for the AIIB's focus on workers' rights in similar projects.

443. During the project implementation monitoring phase, through continuous tracking and analysis of employment data, the project will promote standardized employment management among tenant enterprises and explore the establishment of rights and interests protection mechanisms adapted to the characteristics of new forms of employment. This aims to facilitate their achievement of decent work and sustainable development within the project.

444. The PIU, QHAMG, a state-owned enterprise with 71 employees (42.25% female), fully complies with national labor laws. It has established comprehensive systems for labor contracts, social insurance, working hours, OHS training, and an internal grievance mechanism. Protection of female workers' special rights is implemented, indicating low direct labor risk.

445. In September 2025, due diligence on 2 potential contractors and a PV supplier found their labor management generally sound: (1) Employment Management Compliance: All permanent employees and technical workers have signed labor contracts and are enrolled in the mandatory "Five Social Insurances" according to law. Temporary and casual workers are uniformly managed and paid through legally qualified labor dispatch agencies. The use of child labor and any form of forced labor is explicitly prohibited. (2) Adequate OHS Assurance: This includes enrollment of even dispatched temporary workers in work injury insurance and safety liability insurance. The construction site is covered by "Contractor's All Risks Insurance". A "three-tier safety education system" is implemented, complemented by daily safety briefings. Sufficient PPE is provided. (3) Systematic Safety Training for New and Existing Personnel: Before entering the site, foremen must sign safety commitment

letters and submit physical examination reports. Pre-job training is conducted before construction begins, covering material handling, safe operations, and common risk prevention. Management is continuously reinforced during construction through daily morning meetings where 5-10 key safety points are communicated. It is understood that female workers in the construction area participate in training related to vocational skills, safety production, and labor rights protection. Female workers engaged in indoor activities (e.g., document clerks, kitchen helpers) receive training relevant to their specific posts. The overall participation rate for women in training is approximately 50%. (4) Effective Grievance Mechanism Operation: This includes anonymous suggestion boxes and a complaint hotline, allowing employees to freely report issues. Reported matters are recorded, addressed, and filed by the safety department. No major labor disputes or safety incidents have been recorded for three consecutive years.

446. Overall, the local labor oversight is effective, and the project entities generally comply with laws. However, given the project's long duration, consultants recommend strengthening contract management and capacity building. Key measures include incorporating labor rights, safety reporting, and grievance handling into contracts, and conducting regular reviews of contractor compliance. Specific mitigation measures are as follows:

447. **Mitigation and Management Measures:** Based on the identification and assessment of labor management risks for the project, the E&S consultants have formulated mitigation measures covering labor contracts, remuneration, working hours, and grievance mechanisms. To ensure effective implementation, the project implementation unit will designate a dedicated focal point responsible for promoting these measures, requiring strict adherence by contractors, subcontractors, and suppliers. The specific mitigation and management measures are as follows:

(1) Establish and improve a labor contract management system: ① Tender and procurement documents for contractors and major suppliers shall clearly specify labor management requirements and incorporate them into contractual terms. These shall include labor contract signing, wage payment, social insurance contributions, and occupational health and safety responsibilities. ② Contracts shall stipulate remedial measures for non-compliance and establish a third-party performance management and monitoring mechanism. ③ Strengthen the standardized management of temporary workers to ensure comprehensive signing of labor contracts/agreements. A third-party company shall purchase accident insurance for these workers. ④ Major suppliers shall submit due diligence reports on labor management, covering contract management, prohibition of child labor, equal pay for equal work, non-discrimination based on gender, and anti-forced labor. ⑤ Conduct EHS reviews of major suppliers to ensure their compliance with relevant requirements, effectively safeguarding workers' labor rights and interests as well as their health and safety.

(2) Labor Working Conditions: ① The construction site shall be equipped

with safe drinking water, sanitation facilities, adequate rest areas, and compliant dormitories to meet workers' basic living needs. ② Contractors shall maintain a clean and orderly workplace and provide workers with necessary personal protective equipment (PPE). ③ Suitable sanitation facilities and living conveniences shall be provided to address the special needs of female workers, effectively safeguarding their privacy and safety. ④ The project owner, supervision unit, and construction contractor shall clarify their respective responsibilities in labor condition management, conduct regular inspections on the safety and hygiene of living quarters and workplaces, and accept supervision from the Project Management Office (PMO) and relevant competent authorities. ⑤ Major suppliers shall be required to submit regular self-inspection reports on labor conditions, covering labor compliance, wage payment, working hours, safety guarantees, and prohibition of child labor. ⑥ Annual reviews and on-site labor condition verifications shall be conducted for suppliers identified as high-risk. ⑦ Labor and Working Conditions (LWC) compliance clauses shall be explicitly stipulated in procurement contracts, and suppliers with serious violations of labor laws and regulations shall be included in the blacklist. ⑧ Strengthen communication with enterprises involved in photovoltaic equipment manufacturing, transportation, and cold chain equipment supply to ensure their operations comply with AIIB standards and Chinese laws and regulations.

(3) Occupational Health and Safety (OHS): ① Establishment of a system and responsibility framework. Develop a clear occupational health and safety management system, clarify and implement the responsibilities of implementing units, construction contractors, and subcontractors at all levels to ensure the gradual implementation of safety responsibilities and the formation of an effective accountability traceability mechanism. ② Regular supervision and improvement mechanism. Establish full-time safety management positions to conduct continuous on-site safety inspections and potential hazard identification, and implement closed-loop rectification management. Meanwhile, establish a regular safety meeting mechanism to systematically report, assess, and track safety risks and the effectiveness of prevention and control measures, achieving dynamic management. ③ Systematic training and capacity building. Ensure pre-job and on-the-job safety education during both construction and operation phases, covering general skills such as fall prevention, electric shock prevention, mechanical injury prevention, chemical leakage response, and first aid. For high-risk special operation positions (e.g., high-altitude work, electrical operations, photovoltaic maintenance, cold chain operations), mandatory specialized training shall be implemented, and a strict certification-based employment system shall be enforced. ④ Comprehensive operational risk control. In accordance with national standards, provide and supervise the use of qualified personal protective equipment (e.g., safety helmets, protective shoes, safety belts, goggles) for workers; ensure good ventilation and lighting at the construction site, and effectively control occupational hazards such as noise, dust, and harmful gases; for high-risk operations (e.g., high-altitude, electrical work), install engineering and technical measures such as fall protection devices and insulated tools; implement hygiene and epidemic

prevention as well as special protection in cold chain, warehousing, and other areas. ⑤ Emergency preparedness and response support. Equip the site with first-aid supplies and emergency equipment, and establish an emergency cooperation mechanism with local hospitals (Qinbei District People's Hospital) to ensure unobstructed medical rescue channels; regularly organize emergency drills for scenarios such as fires, electric shocks, chemical leaks, and falls from heights to improve practical disposal capabilities. Meanwhile, clarify and implement work-related injury emergency response procedures to ensure timely and efficient accident reporting, rescue, and subsequent compensation.

(4) Safety Measures for the Construction, Operation, and Maintenance of Photovoltaic Systems: The project will construct a 17.7MW distributed photovoltaic (PV) system on rooftops, involving risks such as high-altitude operations and electrical operations. The following prevention and control requirements must be strictly implemented during construction, operation, and maintenance: ① Construction, operation, and maintenance personnel must complete specialized training for high-altitude operations and hold valid certificates to work; ② Standardize the use of safety ropes, double-hook safety belts, fall protection railings, and non-slip passages during operations; ③ Conduct electrical grounding testing, line insulation inspections, and power outage/restoration approval management to strictly prevent electric shock accidents; ④ Immediately suspend outdoor high-altitude operations in severe weather such as high temperatures and thunderstorms; ⑤ Install prominent safety warning signs at construction, operation, and maintenance sites, and equip them with first-aid supplies and communication equipment.

(5) Equal Employment and Gender Protection: ① Comply with national labor laws and regulations and adhere to the principle of equal opportunity. Prohibit any form of discrimination against women, persons with disabilities, migrant workers, and young people meeting the legal working age during recruitment and employment. During project implementation, fully implement the protection of female employees' rights and interests, ensure that centralized office areas are equipped with safe drinking water, sanitation facilities, and rest areas, and provide separate sanitation facilities for men and women to safeguard privacy and basic living hygiene needs. ② Regarding gender equality and the prevention of sexual harassment, the project unit shall formulate special systems, clarify prohibited behaviors and corresponding penalties, and appoint a full-time environmental and social management person to supervise implementation. All contractors, subcontractors, and suppliers must implement measures for the prevention and control of sexual harassment and gender equality, incorporate relevant content into daily management training, and ensure coverage of all construction personnel, including topics such as professional skills, work safety, gender equality, and the prevention of sexual harassment. Regular systematic training on gender equality, Gender-Based Violence/Sexual Exploitation and Abuse/Sexual Harassment (GBV/SEA/SH) prevention shall be organized for project management personnel and workers, and promotional materials shall be posted in office and residential areas. ③ Effectively safeguard female employees' equal rights in

recruitment, promotion, welfare benefits, pregnancy, and maternity leave; provide safe and hygienic working and living environments for female workers; and legally protect their legitimate rights and interests during pregnancy and lactation. ④ Establish a confidential and safe grievance mechanism for GBV/SEA/SH at the project level, with a full-time grievance receiver to ensure unobstructed complaint channels, timely and professional handling processes that respect privacy, and allow anonymous complaints. In addition, establish a cooperative network with local Women's Federations, public security organs, and legal aid institutions to provide psychological counseling, legal support, and medical assistance to victims.

(6) Strengthen Publicity and Training: With the assistance of the project implementation unit and local functional departments, conduct training on Occupational Health and Safety (OHS), gender equality and anti-sexual harassment, labor rights and interests, and infectious disease prevention and control for project management personnel, contractors, and workers; distribute promotional posters and leaflets to workers.

(7) Establish and Improve the Grievance Mechanism: Ensure that workers' complaints can be handled anonymously and confidentially, feedback the handling results to the complainant in a timely manner, and inform them of the project-affected people's mechanism established by AIIB.

448. Through the above measures, the overall labor management risks of the project are controllable, and workers' legitimate rights and interests, as well as occupational health and safety, will be effectively safeguarded. All measures have been integrated into the project's Environmental and Social Management Plan (ESMP), and a Labor Management Plan has been formulated (see Annex 1 to the ESMP), which will be strictly implemented throughout the project cycle. In addition, the project has established an open, transparent, and documented grievance mechanism to ensure timely response to workers' feedback and timely notification of handling results, further enhancing the transparency and effectiveness of labor rights protection.

Institutional Seminar 2: Seminar Meeting at the Qinbei District Human Resources and Social Security Bureau

Meeting Date: May 16, 2024

Meeting Venue: Conference Room of the Qinbei District Human Resources and Social Security Bureau

Participants: Project Office, Social Consulting Team, Social Security Center of the Human Resources and Social Security Bureau, Labor Inspection Team, Employment Training Staff

Discussion Topics:

First, social consulting experts introduced the project content and the Asian Infrastructure Investment Bank's (AIIB) requirements regarding gender equality. They also inquired about opinions and suggestions related to labor protection.



The main discussion topics and content included:

1. **Three-level Safety Education:** The construction unit is required to conduct safety education at three levels: company-level, project department-level, and team-level, to enhance workers' safety awareness.

2. **Social Insurance Contributions:** The project must pay for work injury insurance according to local regulations, ensuring that workers receive timely medical treatment and financial compensation in case of work-related injuries.

3. **Funding Security and Payment:** The construction

unit must meet funding security requirements, ensuring that project payment guarantees are issued monthly for wages, while also being subject to supervision by relevant departments to prevent wage arrears.

4. Accident Rescue and Accountability: In the event of an accident, a rescue mechanism should be activated immediately to minimize losses and injuries. The responsible parties for the accident should be held accountable according to the law and regulations to ensure fairness and justice. Procedures for requesting rescue or determining liability must be completed within the specified timeframe (e.g., 30 days) to avoid complicating the issues.

5. Employment Services: Provide unemployed individuals with employment guidance, vocational training, and job referral services to assist them in successfully re-entering the workforce or transitioning to new careers.

All industries and units should strictly implement relevant policies and regulations, enhance internal management, and ensure that various measures are effectively executed, creating a safer, fairer, and more secure working environment for workers, protecting their rights, and promoting social harmony and stability.

f. Community Health and Safety

449. To systematically identify and assess the potential social impacts of the project on villages and communities along the route, the E&S team conducted an investigation and analysis of community health and safety risks through questionnaires, interviews, and discussion meetings. The survey revealed that residents' primary concerns focus on travel safety during implementation, environmental impacts such as dust, vibration, and noise, as well as public health issues. Based on the analysis of 380 valid questionnaires, the social risks perceived by residents in the villages/communities along the route are detailed in Table VIII-7.

Table VIII- 8 Potential Negative Impacts of Project Construction

Option	frequency	Percentage	Remarks
The impact on residents' transportation safety	282	74.21%	
Project construction will cause dust, noise, and solid waste pollution, etc	264	69.47%	
Possible public health and safety concerns	164	43.16%	
Worried about the impact of land acquisition or house demolition	39	10.26%	

Data source: ESIA Survey (2024.05)

450. In response to the identified social risk factors from the assessment and incorporating stakeholder opinions, the PMO and PIU will implement corresponding design optimizations and mitigation measures within project management and design processes. This aims to reduce community health and safety risks, ensure smooth project implementation, and deliver tangible benefits to local residents.

(1) Traffic Safety Risks. According to field surveys, questionnaires, and interviews, 74.21% of surveyed residents believe the project implementation will cause short-term traffic inconveniences and safety hazards along the route.

① During construction, the frequent movement of numerous heavy vehicles in and out of the project area, particularly along village roads which are relatively narrow and experience mixed traffic (vehicles and pedestrians), poses potential risks. As local residents often use electric vehicles, areas with limited visibility

like slopes and curves are prone to rear-end collisions and vehicle-pedestrian accidents, endangering daily travel for local villagers. ② High-risk points for traffic safety include areas near schools, kindergartens, concentrations of elderly individuals (e.g., the Hanlin Zunfu residential community), and intersections. Children and the elderly, with their relatively slower reaction times and mobility, face heightened travel risks and require focused attention. ③ Road occupancy construction using segmented enclosures and temporary traffic adjustments may increase traffic pressure at school and residential community entrances, leading to congestion, detour difficulties, and subsequently causing resident complaints. Proactive traffic guidance and communication are necessary. ④ If transport vehicles are improperly loaded or inadequately sealed, it can easily lead to spillage of construction materials and dust, further threatening road traffic safety. ⑤ After project completion, with the operational launch of the entrance trunk road, logistics park, and dedicated rail line, vehicle traffic volume in the area is expected to increase significantly, especially large vehicles like heavy trucks and refrigerated carriers. If corresponding traffic organization management and publicity guidance are insufficient, the risk of accidents at key nodes such as railway crossings and park junctions will rise, creating potential hazards for the travel safety of surrounding residents.

Mitigation and Management Measures: ① Optimize Construction Traffic Organization. Develop a traffic management plan, scientifically plan transport routes for construction vehicles, reasonably schedule transit times to avoid sensitive areas like schools and residential zones, and strictly prohibit heavy vehicle traffic during peak school commute hours to minimize disruption to daily traffic. ② Improve Safety Warning and Segregation Facilities. Install prominent speed limit and no-horn signs in construction zones and village junctions. Add speed bumps, reflective markings, warning lights, and safety barriers at key intersections. Install lighting and guidance lights at construction access points and main roads during nighttime to enhance nighttime travel safety. ③ Traffic Safety Publicity. Collaborate with township governments, village committees, and schools to conduct ongoing traffic safety publicity through community notice boards, WeChat groups, informational materials, school presentations, and public meetings. Strengthen public traffic safety awareness, focusing on enhancing risk prevention capabilities for groups such as children, the elderly, and women. ④ Public Communication and Information Disclosure. Hold regular public meetings to promptly release traffic advisories and construction updates, communicate construction schedules and detour routes, and actively respond to resident concerns to effectively reduce traffic disruptions and complaint risks arising from construction. ⑤ Strengthen Driver and Vehicle Transport Management. Require all transport vehicle drivers to receive traffic safety and environmental protection training, strictly adhering to zonal speed limits and driving regulations. Ensure vehicles are properly loaded and covered with tarps before entering roads to prevent material spillage. Conduct regular maintenance and upkeep of key vehicle components to ensure good vehicle condition and driving safety.

Interview Case 6: Ms. Huang (47 years old), a resident of the Huangma community;

By the time the project starts construction, the surrounding roads will become even busier. Originally, rural roads were narrow, it will led to congestion when we residents traveled. More importantly, some large construction vehicles pass by at a fast speed, and the driver's field of vision is small, which poses a great safety hazard to pedestrians, especially students.



(2) Impact of Environmental Factors on Resident Life. According to field surveys, questionnaires, and interviews, 69.47% of surveyed residents expressed concerns about potential dust, noise, vibration, and solid waste pollution from project construction. During the construction phase, earth excavation, filling, material transport, and machinery operations will generate dust, noise, vibration, and solid waste. This will cause temporary disruption to residents in 6 natural villages (Hengling Village, Laoba Village, Qingtang Village, Maqiong Village, Shuijindong Village) and the Hanlin Zunfu residential community & kindergarten (totaling 1,865 individuals) within a 200-meter radius of the construction site. Elderly residents in Laoba Village and kindergarten students are particularly sensitive to noise and vibration, which may temporarily reduce their comfort levels. During the operational phase, traffic on the entrance trunk road and within the logistics park, as well as train operations and loading/unloading activities on the dedicated rail line, will continuously generate noise and vibration. Within 60 meters of the main railway line, noise affects 21 households in Laoba Village, and vibration affects 9 households. Impacts are more pronounced during night-time hours and for sensitive receptors like schools and elderly populations. Inadequate control of noise and vibration may lead to reduced health comfort and resident complaints. Furthermore, the waste transfer station within the park may cause odor and sanitation impacts affecting 5 schools and surrounding villages (approximately 37,268 people) within a 5-kilometer radius.

Mitigation and Management Measures: **Construction Phase:** ① Noise and Vibration Control: Install noise barriers and vegetative buffers at sensitive points; protect scattered sensitive residential points by installing soundproof windows; utilize low-noise equipment and vibration-damping track structures; strictly control night-time construction, notifying residents in advance if essential work is required. ② Dust and Construction Management: Implement water spraying for dust suppression, use dust-proof enclosures, and enforce road cleaning protocols; install vehicle wheel washing facilities at site exits to prevent dust spread. ③ Solid Waste and Sanitation Management: Sort and store construction waste properly, arranging regular disposal at compliant sites; coordinate with municipal services for organized collection of domestic waste, maintaining a clean and orderly site. ④ Public Communication and Information Disclosure: Prioritize protection for villages, communities, and the kindergarten within 200 meters of the construction area; communicate construction plans and safety measures before work begins, solicit feedback, and dynamically optimize construction schedules. **Operational Phase:** ① Utilize low-noise road surfaces and vegetative buffers within the park; implement speed limits and

controls on night-time transport. ② Ensure the waste transfer station is enclosed and equipped with deodorization systems, conducting regular cleaning and disinfection. ③ Maintain organized collection of domestic waste by sanitation departments; ensure hazardous materials are managed uniformly by qualified units. ④ Sustain communication with residents affected by noise and vibration, actively addressing societal concerns. Through the implementation of the above measures, the impacts of noise, dust, vibration, and solid waste during both construction and operation can be effectively controlled, ensuring the quality of life for surrounding residents and environmental safety.

Interview Case 7: Mr. Wang (53 years old), a resident of Dajing Community;



During the construction process, there may be noise and dust. It is necessary to reduce dust and noise, and to arrange the time reasonably. Construction should not be carried out at night, which will affect residents' rest. The relevant departments need to supervise the construction party not to violate these regulations.

(3) Non-Local Labor and Public Health Risks. According to field surveys, questionnaires, and interviews, 43.16% of residents expressed concern about potential public health issues arising from the project. Based on the updated FSR (October 2025), the construction phase is expected to provide 1,309 jobs. The project will prioritize hiring local labor, introducing non-local workers only if local manpower is insufficient. The project will not establish separate construction camps but will centrally set up one construction production and office area. Non-local construction personnel will rent housing nearby. Although the overall risk associated with the labor influx remains manageable, the large size and high mobility of the workforce still pose a risk of infectious disease transmission (e.g., AIDS, intestinal diseases). Additionally, differences in living habits could potentially lead to unnecessary conflicts or disputes between workers and local community residents, which need to be prevented.

Mitigation Measures: ① Disseminate knowledge on infectious disease prevention and control through community notices, informational materials, and training sessions to enhance the awareness and prevention capabilities of both residents and workers, thereby reducing cross-infection risks. ② Clearly stipulate health education and disease prevention requirements in contractor contracts, strengthening publicity and prevention efforts for infectious diseases such as AIDS, STIs, and influenza. ③ Proactively communicate with village and community representatives. Incorporate respect for local customs and practices into construction management and worker training to prevent and resolve potential unnecessary conflicts between workers and community residents arising from lifestyle differences. Through the above measures, the public health and community integration risks associated with the influx of non-local labor can be effectively controlled, safeguarding the health and safety of both construction personnel and community residents.

451. To effectively respond to and address the concerns and complaints of

community residents regarding the aforementioned aspects, the project will establish and operate a documented community grievance mechanism. This mechanism will assign a dedicated person to receive and follow up on public opinions and complaints, ensuring that the grievance channels are open and transparent, and that the grievance process is anonymous, confidential and traceable, with the handling results fed back to the complainant in a timely manner. The effective operation of the grievance mechanism will be publicized through various means, including issuing public notices and holding meetings, to clearly inform residents of the grievance channels, handling procedures, and the Project-Affected Peoples Mechanism (PPM) established by AIIB (relevant information about PPM can be accessed via the following link: <https://www.aiib.org/en/about-aiib/who-we-are/project-affected-peoples-mechanism/how-we-assist-you/index.html>). In addition, anonymous suggestion boxes will be placed in centralized office areas and communities, and a complaint hotline will be publicized to facilitate residents and workers in reporting problems at any time. The relevant project departments will promptly accept, classify, standardize the filing of the received grievances, and ensure that they are properly resolved.

452. Impact on Public Utilities and Pipelines. According to the design plan in the updated FSR (October 2025), no underground pipelines have been identified along the project route, thus avoiding risks of water or power outages caused by pipeline relocation or excavation. During construction, existing water supply, power, communication, and drainage facilities will be strictly avoided. Communication with relevant pipeline management departments will be enhanced, and temporary support or protective measures will be taken when necessary to prevent damage to public utilities from mechanical operations or transport vehicles.

453. Although the construction and operation of the engineering project will inevitably cause certain impacts on the surrounding environment, these impacts are typically short-term under normal circumstances. By implementing targeted mitigation measures, the community health and safety risks in the project area can be effectively controlled and reduced, thereby ensuring the smooth implementation of the project and promoting sustainable regional development.

g. Positive Impact of the Project

454. This project is an important infrastructure project to implement the national strategy of "New Western Land-Sea Corridor" and serve China-ASEAN economic and trade cooperation. According to the results of 380 questionnaires (see Table VIII 8 for details), residents along the project area generally believe that the project implementation will have the following positive impacts:

Table VIII-9 Investigation of the possible positive impact of project construction

Options	Frequency	Percentage	Remarks
It can increase employment opportunities	302	79.47%	

Improve regional transportation conditions	76	20.00%	
It can promote the coordinated development of the regional economy	213	56.05%	

Data source: ESIA Survey (May 2024)

(1) Create employment opportunities and promote residents' income.

According to the survey, 79.47% of residents believe that the construction of the project will increase more employment opportunities; After visiting and surveying, it was found that the village (community) residents in the affected areas of the project, especially the young and middle-aged groups, believed that local jobs were limited and the income level was not high, and most of them chose to go out to work. Residents generally expect more job opportunities at their doorstep after the completion of the project, so as to achieve nearby employment and increase family income.

455. The construction and operation of the project will create a large number of direct employment opportunities, drive the development of related logistics, warehousing, transportation and supporting services, indirectly promote regional employment growth and residents' income increase, and promote the continuous enhancement of local economic vitality and social inclusion. The specific employment estimate statistical table is shown in Table VIII 9.



Interview Case 8: Mr. Gao (44 years old), Hengling Village, Dadong Town;
Right at my doorstep, I was also willing to work and move bricks during the project construction. A few years ago, I also went out to work, and now my child has also gone to Guangdong to work. I will stay as the main force of the family. After the project is completed, there should be many job opportunities in the logistics park. If there are good opportunities, my child will not have to travel outside.

Table VIII-9 Estimated jobs generated during the construction and operation periods of sub-projects

Project		China-ASEAN Sea-Rail Multimodal Logistics Project			
Post	Job type	Subproject 1	Subproject 2	Subproject 3	Subtotal
Temporary positions during the construction period of the project	Skilled job	432	267	225	924
	Unskilled job	120	165	100	385
	Subtotal	505	432	335	1,309
Permanent positions during the operation period of the project	Skilled job	45	34	/	79
	Unskilled job	12		/	12
	Subtotal	57	34	/	91
Total		562	466	335	1,400

456. Through discussions and consultations with the project office, project implementation units and project townships, the project implementation unit promised to give priority to hiring the remaining labor force in the project area and surrounding areas, especially women and low-income families, to help them increase their income and improve their living conditions.

(2) Promote the coordinated development of the regional economy. According to the survey, 56.05% of residents believe that the project will help promote the coordinated development of the regional economy. After the completion of the project, it will drive the coordinated development of upstream and downstream industries such as port logistics, warehousing, cold chain processing, trade, and information services, forming an agglomeration effect of multimodal transport and modern supply chains. It is expected to directly drive the increase in regional annual output value, increase the overall throughput of Qinzhou Port, and consolidate its position as a hub port for the new land-sea corridor in the west. Labor-intensive industries such as logistics, trade, and processing have a strong driving force, which can provide more market opportunities and sales channels for traditional agriculture, forestry and other industries, and help residents increase their income.



Interview Case 9: Mr. Jiang (57 years old), Jiangbiao Community, Dadong Town;

At present, our family has 7 acres of paddy fields and 10 acres of forest land, mainly planted with eucalyptus trees. We hope that this wood industry can also develop well. Eucalyptus trees have a growth period of five years and an output value of 7-8 tons per acre of land. Eucalyptus trees have an output value of five to six thousand yuan per acre, and even a small eucalyptus tree can cost fifty to sixty yuan. I am also engaged in logging work, which requires a logging certificate. I can earn 180-300

yuan a day. In our surrounding factories such as brick factories and pharmaceutical factories, each factory can have more than a thousand people. I hope to promote the development of such industries and create more job opportunities.

(3) Improve travel and living conditions. According to the survey, 20.00% of residents believe that the project will improve travel conditions. After the completion of the park avenue and supporting infrastructure, it will significantly improve the travel conditions and living environment of residents along the road, and improve the basic service facilities such as water supply, drainage, electricity, and gas in the surrounding area.

457. In general, the project will play an important role in enhancing the capacity of regional logistics hubs, promoting industrial upgrading, stimulating employment and income, promoting China-ASEAN economic and trade cooperation, and improving social and people's livelihood. The implementation of the project is not only of strategic significance to the economic transformation of Qinzhou City, but also has a significant demonstration and driving effect on the opening pattern of Guangxi and even the western region of the country.

IX. Information Disclosure and Public Participation

458. To meet the requirements for "Meaningful Consultation" and information disclosure under the AIIB's ESF, the project, during the preparation of the ESIA, identified and managed different stakeholders, continuously disclosed project information, collected and responded to concerns, and incorporated reasonable feedback into the project design, as well as environmental and social management arrangements. This aims to reduce environmental and social risks and enhance project acceptability and sustainability. The project has prepared a SEP, which defines the objectives, processes, outcomes, institutions and responsibilities, grievance mechanisms, and subsequent monitoring arrangements for information disclosure and public consultation. SEP is a dynamic document. This plan will be updated in a timely manner alongside detailed design and changes. Should substantive adjustments occur in the scope or methods of engagement or in the disclosure of major issues, the SEP will be revised accordingly and subject to renewed disclosure and consultation.

459. This section outlines the key stakeholder engagement activities already conducted during the project preparation phase, the key findings, and the engagement plan for subsequent phases, providing a basis for the environmental and social impact assessment, mitigation measures, and management. To avoid repetition, the detailed specifics of the SEP and its appendixes are not elaborated within this ESIA report. For detailed information, please refer to the project's SEP.

A. Stakeholder Engagement Activities Conducted

460. During the project preparation phase, the E&S consultants conducted a series of public consultation activities through field visits, discussion meetings, KIIs, household surveys, and online meetings. These activities focused on discussing the project's components, potential environmental and social impacts and risks. The findings were promptly discussed with the feasibility study unit and the PMO, thus providing input for project design optimization. Following the field surveys, the E&S consultants continued follow-up efforts, conducting subsequent assessments and public participation activities. They fully communicated and confirmed details regarding risk mitigation measures, plan optimization, and implementation scheduling with the PIU to further refine the social impact assessment and enable the dynamic improvement of management measures.

461. The main public participation activities carried out prior to the assessment are summarized below: (1) From May 8 to 20, 2024, a field survey was conducted, comprising 16 focus group discussions with a total of 240 participants; 45 key informant interviews were completed; and 380 valid E&S questionnaires were collected. (2) In October 2024, an online meeting was held to discuss the relocation of the Tudimiao in Hengling Village. (3) From March to

April 2025, meetings were organized to discuss land acquisition compensation, support for vulnerable groups, and social security measures. (4) In July 2025, an online meeting was held with the PMO and the Qinbei District Expropriation Center to verify the project's area of impact and physical assets. Discussions also covered compensation standards, resettlement plans, implementation schedules, and detailed revisions to the report. (5) On September 15–16, 2025, online meetings were conducted with local potential photovoltaic enterprises to carry out due diligence on occupational health and labor management. (6) On September 23, 2025, the AIIB mission, together with the PMO, the E&S team, and local government representatives, conducted a site visit. They interviewed villagers potentially affected by railway noise and vibration, inspected the current condition and proposed new site of the Tudimiao in Hengling Village, as well as the status of the resettlement community. Discussions were held on the resettlement plan and the relocation of the Tudimiao.

462. As of the evaluation stage, the primary information disclosure activities completed mainly include:

(1) Government and Planning-Level Information Disclosure: The project has been incorporated into relevant plans at the national and Guangxi Zhuang Autonomous Region levels. Policy documents and planning approvals have been published via the official websites of the Qinzhou Municipal and Qinbei District governments, clarifying the project's positioning, objectives, and implementation pathway, thereby providing the public with a basis for understanding the project background.



Figure IX-1 Information Disclosure

(2) Environmental and Social Information Disclosure: From August 7 to 21, 2024, E&S information was posted on the bulletin boards of villages and communities within the project's area of influence (including Huangma Community, Jiangbiao Community, Laoba Village, Qingtang Village, Maqiong Village, and Shuijindong Village), covering potential impacts, management measures, and feedback channels. The Draft Environmental Impact Assessment (DEIA) report underwent three rounds of online public disclosure on the National Construction Project Environmental Information Disclosure Platform in August 2024, with announcements also published in the Global Times on August 9 and August 14, 2024. Subsequently, the Qinzhou Municipal

ecology and environment department lawfully conducted three rounds of public disclosure regarding the acceptance, review, and approval process of the project's EIA report, safeguarding the public's right to know and participate during the preliminary project stage.

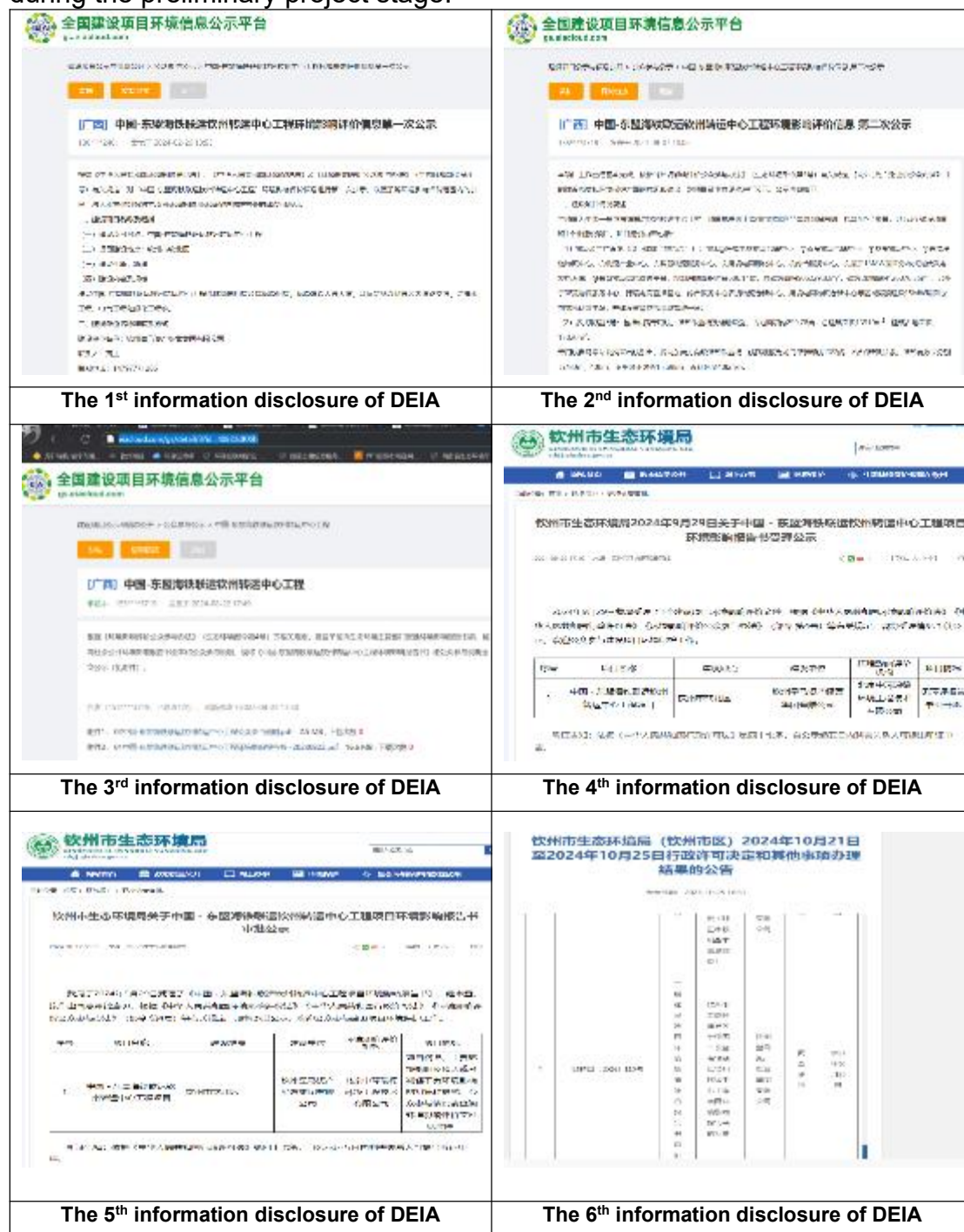


Figure IX-2 Information disclosure of DEIA

【本報記者王曉明專訪】日前，在國台辦長王毅主持下，大陸與台灣在國台辦進行了多輪會談。據悉，雙方在多個領域達成共識，包括加強經貿合作、推動文化交流等。此次會談被視為兩岸關係發展的重要契機。 此外，大陸方面還強調了維護國家主權和領土完整的堅定決心，並呼籲台灣方面在一個中國原則下，與大陸共同推動兩岸關係和平發展。 【本報記者王曉明專訪】日前，在國台辦長王毅主持下，大陸與台灣在國台辦進行了多輪會談。據悉，雙方在多個領域達成共識，包括加強經貿合作、推動文化交流等。此次會談被視為兩岸關係發展的重要契機。 此外，大陸方面還強調了維護國家主權和領土完整的堅定決心，並呼籲台灣方面在一個中國原則下，與大陸共同推動兩岸關係和平發展。	令人意外。全球物流服务提供商中非行估算，从中国西安出发的货运班列需要13至25天到达欧洲，而海运长达35至50天。铁路运输成本比海运高出15%至25%，但高昂的费用可通过避免支付海运附加费等抵消。此外，更快的运输时间能降低库存，更易赢得和留住客户。DHL 报告称，由于货物量大且需接受海关检查，中国-哈萨克斯坦边境口岸的主要铁路货运走廊仍拥堵。西安和成都等枢纽的货运班列发车延误状况已改善。 中欧班列的业务增长受到服务升级的推动，例如中国推出境外全程时刻表中欧班列——意味着车次、线路、班期和运行时间都是固定的。这进一步鼓励那些不因红海危机而绕行更远的海运公司。 红海危机并非托运人越来越青睐陆路运输的唯一原因。俄乌冲突爆发后，中国一直在迅速发展铁路货运服务。中国的铁路运营商开创了更多穿越哈萨克斯坦等中亚邻国的新“中间走廊”路线。6月，东方国
2024.8.9	2024.8.14

Figure IX-3 Publication of DEIA in Newspapers

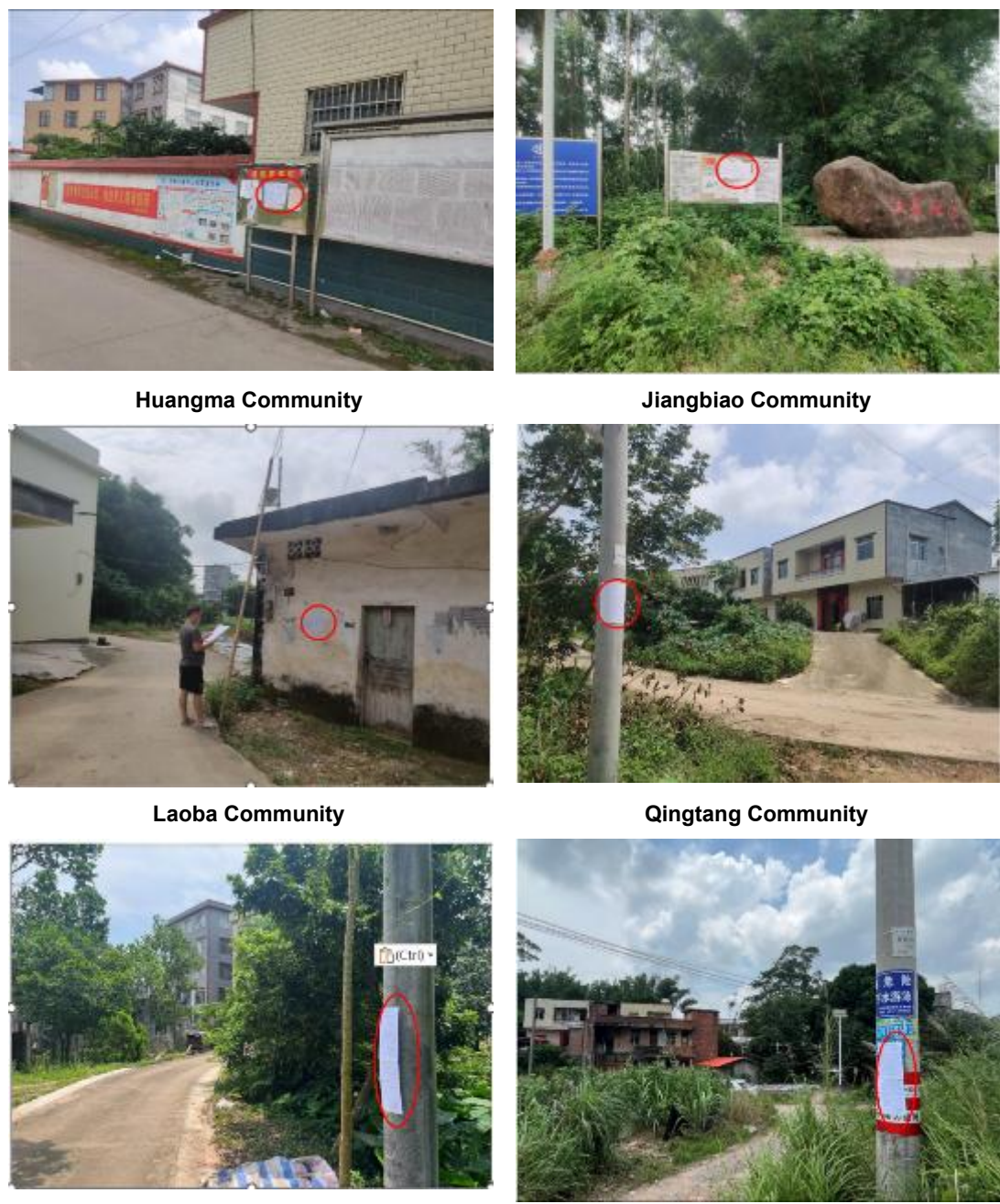


Figure IX-4 Announcements posted by affected villages and communities

(3) Disclosure of Land Acquisition and Resettlement Policies: Relevant policy documents regarding land acquisition, compensation standards, and resettlement procedures have been publicly disclosed in accordance with the law. This safeguards the affected groups' right to information and oversight, thereby ensuring a lawful and transparent process.

463. According to the implementation schedule, the Qinbei District People's Government and the Qinbei District Natural Resources Bureau have issued a project pre-expropriation announcement on April 9, 2024 through the posting of notices and the government website, according to the announcement, from the date of the release of the pre-announcement, the collective economic organizations and land contractors of the land-expropriated villages will not be compensated for the construction (structures) of buildings, trees, nurseries, flowers and other crops and cash crops within the scope of the proposed land acquisition, as well as the unauthorized change of land use to dig ponds and breeding. The project pre-expropriation announcement has been posted on the government website, the bulletin boards of townships and affected villages in the project area.

464. On June 25, 2025, the Qinbei District People's Government announced the eligibility and entitlement for compensation and relocation for land acquisition compensation and relocation plan, which announced the location and scope of the expropriated collective land, the ownership of the expropriated collective land, the type and area of the land, the land compensation standards and the relocation management measures, and once again clarified that from the date of this announcement, the villages, groups and land contractors of the collective land to be expropriated shall not rush to plant crops or build buildings and structures on the collective land to be expropriated. The announcement of eligibility and entitlement for compensation and relocation for land acquisition compensation and relocation plan has been posted on the government website, the bulletin boards of the townships and affected villages in the project area.



Figure IX-5 Issued Pre-Expropriation Announcement and Land Acquisition Compensation and Resettlement Plan



Figure IX-6 Public disclosure of LA, HD and resettlement policies

465. The project has strictly carried out information disclosure and public participation in accordance with domestic legal procedures, covering government coordination, feasibility studies, environmental impact assessments, social stability risk assessments, and preliminary work for land acquisition and resettlement. Simultaneously, in line with the requirements of the AIIB's ESF, and coordinated by the PMO and PIU, the E&S consultants have further deepened the breadth and depth of stakeholder engagement. This enhanced engagement covers stakeholders across all stages of the project cycle, clearly identifies affected parties (particularly vulnerable groups) and key government functional departments, and tailors more diverse methods of information disclosure and participation to the characteristics, needs, and influence of different stakeholders. This approach aims to optimize project design, improve risk management measures, and has resulted in the formulation of a SEP to guide subsequent project implementation (including information disclosure and public consultation). This ensures continuous public participation and transparent information disclosure throughout the entire project implementation process.

B. Stakeholder Identification

466. Stakeholders refer to individuals or groups who can influence the achievement of the project's objectives, are affected by the achievement of these objectives, or benefit from them. The stakeholders for this project are categorized into three groups: Affected Parties, Other Stakeholders, and Vulnerable Groups. For details, please refer to the table below, Table IX-1.

Table IX-1 Stakeholder Identification

Cat.	Stakeholder	Relationship with the Project
Affected Parties	Residents within the project's area of influence (including EMs and females), particularly those near environmental sensitive points	Directly affected by environmental impacts during construction and operation, such as noise, dust, vibration, and traffic safety risks.
	Households/individuals affected by land acquisition	Directly impacted by the permanent land acquisition and demolition of

	and house demolition (including EMs)	houses, affecting their land, housing, and livelihood sources.
	Project Workers (Direct Workers, Contractor & Supplier Workers)	Directly involved in project construction; their working conditions, health, and safety are directly affected by project management and contractor practices.
Other Stakeholders	Project Supervising & PIUs (e.g., Qinbei District Leading Group, PMO, QHAMG)	Responsible for project decision-making, investment, coordination, and implementation; bear primary responsibility for the project.
	Relevant Government Functional Departments (e.g., Bureau of Natural Resources, Bureau of Ecology and Environment, Bureau of Human Resources and Social Security)	Responsible for reviewing and supervising project aspects like land use, EIA, and labor protection according to regulations.
	Sub-district/Town Governments, Village/Neighborhood Committees	Local grassroots management organizations in the project area; undertake coordination, communication, and execution duties.
	Design Institutes, Contractors, Suppliers, Supervisors, Media	Participate in project design and construction, or disseminate project information, influencing project execution and public perception.
Vulnerable Groups (Requiring Special Attention)	Low-income individuals	Limited economic capacity to withstand shocks like increased living costs or unexpected impacts caused by the project.
	Women (especially female-headed households)	Often disadvantaged in resource access and decision-making, may bear greater domestic care burdens, and are more vulnerable to negative impacts.
	The Elderly, Kindergarten Students	Health is more sensitive to environmental changes (e.g., pollution); have limited mobility and are often disadvantaged in information access and self-advocacy.

467. The identification of stakeholders encompasses all parties involved during both the construction and operation phases of the project activities. For the identified stakeholders, the E&S consultants systematically collected their opinions, suggestions, and concerns. Following the public consultation activities, various issues and opinions were consolidated, analyzed, and addressed, with the feedback outcomes promptly communicated to the relevant parties. Comprehensive records of the entire public participation process, key outcomes, and subsequent engagement arrangements are to be detailed in the SEP. Concurrently, content related to environmental and social risk management and the corresponding management measures are integrated into the ESMP. This provides a crucial foundation for the subsequent implementation of public participation, information disclosure, and the grievance mechanism. Detailed stakeholder identification and impact analysis will be elaborated in the SEP.

C. Key Findings from Completed Stakeholder Engagement Activities

468. During the project preparation period, in strict accordance with the public consultation and information disclosure requirements of the AIIB's ESF and adhering to domestic public participation regulations, the E&S consultants organized a series of public participation and consultation activities with the support of the PMO and QHAMG. Through methods including field visits, FGDs, and questionnaire surveys, and in strict accordance with the principle of FPIC, a series of public participation and consultation activities were organized and conducted with the support of the PMO and QHAMG. These activities discussed the project's components, potential environmental and social impacts and risks. The findings were promptly shared and discussed with the feasibility study unit to support project design optimization. The main findings are as follows:

(1) Government departments at various levels in Qinbei District, representatives from the affected townships/sub-districts, and village/community residents generally support the construction of the Project. They believe that upon completion, the project will significantly enhance regional logistics capacity, promote local economic development, and create employment opportunities.

(2) The public primarily focused on construction phase impacts and safety management. Residents were mainly concerned about issues such as construction-related dust, noise, vibration, solid waste disposal, and traffic safety. They recommended implementing effective mitigation and management measures throughout the entire project construction and operation process to minimize adverse effects on sensitive receptors like surrounding residential areas and schools.

(3) Residents affected by land acquisition and demolition expressed the desire for full, timely, and reasonable compensation, along with proper resettlement to ensure livelihood restoration. Regarding the simple land temple affected in Laoba Village, Hengling Village, villagers and the project party, after full consultation, agreed on monetary compensation, with the villagers responsible for relocating the temple themselves.

(4) Women generally support the project implementation and hope to obtain suitable employment opportunities during both the construction and operation phases. It was suggested that the project, while respecting their willingness and labor capacity, prioritize employment opportunities for women and low-income groups in positions such as cleaning, security, and landscaping to promote women's economic empowerment and socially inclusive development.

(5) Concern was raised regarding workers' working conditions and OHS. The project should improve the labor management system to ensure working conditions and OHS comply with national laws and regulations as well as the AIIB's ESF requirements. Construction units must sign labor contracts with all workers according to law, contribute to mandatory social insurances, and purchase accident injury insurance. They must effectively implement occupational safety and health training, provide necessary PPE, strengthen safety management and risk prevention, and ensure a safe and orderly construction site. The PMO should establish and monitor the effective operation

of a worker grievance mechanism, ensuring timely handling of issues such as labor disputes, work-related injuries, and safety hazards. Concurrently, it should enhance communication and coordination with the Qinbei District Bureau of Human Resources and Social Security and the health administration authorities to promote the effective implementation of various labor protection and OHS measures throughout the project implementation process.

(6) Establish information disclosure and grievance channels. Village/neighborhood committees, township governments, and sub-district offices are important channels for residents to provide feedback. The PMO (Qinbei District Development and Reform Bureau), QHAMG, and relevant departments have established a multi-level communication and coordination mechanism to ensure timely response and resolution of issues. The project should incorporate the participation arrangements for affected parties and key stakeholders into the implementation plan, establishing a continuous and systematic public participation mechanism to enhance project transparency and sustainability.

(7) In addition to the needs mentioned above, the ethnic minority (Zhuang) residents further expressed: the hope that during the construction process, full respect will be given to the cultural customs of ethnic minorities, such as reasonably arranging construction time or suspending work during traditional ethnic festivals like "Sanyuesan", thereby reflecting respect for and inclusion of local culture.

D. Information Disclosure of E&S Documentation

469. During the preparation of the project's E&S documentation, the consultants fully communicated with relevant stakeholders regarding the identified risks and mitigation/management measures. In accordance with AIIB requirements, it is planned to submit the revised Chinese and English versions by 2nd week of February 2026. Following the finalization of the Chinese version, public disclosure will commence: offline through posting notices and establishing document review points in the townships and communities to which the affected communities belong; and online through simultaneous publication on the Qinbei District government portal website and the official WeChat public account of QHAMG Documents scheduled for disclosure include the ESIA, SEP, RP, and ESMP.

E. Future SEP during Implementation

470. The project will continue to implement information disclosure and public participation throughout its entire cycle. It will focus on fully communicating with residents in the project area, project workers, communities, and relevant government departments on issues such as environmental impacts, land acquisition and resettlement impacts, worker employment terms, working conditions and OHS, community health and safety, and traffic safety, ensuring open channels for public communication and grievance redress. Key arrangements are as follows:

471. For the project workforce, disclose content related to the labor management procedures. Through ongoing meaningful consultation and optimization of the grievance mechanism, ensure a fair and safe working environment.

472. For surrounding village and community residents, conduct adequate consultation and discussion during the design and implementation process. Pay special attention to the needs of vulnerable groups such as the elderly, women, students, and low-income families, minimizing the adverse impacts of project construction to the greatest extent possible.

473. For persons affected by LA and HD, widely publicize the compensation and resettlement policies before implementation, and organize meaningful consultation activities with them to fully understand their perspectives and legitimate demands. Ensure compensation is distributed fairly, fully, and in a timely manner, along with proper resettlement. Simultaneously, provide necessary skills training and employment support to those affected to promote livelihood restoration.

474. Prior to and during project implementation, the PIU, Qinbei District Land and Housing Expropriation Center, townships, and communities/villages will conduct culturally appropriate and gender-inclusive substantive consultations with Zhuang residents in the project area to systematically collect and fully incorporate their opinions and concerns. The Table of Ethnic Minority Development Measures in the ESMP will be implemented to ensure the legitimate rights and interests of ethnic minority groups are respected and safeguarded, and that they receive substantive, equitable, and inclusive benefits throughout the project lifecycle.

475. Detailed stakeholder engagement plans for each phase, including content, target groups, timing, engagement locations, and responsible agencies, can be found in Chapter 5 of the SEP.

X. Grievance Redress Mechanism

476. During the preparation of the Environmental and Social Impact Assessment (ESIA), a Grievance Redress Mechanism (GRM) was established in the project area, in accordance with the requirements of the Asian Infrastructure Investment Bank's (AIIB) Environmental and Social Framework (ESF), to address environmental, health, safety, and social issues related to the project construction, operation, and land acquisition. The objectives of the GRM are: (i) to provide local communities with a communication channel to express concerns about potential environmental and social issues arising from the project; (ii) to prevent and mitigate adverse environmental and social impacts on the community during project construction and operation, including impacts related to resettlement; (iii) to enhance mutual trust and respect between international institutions and local communities and to foster productive relationships; (iv) to establish community acceptance of the project.

477. Issues addressed by the GRM may include but are not limited to: dust emissions, construction noise, improper disposal of construction waste, disruption to traffic, damage to residential homes, safety measures for citizens and construction personnel, water quality deterioration, etc. Complaints related to involuntary resettlement may involve the standards, disbursement procedures for, or lack or untimely payment of compensation, other allowances, and/or transitional rental allowances as stipulated in the RP and related documents.

478. Currently, in China, when residents or organizations are negatively impacted by development, they can file complaints themselves or through township governments or community committees to contractors, developers, township governments, local environmental protection bureaus, or directly appeal to local courts. The main weaknesses of this system are: (i) the lack of a specialized unit to handle grievances; and (ii) the lack of a specific timeframe for resolving complaints. The project GRM addresses these weaknesses.

479. The GRM complies with China's regulatory standards for protecting citizens' rights from construction-related environmental and/or social impacts. In accordance with the Regulations on Letters and Visits Work effective 2022 and the current systems in the ecological and environmental field, project-related petitions and environmental complaints can be submitted and handled through channels including the "12345" Government Service Hotline, the "12369" Environmental Complaint Hotline, the National Petitions Information System, and local ecology and environment departments. The GRM operates in parallel and connects with the aforementioned statutory channels, ensuring procedural legality and compliance, information transparency, and protecting complainants from reprisal.

480. The GRM is accessible to all community members, including vulnerable groups such as EMs, women, youth, the elderly, persons with disabilities, and low-income populations, ensuring non-discrimination and privacy protection. It offers multiple access channels, including in-person meetings, written complaints, phone calls, emails, and social media. The details of the GRM, including a procedural flowchart with specified timeframes, are contained within the ESMP.

481. In addition, AIIB has established the Project-Affected People's Mechanism (PPM). When project-affected people believes that they have suffered or may suffer adverse impacts due to the failure of an AIIB-funded project to implement its Environmental and Social Policy (ESP), and their concerns cannot be satisfactorily resolved through the project's Grievance Redress Mechanism (GRM) or AIIB's internal management mechanisms, the PPM provides an independent and impartial review opportunity. Relevant information about the PPM can be accessed via the following link: <https://www.aiib.org/en/about-aiib/who-we-are/project-affected-peoples-mechanism/how-we-assist-you/index.html>.

XI. Environmental and Social Management Plan

482. A stand-alone Project Environmental and Social Management Plan (ESMP) has been prepared. The development of the ESMP referenced domestic documents such as the Environmental Impact Assessment and Feasibility Study, and involved consultations and solicitation of opinions from various stakeholders at the project level, as well as communication and discussions with the local Ecological and Environment Bureau, other government agencies, and local communities.

483. The ESMP identifies mitigation measures for anticipated environmental and social impacts, institutional responsibilities, and mechanisms to monitor and ensure compliance with Chinese laws, standards, and regulations, as well as the AIIB's Environmental and Social Policy. The ESMP specifies the main environmental and social impacts and corresponding mitigation measures, roles and responsibilities, monitoring and reporting arrangements, training, and the grievance mechanism. The ESMP will be adjusted based on actual circumstances following the completion of detailed design. Should any significant changes occur, this plan will be updated and disclosed.

XII. Conclusion and Recommendations

484. Upon completion, the project will enhance regional cargo collection, distribution, and transshipment capacity, improve multimodal transport efficiency, reduce logistics turnover costs, promote local economic development, and provide employment opportunities for countries along the "Belt and Road".

485. Based on the information provided in this Environmental and Social Impact Assessment report and assuming the comprehensive and effective implementation of the Environmental and Social Management Plan, along with training and capacity building, it is expected that potential adverse environmental and social impacts will be minimized and/or mitigated to acceptable levels.

486. The primary negative environmental impacts of the project mainly include soil erosion, construction noise and vibration, dust, wastewater discharge, and worker health and safety risks during the construction phase. Key activities during the operational phase include the operation of refrigeration and freezing facilities, and the operation and maintenance of the Access Road, internal roads, the railway siding, logistics and production facilities, and the railway loading/unloading yard, which will generate noise, vibration, exhaust emissions, domestic sewage, solid waste, and occupational health and safety risks. However, the report proposes a series of economically and technically feasible mitigation measures to eliminate or reduce these environmental impacts, ensuring the effectiveness of environmental protection during project implementation.

487. The main negative social impacts of the project are divided into two phases. During the implementation (construction) phase, key social risks include impacts from land acquisition and resettlement, potential traffic safety hazards, adverse effects of construction on community life, health and cultural conflict risks brought by migrant workers, as well as impacts on ethnic minority groups and gender equality issues. During the operation phase, potential challenges may involve employment and livelihood restoration after resettlement, traffic safety pressures, and gender equality issues. In response to these risks, the project has adopted multiple mitigation measures, including formulating resettlement plans, improving traffic guidance and safety guarantees, establishing communication mechanisms and public participation platforms, strengthening the management of migrant workers, safeguarding women's rights and interests, and implementing cultural heritage protection measures.

488. The establishment of a grievance mechanism and the conduct of stakeholder engagement will realize the public's right to participate in the investment project. This can effectively address doubts and concerns regarding potential environmental or social issues associated with the investment,

thereby better ensuring the smooth implementation of the project.

Appendix 1: Biodiversity Survey and Evaluation

China-ASEAN Sea-Rail Multimodal Logistics Project Biodiversity Survey and Evaluation



September 2025

Qinzhou Huangma Asset Management Group Co., Ltd

Beijing Zhonghuanruide Environmental Engineering Co., Ltd

I. Biological Environment Baseline

A. Time, Methods, Scope and Content of Biodiversity Survey

1. To identify the habitats and species of plants and animals along the route of the China-ASEAN Maritime-Rail Intermodal Qinzhou Transfer Center Project and the potential impacts of the project on them, Beijing Zhonghuan Ruide Environmental Engineering Technology Co., Ltd. organized a team of 4 biodiversity experts to conduct a survey in the project area from August 2023 to May 2024 through methods such as data review, interview surveys, and on-site investigations.

2. From August 2023 to May 2024, the survey team determined the on-site research plan for the project by reviewing data, studying satellite image data of the project area, and interviewing local ecological environment management departments, forest land management departments, and residents in the project's residential areas.

3. From May 6 to May 22, 2024, the biodiversity survey team selected 15 plant quadrat survey points and 10 animal survey transects. The survey points were set around the project's impact area, with their selection considering vehicle accessibility and the habitat types in the region, focusing on natural and semi-natural areas. During the field survey, the habitat of each site was carefully inspected, and quadrat survey forms were recorded. In the on-site investigation, the key survey objects within the project's survey scope included ecological sensitive areas, national and local key protected wild animals and plants, covering forest vegetation composition types, current status of forest community structure, artificial and natural vegetation, ecological public welfare forests, agricultural ecology, distribution and quantity of terrestrial wild animals and plants, endemic plants, invasive plants, etc. Since the project does not cross any rivers, and all the ponds it crosses are independent puddles not connected to rivers, aquatic plants and animals were not included in this survey.

a. Survey Methods

4. **Data Review Method.** The data reviewed in this survey include List of Guangxi Plants (Qin Haining, Liu Yan, 2010), Vegetation of Guangxi (Su Zongming, Li Xiankun et al., 2014), National Key Protected Plants List, Guangxi Key Protected Plants List, National Key Protected Wild Animals List, Guangxi Key Protected Wild Animals List, Zoogeography of China (Zhang Rongzu, 2011), Wild Animals of Guangxi (edited by Wu Mingchuan), topographic maps of the project route, satellite images, overall land use plans, and other relevant materials.

5. **Interview Survey Method.** Within the project survey area, interviews and conversations were conducted with local residents, as well as with relevant personnel from local forestry departments, to understand the evolution of local vegetation, the distribution of protected plants, and the activities and distribution of birds, amphibians, reptiles, and mammals. Discussions with staff from local ecological environment departments were held to gather information on locally protected wild animals and plants, as well as previous biological surveys and biodiversity conservation efforts carried out in the area surrounding the project. Conversations with local residents also helped identify common wild animals and plants in the region.

6. **On-Site Survey Method.** The on-site survey followed the principle of combining overall investigation with key-focused research. While comprehensively considering the integrity of the structure and function of dominant ecological factors, it emphasized surveys in key areas and critical periods. Through actual site reconnaissance of the project construction area, the accuracy of relevant data was further analyzed and verified. The current status survey of the ecological environment was conducted by selecting representative sample plots based on the types of ecosystems, typical vegetation, and habitats along the project route.

b. Plant Survey Methods

7. On-site reconnaissance adopted a technical approach combining route surveys and typical sample plot surveys. The route survey mainly covered a 300-meter area around the project; through comprehensive observation, it recorded the general vegetation types, structures, and main species composition along the project route. The typical quadrat survey focused on understanding the community structure characteristics of major vegetation types and important habitats. The survey team set up 15 representative quadrats within the survey scope, covering all sub-projects. Among them, 2 quadrats were set in the logistics and production facilities area of Sub-project 1, 1 quadrat in the multimodal transport freight yard area of Sub-project 2, and 12 quadrats in the supporting infrastructure area of Sub-project 3. The quadrat types included various typical vegetation in the project area, such as artificial forests (including timber forests and economic forests), natural forests, shrub-grasslands, and grasslands. Specifically, there were 8 arbor communities (3 eucalyptus forest communities, 3 masson pine forest communities, 1 *Baeckea frutescens** seedling forest, and 1 bamboo forest), 3 shrub-grass communities, 2 grass communities, 1 vegetation community along the pond bank, and 1 litchi orchard community. The basic information of the quadrats is shown in Table 1, and the setup of the quadrats is shown in Figure 1.

Table 1 Setup of Plant Quadrats

Serial number	Project content	Pile number	Biome name	Quadrant coordinates	altitude/m	Quadrat area/m2	Habitat types
1	Sub - project 3 Supporting infrastructure	13m west of K0+050	shrub-grassland	E108°40'29.98" N22°04'52.77"	23	25	Shrub-grassland community
2		200 meters east of K0+440	shrub-grassland	E 108°40'29.99" N 22°04'38.57"	23	25	Colony of Baeckea frutescens seedling forest
3		220 meters east of K0+380	planted forest	E 108°40'32.19" N 22°04'39.92"	21	400	Masson pine forest community
4		220 meters east of K0+260	shrub-grassland	E 108°40'33.90" N 22°04'43.71"	24	20	Plant communities on the banks of the pond
5		250 meters east of K0+380	grassland	E 108°40'32.42" N 22°04'39.16"	24	1	Grassland community
6		245 meters east of K0+410	grassland	E 108°40'31.97" N 22°04'38.77"	24	1	Grassland community
7		3 meters east of K1+320	planted forest	E 108°40'09.30" N 22°04'15.97"	21	400	Masson pine forest community
8		185 meters east of	shrub-grassland	E 108°40'02.62"	29	25	Shrub-grassland

Serial number	Project content	Pile number	Biome name	Quadrant coordinates	altitude/m	Quadrat area/m2	Habitat types
		K3+030		N 22°03'23.51"			community
9		6 meters east of K4+480	planted forest	E 108°40'02.62" N 22°03'23.51"	28	400	Eucalyptus forest community
10		12 meters east of K4+440	shrub-grassland	E 108°39'46.05" N22°02'39.18"	28	25	Shrub-grassland community
11		57m east of K5+760	natural forest	E108°39'31.33" N22°02'00.14"	18	400	Masson pine forest community
12		94 meters west of K8+380	planted forest	E108°38'50.72" N22°00'44.50"	15	400	Eucalyptus forest community
13	Sub - project 2 Intermodal Freight Yard	54 meters west of the railway special line	bamboo forest	E 108°39'17.91" N 22°03'11.52"	23	100	Bamboo forest community
14	Sub - project 1 Logistics and Production Facilities	Logistics and production facilities area	planted forest	E 108°39'26.90" N 22°02'51.56"	30	225	Litchi tree community
15		Logistics and production facilities area	planted forest	E 108°39'27.12" N 22°02'49.75"	28	400	Eucalyptus forest community

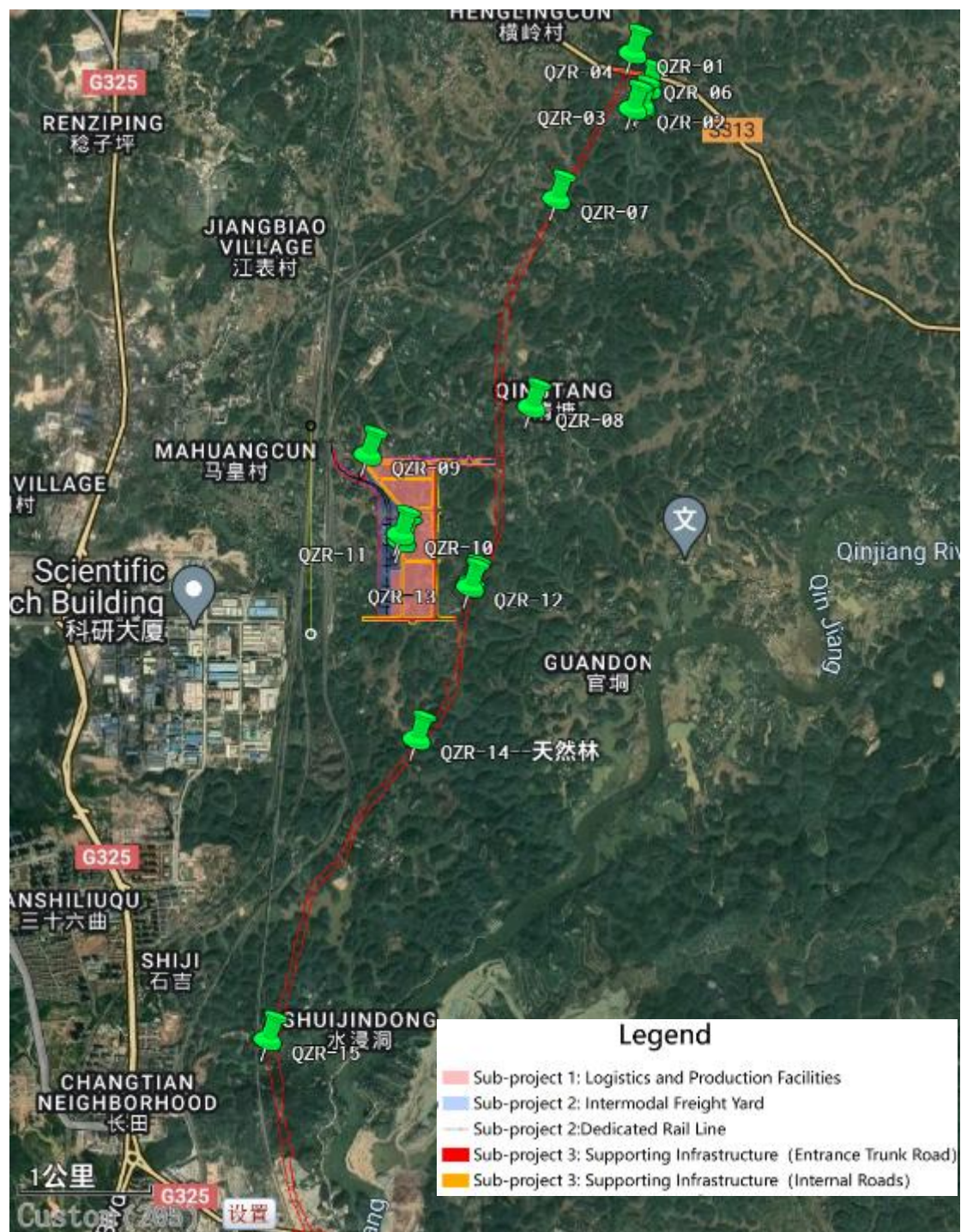


Figure 1 Distribution map of plant quadrats

c. Animal Survey Methods

8. Animals were surveyed using a combination of methods including data research, interview surveys (expert consultation and folk interviews), and on-site reconnaissance, with a focus on investigating animals listed in national and local wild protection lists and their habitats.

9. Investigators set up representative survey transects within the impact scope to conduct field surveys of wild animals. To assess the project's impact on wild animals, survey transects were established within the range of 300m to 1000m on both sides of the project. The setup of these transects comprehensively considered factors such as the living habits of different wildlife groups, topographic conditions, and the degree of human disturbance, while covering various habitat types of wild animals in the survey area. Based on different habitats, different animal groups, and their activity patterns, transects were set up along forest roads, forest paths, ditches, ponds, etc. Information such as the species, quantity, activity traces of terrestrial vertebrates appearing on both sides of the transects, as well as habitat conditions, was observed and recorded.

10. A total of 5 transects were set up in this survey, covering various ecosystems in the region such as artificial forests, natural forests, shrub-grasslands, grasslands, farmlands, and villages. Details of the transects are shown in the table below.

Table 2 Setting of animal transects

Serial number	Sample line name	Length/ km	Main types of ecosystems	Set area	Corresponding project location
1	Daytime animal transect 1	0.929	Mainly forest ecosystems, with a small amount of wetland ecosystems, farmland ecosystems, and shrub-grassland ecosystems.	Hengling Village	near the starting point
2	Daytime animal transect 2	4.396	An artificial ecosystem that integrates urban ecosystems, forest ecosystems, and farmland ecosystems, along with a small amount of wetland ecosystems and shrub-grassland ecosystems.	Qingtang Village	Entrance Trunk Road K2+540~K3+380
3	Daytime animal transect 3	1.363	An artificial ecosystem integrating urban ecosystems, forest ecosystems, and farmland ecosystems, along with a small amount of wetland ecosystems and shrub-grassland ecosystems	Old Village	Logistics and Production Facilities; Intermodal Freight Yard
4	Daytime	1.537	Urban ecosystem, forest	Maxiong	Entrance

	animal transect 4		ecosystem, farmland ecosystem, and integrated ecosystem, with a small amount of natural forest	Village	Trunk Road K5+960~K6+5 40
5	Daytime animal transect 5	1.545	Mainly consist of wetland ecosystems and forest ecosystems	Shuijindong Village	Entrance Trunk Road K8+360~K9+2 40

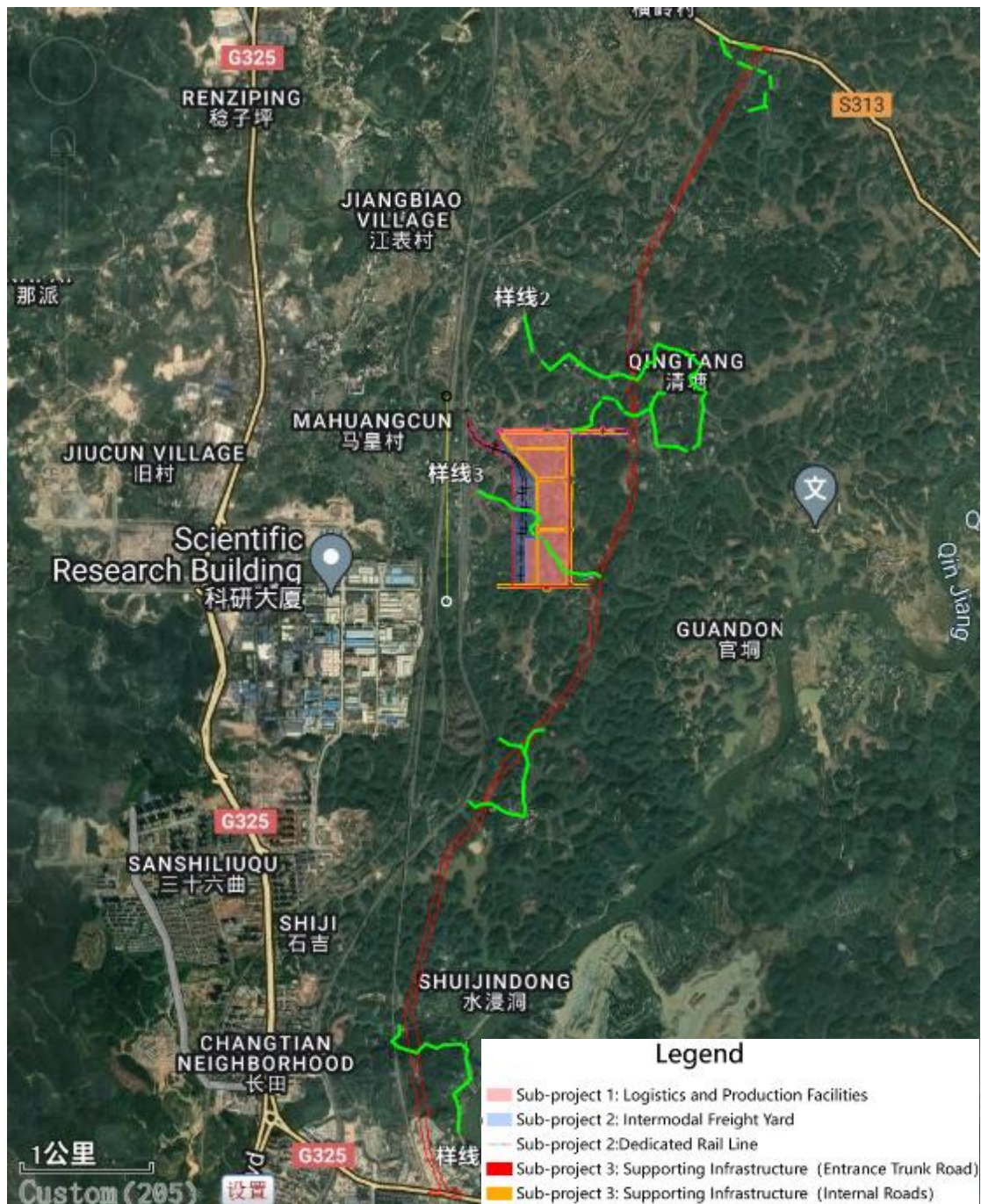


Figure 2 Distribution Map of Animal Transects

d. Biodiversity Protection Areas

11. After reviewing local policies, communicating with local ecological environment departments and forestry departments, and combining with on-site surveys, it is found that there are no national statutory protected areas such as nature reserves, forest parks, scenic spots (core scenic areas), geoparks, or natural and cultural heritage sites within 5km around the Entrance Avenue of this project. Part of the estuary of Qinzhou City is located on the international thoroughfare for bird migration and the bird migration route in Guangxi. This project is approximately 40km away from the estuary, and the project route is not on the bird migration route. No international bird areas or key biodiversity areas were found within the project survey scope.

B. Habitats

12. The project area is mainly composed of forest ecosystems, shrub ecosystems, grassland ecosystems, wetland ecosystems, farmland ecosystems, and urban ecosystems.

Table 3 List of Ecosystem Types Along the Project Route

Serial number	Types of ecosystems	Main species	distribution
1	forest ecosystem	Eucalyptus, banyan, Masson pine, etc.	Blocky or patchy, which is widely distributed within the survey area
2	Shrub ecosystem	Bamboo forests, Mussaenda pubescens, Mimosa bimucronata, Melastoma candidum, etc.	Blocky or patchy, scattered within the survey area
3	Grassland ecosystem	Miscanthus floridulus, Bidens pilosa, Imperata cylindrica, etc.	Show a scattered point-like distribution within the survey scope
4	Wetland ecosystem	ponds, wetlands	Show a scattered and spotty distribution within the survey area
5	farmland ecosystem	Cassava, rice, taro, corn, etc.	Blocky or patchy, scattered within the survey area
6	Urban ecosystem	Residential houses and green plants around the "four sides", regional transportation	Distributed in dots or patchy scatter



Forest ecosystem



Shrub ecosystem



Grassland ecosystem



Wetland ecosystem



farmland ecosystem



Urban ecosystem

Figure 3 Ecosystems along the project route

13. **Forest Ecosystem.** The forest ecosystem within the project survey scope is mainly composed of planted forests, dominated by fast-growing eucalyptus, large-diameter mixed bamboo, *Bambusa chungii* (Chung's bamboo), *Pinus massoniana* (Masson pine), etc. The animals distributed therein include birds, reptiles, mammals, and other groups.

14. **Shrub-Grassland Ecosystem.** The shrub and grassland ecosystems within the project survey scope are dominated by small mixed shrubs (e.g.,

Rhodomirtus tomentosa [downy rose myrtle], Mussaenda pubescens [hairy mussaenda]) and herbaceous plants (e.g., Bidens pilosa [hairy beggarticks], Miscanthus floridulus [feather grass], Setaria viridis [green bristlegrass]), with a small amount of Mimosa bimucronata (southern mimosa) shrubs. This ecosystem boasts strong resilience and prominent dominant species. The animals distributed therein are mainly reptiles, some small mammals, and birds.

15. **Wetland Ecosystem.** The wetland ecosystem within the project survey scope is mainly composed of rivers, ditches, ponds, etc. The animals distributed in it are mainly amphibians, with occasional reptiles and birds.

16. **Farmland Ecosystem.** The farmland ecosystem within the project survey scope mainly includes dry land and paddy fields, dominated by artificially planted crops with a single community structure. The paddy fields along the route are mainly planted with rice, and the dry land is mainly planted with taro, cassava, corn and other crops. The animals distributed in the farmland ecosystem are mainly amphibians, some reptiles, and occasionally some birds.

17. **Urban Ecosystem.** The urban ecosystem is a highly complex artificial ecosystem, which is significantly different from natural ecosystems in terms of structure and function.

18. The urban ecosystem within the project survey scope mainly includes village residential areas and railways. The vegetation in the village residential habitat mainly consists of some plant components artificially retained from the nearby forest habitat. The animal species in the village residential habitat are mainly those living near humans, such as dogs, cattle, pigs, chickens, etc. The wild bird species are mostly songbirds such as barn swallows and tree sparrows, and the mammals are mainly small rodents living semi-underground, such as rats.

19. The land types within the project survey scope are divided into 28 categories, including arbor forest land, shrub forest land, bamboo forest land, other forest land, orchard, other garden land, dry land, irrigated land, paddy field, river, urban residential land, rural homestead, industrial land, transportation land, ditch, etc. Arbor forest land covers the largest area and is the main land use type, accounting for 48.26% of the ecological impact scope; followed by paddy field, accounting for 14.89% of the ecological impact scope. The remaining land types are mainly transportation land, pit-pond water surface, and dry land, accounting for 7.33%, 5.89%, and 4.20% of the total land area respectively. The current status of land use in the survey area is shown in the table below.

Table 4 Statistical List of the Current Land Use Status in the Survey Area of This Project

Land use types			Area/hm ²	Proportion
agricultural land	woodland	Bamboo forest land	6.8	6.03%
		Other forest land	4.05	3.59%
		Arbor forest land	44.86	39.77%
		Shrub land	1.94	1.72%
	grassland	Other grasslands	1.69	1.50%
	garden	orchard	5.09	4.51%
	cultivated land	dry land	8.79	7.79%
		paddy field	19.64	17.41%
	ditch		0.21	0.19%
	cultured ponds		0.41	0.36%
	Pit and pond water surface		5.07	4.49%
	Facility agricultural land		1.51	1.34%
Construction land	Industrial land		0.9	0.80%
	Rural homestead		5.23	4.64%
	Land for commercial and service facilities		0.06	0.05%
	Logistics and warehousing land		0.14	0.12%
	Transportation land		6.33	5.61%
waters		The water surface of the ditch	0.07	0.06%
Other		Special-purpose land	0.01	0.01%
Total			112.8	1

C. Plants

a. Plant Resources in Qinzhou City

20. The main landform type in Qinzhou City is hills. The central part belongs to the low hill platform, basin, and river valley alluvial plain area, dominated by low hills and river valley plains with relatively flat land; the eastern part is a low hilly area; the southern part is a low hill coastal mound and plain area, including the largest alluvial plain in the city—the Qinjiang Delta. Qinzhou City has a total of 228 families, 931 genera, and nearly 2,000 species of terrestrial plants. The city's forest coverage rate is 51.18%, and the forest greening rate is 51.58%. The total land area of the city is 1,032,880.4 hm², of which forest land accounts for 591,578.3 hm² (57.27%) and non-forest land accounts for 441,302.1 hm² (42.73%). There are 2 nature reserves and 2 forest parks in the city. Qinzhou

City has 765 species of terrestrial wild plants, belonging to 476 genera and 150 families. Among them, there are 723 species of angiosperms (128 families, 441 genera), 11 species of gymnosperms (6 families, 10 genera), and 31 species of ferns (16 families, 25 genera). The dominant families are Theaceae, Fagaceae, Pinaceae, Myrtaceae, Magnoliaceae, and Poaceae.

21. Qinzhou City has lush vegetation, and its natural vegetation is classified under the southern Guangxi tropical rainforest and subtropical monsoon forest zone. There are diverse vegetation types and plant communities, roughly divided into 5 major vegetation types: monsoon forest, evergreen broad-leaved forest, coniferous forest, coniferous-broad-leaved mixed forest, and open woodland with short grass. The distribution of vegetation is highly uneven. In parts of the western, northern, and eastern regions, most of the primary vegetation has been damaged. The existing forests are secondary mixed forests dominated by pine and fir trees, with mixed tree species including *Castanopsis*, *camphor*, *nanmu*, *Schima*, *Erythrophleum fordii*, and *bauhinia*. The ground surface is dominated by communities of *Rhodomyrtus tomentosa* and *Dicranopteris*. The central and southern regions are dominated by shrub and low grass communities. Shrubs are mainly *Baeckea frutescens*, and low grasses are mainly *Ischaemum aristatum*. Additionally, there are *Rhodomyrtus tomentosa*, *Dicranopteris*, and *Eriachne pallescens* among others.

22. The forest vegetation in the Qinbei area is dominated by eucalyptus and broad-leaved forests. Due to differences in soil, climate, and topographic conditions, the vegetation distribution shows regional variations: the eastern and northwestern regions are dominated by *Rhodomyrtus tomentosa*-*Dicranopteris* communities, with grasses dominated by velvet grass, covering 80%-90% of the area, and arbors dominated by eucalyptus; the southern and central regions are dominated by shrub (*Baeckea frutescens*) and low grass (*Ischaemum aristatum*) communities, covering 50%-60% of the area, with arbors dominated by eucalyptus; the coastal areas are dominated by short *Eriachne pallescens* communities, covering 30%-40% of the area, with arbors dominated by eucalyptus.

23. The project area consists of low hills, most of which are covered with eucalyptus forests, and the south of the project site is forest land.

b. Vegetation in the Project Area

1. Vegetation Types

24. The terrestrial vegetation in the project area is divided into 2 categories: natural vegetation and artificial vegetation. The natural vegetation includes 4 vegetation type groups, 8 vegetation types, and 12 main formations; the artificial vegetation includes 2 vegetation type groups, 4 vegetation types, and 5 main formations. The main vegetation types within the survey scope are detailed in the table below. Aquatic vegetation is mainly distributed in the ponds

along the route, with the main vegetation formation being water hyacinth (*Eichhornia crassipes*).

Table 5 Survey Results of Terrestrial Vegetation Types in the Project Area

Vegetation type group		Vegetation type	Major biomes	distribution
Natural vegetation	1.coniferous forest	evergreen coniferous forest	Masson pine	Mainly distributed on the east side of K5+740 of the Entrance Trunk Road
	2. bamboo forest	Warm bamboo forest	Bambusa chungii community	Scattered along the village
	3.shrubbery	Thermal shrub	Ficus hispida shrubbery	sporadically distributed in small pieces
		Warm shrubbery	Rhus chinensis shrub	sporadically distributed in small pieces
			Acacia retinodes shrubbery	sporadically distributed in small pieces
	4.grassland	grass clumps	Miscanthus grassland biome	Scattered along the roadside, beside the pond and along the edge of the forest
			Saccharum arundinaceum community	
			Imperata cylindrica community	
			Bamboo Knot Grass Biome	
		Fern thickets	Blechnum orientale community	Mainly distributed under the masson pine forest or along the forest edge
			Dicranopteris community	It is distributed along the line.
		Other weed grass clumps	Bidens pilosa biome	It is distributed along the line.
	5. aquatic plants	aquatic plants	water hyacinth	Mainly distributed in the ponds along the line
Artificial vegetation	6. planted forest	timber forest	Eucalyptus forest biome	Widely distributed within the survey area and covering a large area
			Masson pine forest formation	sporadically distributed in small pieces
			Pinus densata forest formation	Only a small area of artificially planted

Vegetation type group		Vegetation type	Major biomes	distribution
				seedlings is distributed on the left side of the Entrance Trunk Road from K0+450 to K0+600.
		economic forest	Economic forest community dominated by litchi	Distributed on the slopes and valleys near the village
	7. crops	paddy field crops	Rice biome	They are distributed along the line, mostly on flat ground near villages.
		Dryland crops	Cassava, sugarcane, peanuts, corn, taro, vegetables, etc.	It is distributed sporadically in small pieces, mostly on flat ground near villages.

25. **Coniferous Forests.** Warm-temperate coniferous forests are distributed in certain areas within the survey scope, but mostly in patchy and scattered patterns. This vegetation type includes one subtype: warm-temperate coniferous forests in low mountains and hills, with the main formation being *Pinus massoniana* forests. Fragmented *Pinus massoniana* forests are distributed in areas such as the left side of Entrance Avenue K0+260-K0+420, both sides of K1+300-K1+440, the left side of K5+520-K6+100, and both sides of K8+140-K8+340, with scattered distributions in other regions. Additionally, a plot of artificially planted *Baeckea frutescens* seedlings is distributed on the left side of K0+280-K0+640.

26. ***Pinus massoniana* Forests.** These are mainly artificially planted, with only a small number of plots having natural *Pinus massoniana* forests. The community has an emerald-green appearance and a simple structure, with an overall coverage of approximately 95% and a height of about 15 meters. The plant community structure is usually divided into three layers: arbor layer, shrub layer, and herb layer, along with interlayer plants. The arbor layer has a coverage of about 80% and a height of around 15 meters, with *Pinus massoniana* being absolutely dominant. The shrub layer has a coverage of approximately 30% and a height of 0.5-1.6 meters, with common species including *Melastoma candidum*, *Mallotus barbatus*, *Rhodomyrtus tomentosa*, *Flueggea virosa*, and *Loropetalum chinense*. The herb layer has a coverage of about 20% and a height of 0.1-1.2 meters, dominated by *Dicranopteris linearis*, *Miscanthus sinensis*, and *Blechnum orientale*, with other common herbs including *Miscanthus floridulus*, ferns, and *Imperata cylindrica*.

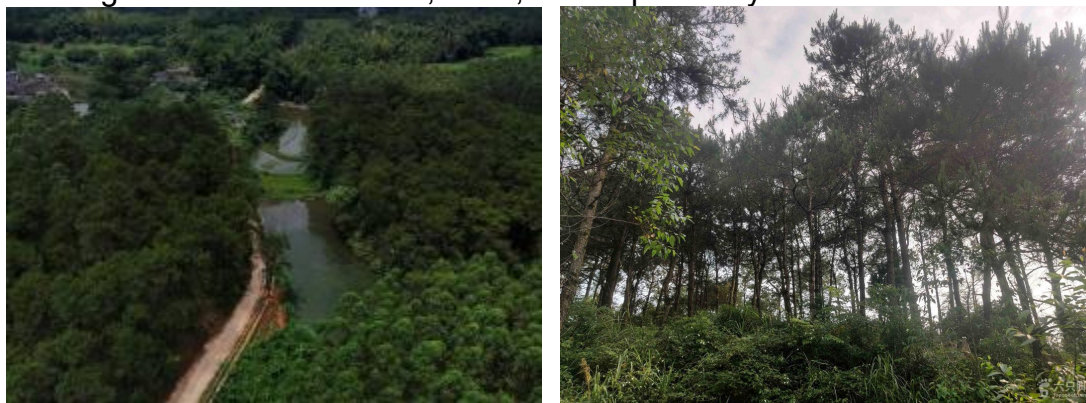


Figure 4 Current Situation of Coniferous Forests

27. **Bamboo Forests (Thickets).** This includes one vegetation subtype: tropical bamboo forests, with the main community being *Bambusa chungii* forests. Within the survey scope, bamboo forests have a small distribution area, mainly scattered and in small patches, generally distributed along the hilly mountains or on both sides of ponds along the route.

28. ***Bambusa chungii* Forests.** Within the survey scope, they are mainly distributed along rural roads and near villages. The community height is 6-10

meters, with an overall coverage of about 80%, and *Bambusa chungii* is the dominant species. The shrub-grass layer is underdeveloped, generally not exceeding 2 meters, with a coverage of about 5%. Occasionally, shrubs such as *Urena lobata* and *Mussaenda pubescens* are distributed in the community. The herb layer is about 0.4 meters high, with a coverage of about 5%, and common herbaceous plants include *Pueraria lobata*, *Imperata cylindrica*, and *Bidens pilosa*.



Figure 5 Current Situation of Bamboo Forest

29. **Shrubs.** Shrubs refer to vegetation types dominated by shrub life-form plants. Some arbors, restricted by habitat conditions, cannot grow into full arbors and remain in a shrubby form for a long time; such types are also classified as shrubs. This type generally has a height of less than 4 meters and a coverage of more than 40%. The distribution types of shrubs in the key survey area are relatively rich, with typical shrubs including *Ficus hispida* shrub, *Rhus chinensis* shrub, *Mimosa sepiaria* shrub, etc.

30. ***Ficus hirta* Shrub.** *Ficus hirta* shrubs are scattered on slopes, roadsides, and valleys within the survey scope, with a coverage of about 40% and a height of 1.5-2 meters. Common associated species in the community include *Schefflera heptaphylla*, *Rubus alceifolius*, *Rubus cochinchinensis*, *Clerodendrum cyrtophyllum*, *Maesa perlaris*, etc. The herb layer has a coverage of about 20-60%, with main species including *Dicranopteris dichotoma*, *Miscanthus sinensis*, *Miscanthus floridulus*, *Microstegium fasciculatum*, *Osmunda vachellii*, *Polygonum chinense*, etc.

31. ***Rhus chinensis* Shrub.** *Rhus chinensis* shrubs are generally divided into shrub layer and herb layer, with occasional arbor layer plants mixed in. They are distributed along roadsides and in low mountain and hilly areas, with *Rhus chinensis* being obviously dominant in the community. The total coverage of the community is about 90%, with a height of 2.6-3.0 meters. Associated species include *Melastoma candidum*, *Desmodium sequax*, *Toxicodendron succedaneum*, *Mussaenda pubescens*, *Melastoma dodecandrum*, etc. The herb layer has a coverage of about 50% and a height of 0.1-2.0 meters, with common species including *Miscanthus sinensis*, *Dicranopteris linearis*, *Pogonatherum crinitum*, *Diplopterygium chinense*, *Blechnum orientale*, *Lycopodium japonicum*, *Imperata cylindrica*, *Eragrostis pilosa*, etc. Interlayer plants include *Rhynchosia volubilis*, etc.

32. **Mimosa sepiaria Shrub.** *Mimosa sepiaria* is an alien invasive species, introduced by means of vehicle transportation, road construction, etc. It is mainly distributed along roadsides in the survey area. The community structure is generally divided into shrub layer and herb layer, with the arbor layer missing. The total coverage of the community is about 90%, with a height of about 2.4 meters. The shrub layer has *Mimosa sepiaria* as the sole dominant species, with few other species distributed. The herb layer has a coverage of about 40% and a height of 0.1-1.2 meters, with the dominant species being *Miscanthus sinensis*, and other common species including *Imperata cylindrica*, *Bidens pilosa*, *Erigeron annuus*, etc.



Figure 6 Current Situation of Shrubberty

Grasslands

33. **Grass-dominated Grasslands.** This vegetation type includes one subtype: grasslands in red soil areas, which are formed after the destruction of forest vegetation. The main formations of grass-dominated grasslands are *Miscanthus sinensis* grasslands and *Miscanthus floridulus* grasslands, which are distributed in large areas along forest edges, roadsides and other regions in small patches or plaques.

34. ***Miscanthus sinensis* Grasslands.** They are distributed in humid valley environments at an altitude of 700-1500 meters, and are also common on roadsides and abandoned cultivated land. The herb layer is about 1.2 meters high, with grass growing very vigorously and a coverage of about 83%-90%, almost entirely occupied by *Miscanthus sinensis*. There are few plants under the grass layer. *Cyclosorus parasiticus* can be seen at the edges, as well as *Mimosa sepiaria*, *Melastoma candidum*, *Ligustrum quihoui*, *Rosa laevigata*, *Senecio scandens*, *Mallotus apelta*, etc. Other common herbs include *Lophatherum gracile*, *Blechnum orientale*, *Pteris vittata*, *Bidens pilosa*, *Ageratum conyzoides*, *Dicranopteris dichotoma*, *Imperata cylindrica*, *Neyraudia reynaudiana*, *Thysanolaena latifolia*, *Lygodium scandens*, etc.



Figure 7 Current situation of grass clumps

35. **Fern Grasslands.** Fern grasslands are mainly *Blechnum orientale* grasslands and *Dicranopteris dichotoma* grasslands. *Blechnum orientale* grasslands have *Blechnum orientale* as the dominant species, with a community coverage of about 75%-90% and a community height of about 1.2m-4m. The dominant species of the community are single, with *Blechnum orientale* and *Dicranopteris dichotoma* as the dominant species. The arbor layer occasionally has *Pinus massoniana*, the shrub layer occasionally has *Melastoma candidum*, and the herb layer commonly has *Thysanolaena latifolia*, *Nephrolepis auriculata*, *Lophatherum gracile*, *Lygodium scandens*, *Arthraxon microphyllus*, *Cyclosorus parasiticus*, *Miscanthus floridulus*, etc.



Figure 8 Current situation of fern grasslands

36. **Aquatic Plants.** The main aquatic plant within the survey scope is water hyacinth, which is mainly distributed in the ponds in the project area. *Eichhornia crassipes* is a perennial aquatic herb belonging to the genus *Eichhornia* of the Pontederiaceae family, and there are several small patches distributed in the Zishui River within the survey scope. The *Eichhornia crassipes* community has a height of about 40 cm and a coverage of 95%, with a small amount of *Eichhornia crassipes* and *Myriophyllum spicatum* in it.

37. **Timber Forests.** The main formations of timber forests within the survey scope are eucalyptus forests and *Pinus massoniana* forests. Among them, eucalyptus forests are widely distributed in the project area with a large area, while *Pinus massoniana* forests are scattered in patches. Timber forests are

generally pure forests. Due to significant human interference, the communities generally only have an arbor layer and a herb layer, and the shrub layer is occasionally present in some communities. Common species in the herb layer are *Imperata cylindrica*, *Blechnum orientale*, *Cyclosorus parasiticus*, *Miscanthus sinensis*, etc. Within the survey scope, there are also many artificial forests of *Eucalyptus urophylla* × *E. grandis* and *Pinus massoniana* forests. Due to long-term lack of human management, the understory plants grow naturally, with a shrub layer, and the herbaceous plant species are relatively rich. The shrub layer has a coverage of 10%-20% and a height of about 2.2 m. The dominant species in the shrub layer are not obvious, and common plants include *Melastoma candidum*, *Rubus cochinchinensis*, *Psychotria asiatica*, *Clerodendrum cyrtophyllum*, *Rhus chinensis*, etc. The herb layer has a coverage of about 60%, with *Dicranopteris linearis*, *Miscanthus floridulus*, and *Miscanthus sinensis* as the dominant species. Other common plants include *Commelina communis*, *Lygodium scandens*, *Miscanthus sinensis*, *Erianthus rufipilus*, *Imperata cylindrica*, *Blechnum orientale*, *Setaria viridis*, *Neyraudia reynaudiana*, etc.

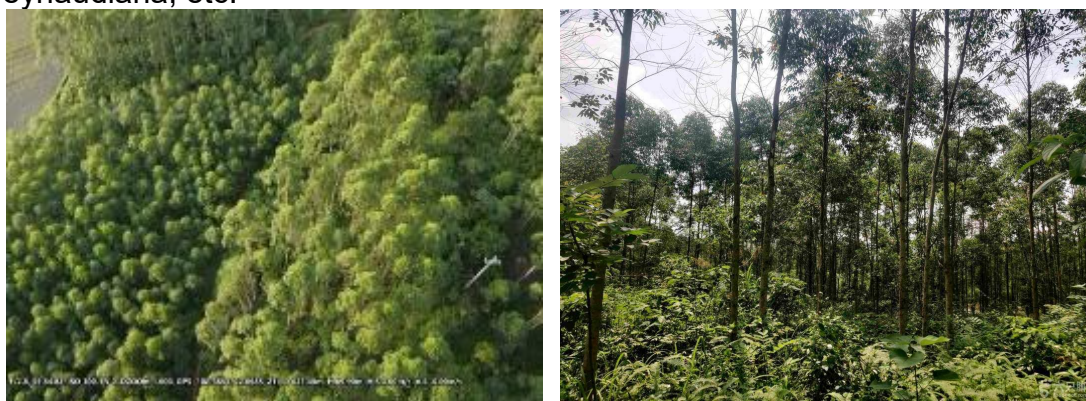


Figure 9 Current Situation of Timber Forest

38. **Economic forests.** The affected areas of economic forests are mainly distributed in the mountains and plains along the line. The main forest formations include litchi forests and longan forests, which are distributed in patches or sporadically in the hills around the residential areas along the line.



Figure 10 Current Situation of Economic Forests

39. **Crops.** The agricultural ecosystem along the project route is relatively

simple. Farmland crops have a small distribution area within the survey scope, mainly including dryland and paddy field crops, which are mainly food crops and vegetable crops.

40. Dryland crops mainly include *Zea mays*, *Arachis hypogaea*, *Capsicum annuum*, *Vigna unguiculata*, *Citrullus lanatus*, etc., distributed in flakes (*Zea mays*) or small scattered patches on flat cultivated land within the survey scope along the route. Among them, *Zea mays* covers a relatively large area, while other dryland crops have smaller areas. Due to the high planting density, apart from the cash crops themselves, common herbaceous plants include *Panicum repens*, *Paspalum orbiculare*, *Pogonatherum crinitum*, *Cynodon dactylon*, *Ischaemum ciliare*, etc., but their quantities are small. Some cultivated land (dryland) that has been abandoned has evolved into dryland grasslands dominated by *Panicum repens* and *Bidens alba*.

41. Paddy field crops are mainly *Oryza sativa* (usually cultivated as double-cropping rice plus winter planting), and some are planted with vegetable crops such as *Capsicum annuum*, *Vigna unguiculata*, and cucurbits, mostly scattered in lower-lying sections within the survey scope along the route.



Figure 11 Current Situation of Crops

2. Current Status of Vegetation Distribution

42. The main vegetation types in the survey area include eucalyptus forests, *Pinus massoniana* forests, bamboo forests, and shrubs, etc. The current status of vegetation types in the survey area is shown in the figures, and the statistical tables are detailed in the following tables.

Table 6 Statistical Table of Various Vegetation Types and Areas in the Survey Area

Serial number	Vegetation types	Representative plants	area (hm ²)	Proportion of the total area	The proportion of the area occupied by the vegetation area
1	Masson pine	Masson pine (planted forest)	7.54	0.95%	1.18%
		Masson pine (natural forest)	2.8	0.35%	0.44%
2	Pine forest on the hill	Baekkea frutescens seedlings	1.04	0.13%	0.16%
3	eucalyptus	eucalyptus	396.65	49.91%	62.15%
4	bamboo forest	Bambusa chungii	23.24	2.92%	3.64%
5	shrubbery	Mimosa bimucronata, Ficus hispida, Rhus chinensis, Mussaenda pubescens, etc.	14.25	1.79%	2.23%
6	Litchi Orchard	lychee	28.3	3.56%	4.43%
7	grassland	Miscanthus floridulus, Blechnum orientale, Miscanthus sinensis, etc.	12.67	1.59%	1.99%
8	Paddy field crops	rice	118.3	14.89%	18.54%
9	Dryland crops	Corn, cassava, taro	33.46	4.21%	5.24%
10	Vegetation-free area		156.48	19.69%	/
Total			794.73	1	/

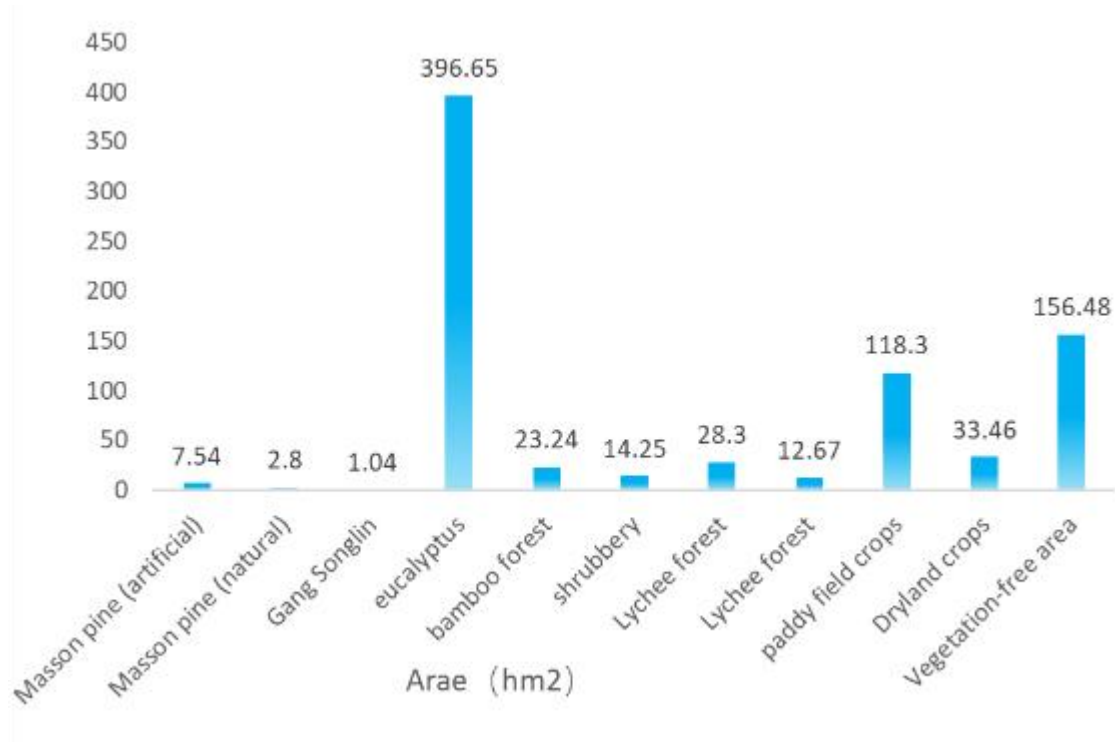


Figure 12 Statistical Chart of Vegetation Types in the Survey Area

43. As can be seen from the above figures and tables, the area with vegetation in the project survey scope is 638.25 hm², accounting for 80.31% of the total area of the evaluation area. The vegetation in the project survey scope is mainly artificially cultivated vegetation. The largest areas are artificially planted eucalyptus forests and paddy field crops, with areas of 396.65 hm² and 118.3 hm² respectively, accounting for 62.15% and 18.54% of the total area with vegetation. Followed by artificially planted dryland crops, litchi orchards and bamboo forests, with areas of 33.46 hm², 28.3 hm² and 23.24 hm² respectively, accounting for 5.24%, 4.43% and 3.64% of the total area with vegetation. The areas of artificially planted *Pinus massoniana* forests and *Baeckea frutescens* forests are relatively small, being 7.54 hm² and 1.01 hm² respectively, accounting for 1.18% and 0.16% of the total area with vegetation. The areas of natural vegetation, in order, are shrubs, grasslands and natural *Pinus massoniana* forests, with areas of 14.25 hm², 12.67 hm² and 2.80 hm² respectively, accounting for 1.79%, 1.59% and 0.35% of the total area with vegetation.

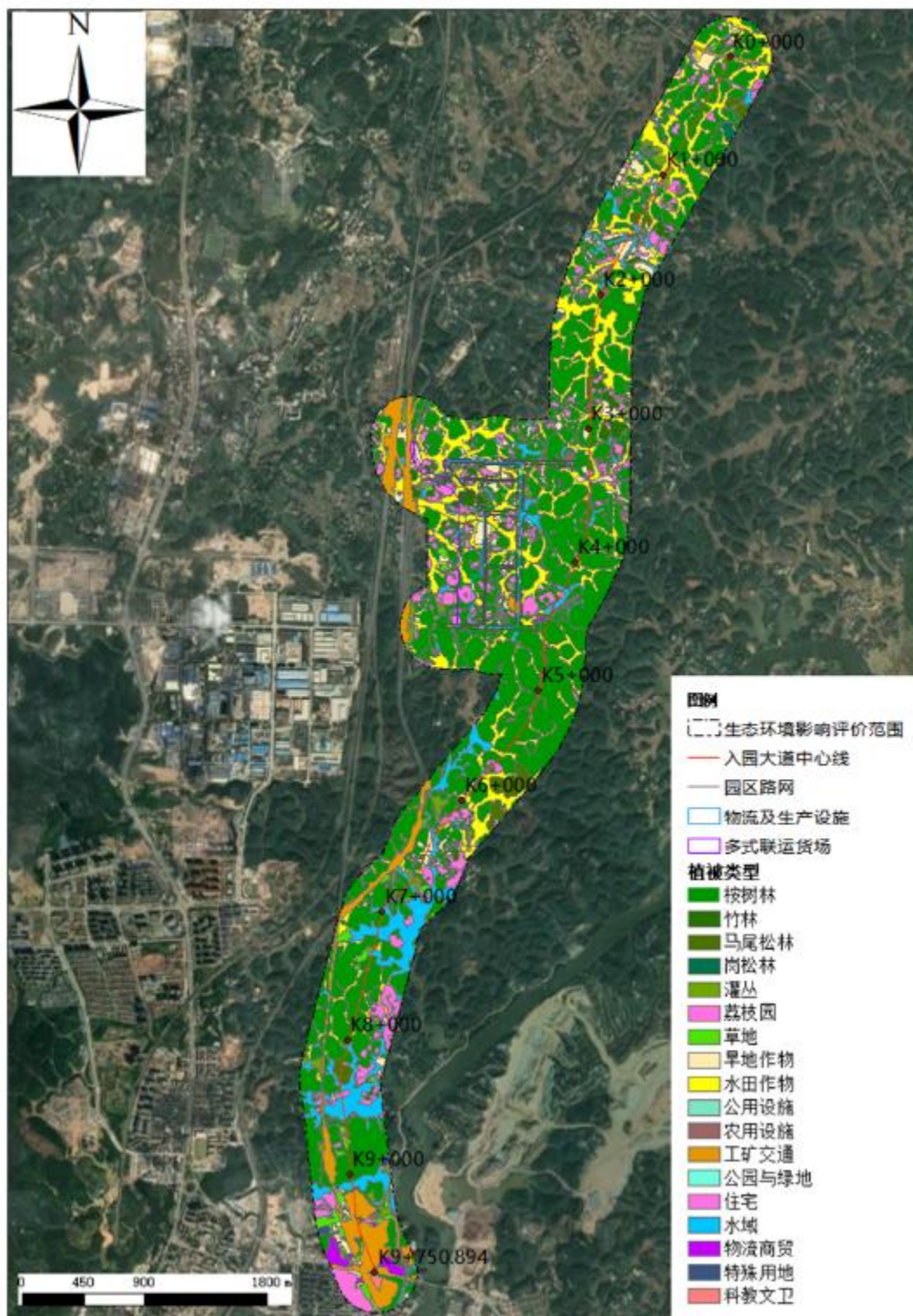


Figure 13 Vegetation Types Map along the Project Route

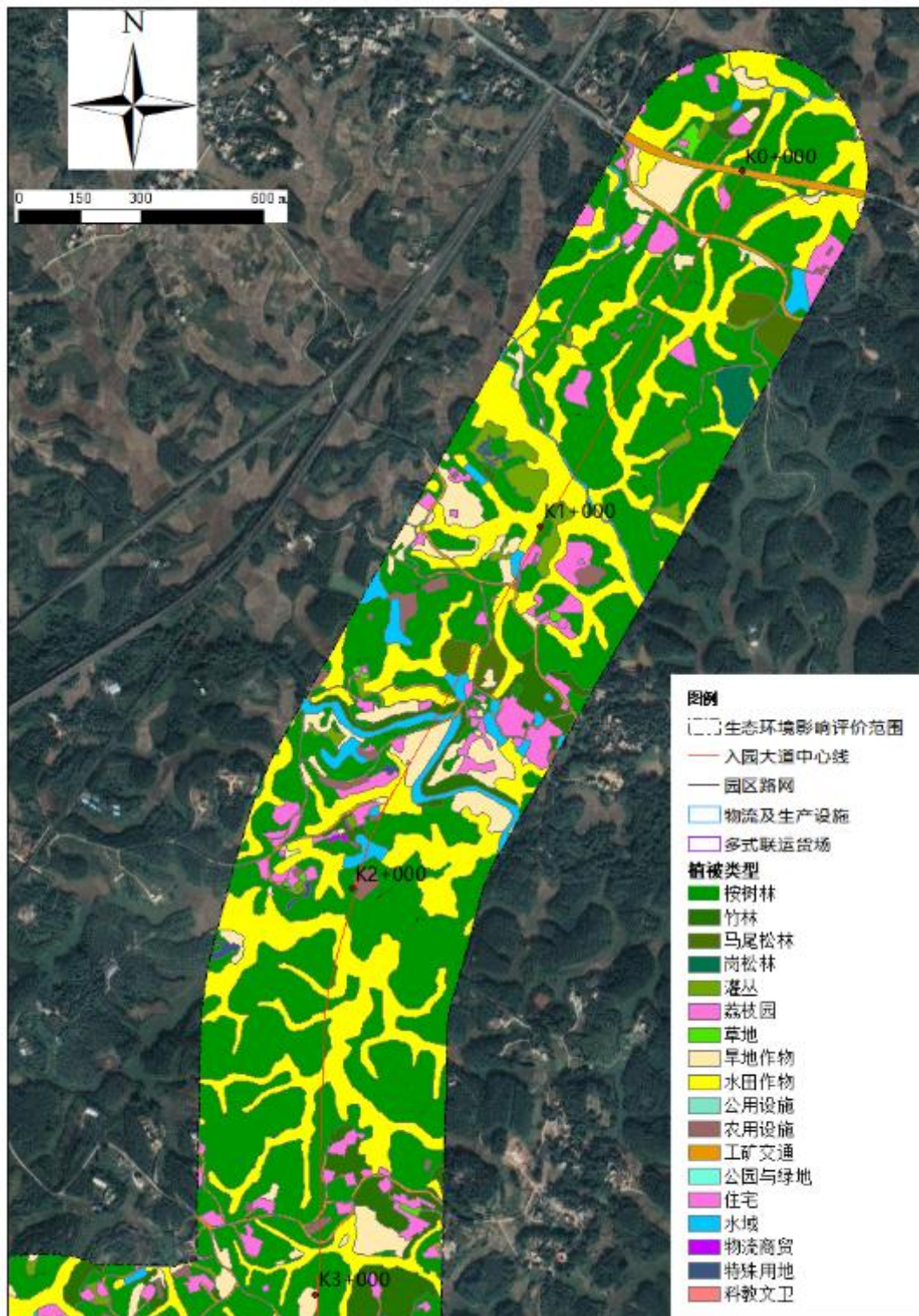


Figure 14 Vegetation Type Map along the Project (North Area of the Logistics Park)

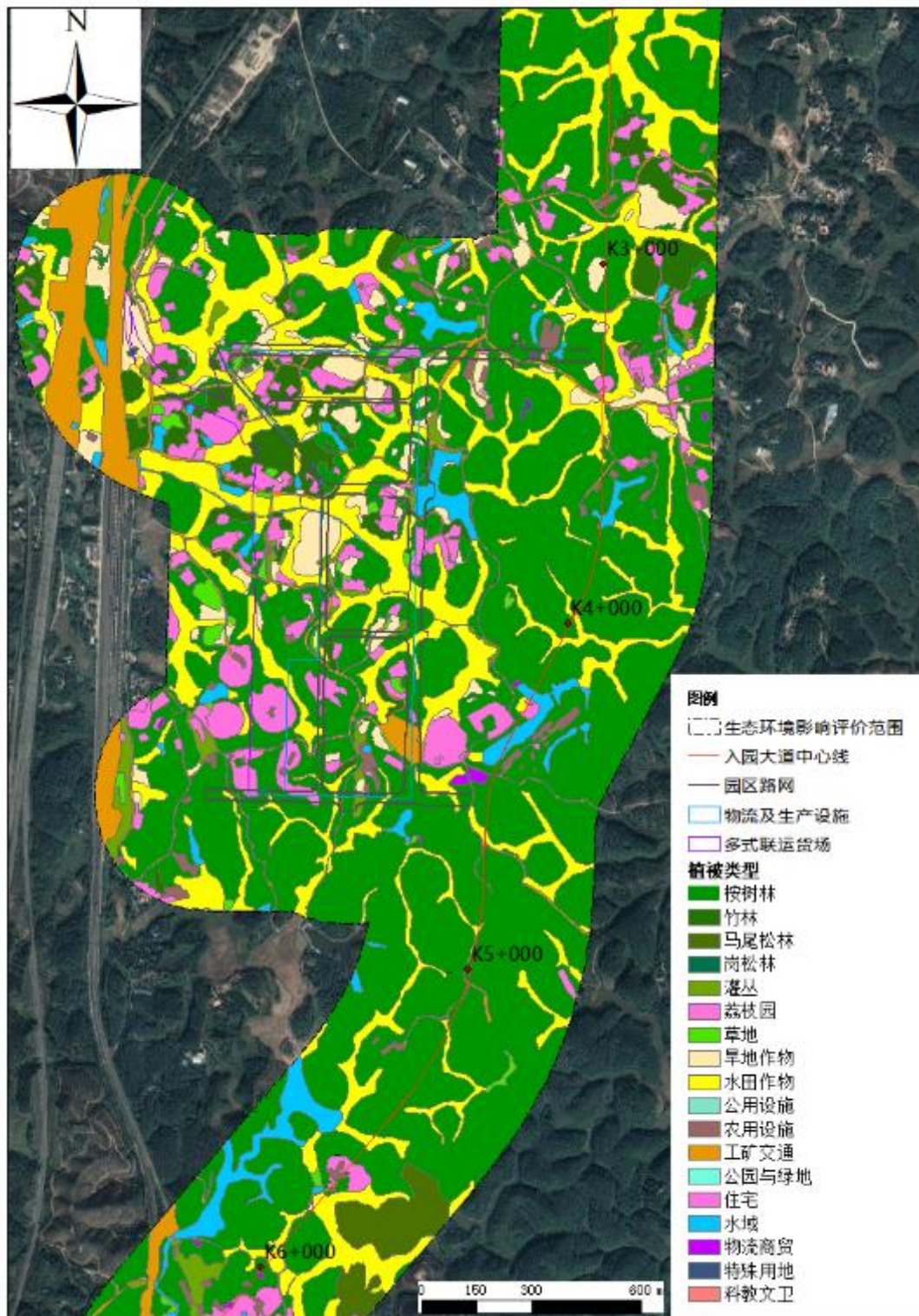


Figure 15 Vegetation Type Map along the Project (Intermodal Freight Yard and Logistics Park Area)

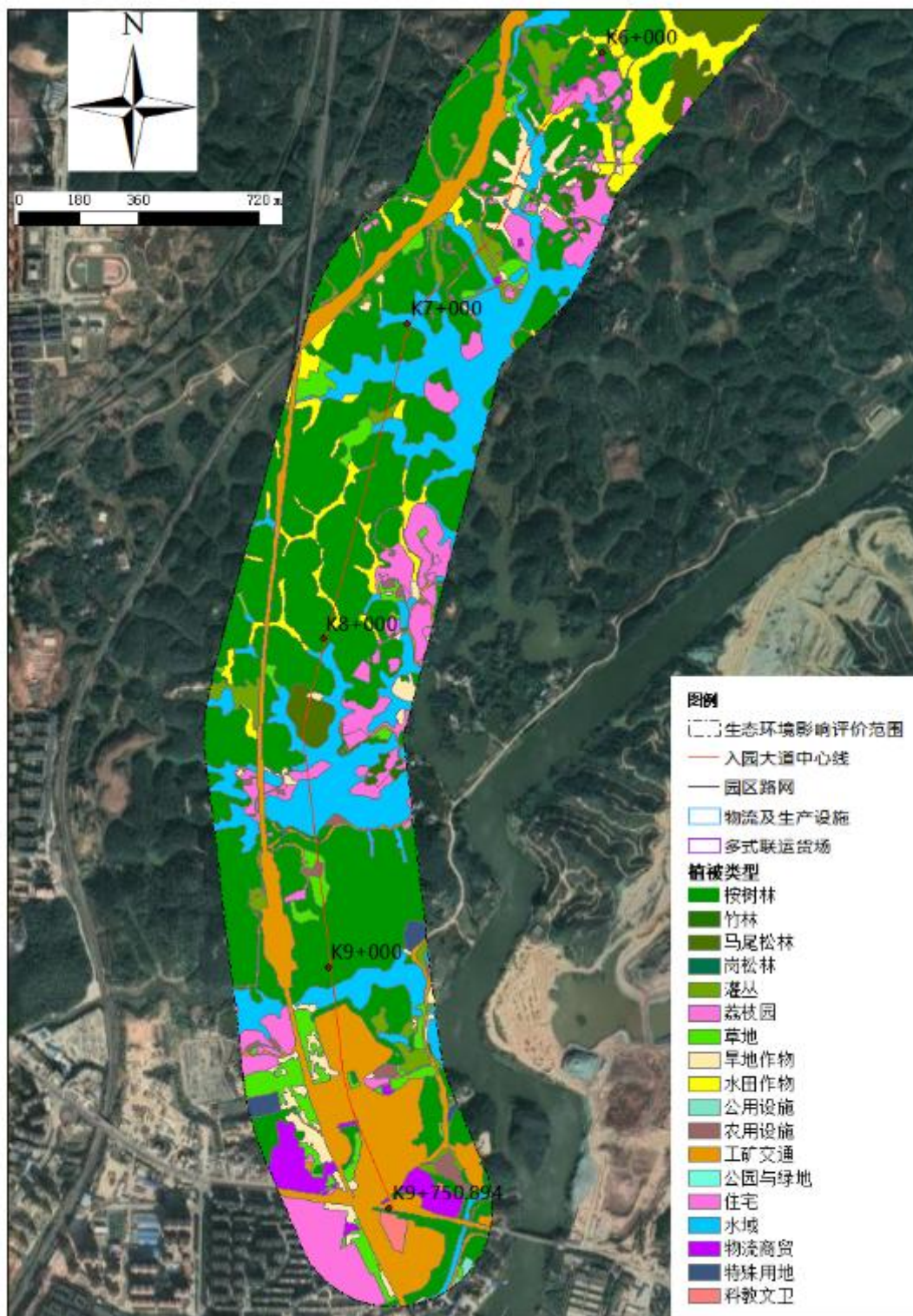


Figure 16 Vegetation Types Map along the Project (Area South of the Logistics Park)

3. Vegetation Biomass

44. The vegetation biomass within the project investigation area is 29,198.66 t.

The biomass of the main vegetation types within the investigation area is shown in the following table.

Table 7 Survey Results of Biomass of Main Vegetation Types within the Survey

Type	Vegetation type	Area		Average biomass (t/hm ²)	biomass	
		quantity (hm ²)	proportion (%)		quantity (t)	proportion (%)
natural vegetation	Masson pine forest	2.8	0.44%	75.85	212.38	0.73%
	shrubbery	14.25	2.23%	10.15	144.64	0.50%
	grassland	12.67	1.99%	4.68	59.30	0.20%
Artificial vegetation	Masson pine forest	7.54	1.18%	75.85	571.91	1.96%
	Eucalyptus forest	396.65	62.15%	63.35	25127.78	86.06%
	Gang Songlin	1.04	0.16%	10.15	10.56	0.04%
	bamboo forest	23.24	3.64%	28.63	665.36	2.28%
	garden	28.3	4.43%	29.87	845.32	2.90%
	paddy field	118.3	18.54%	10.69	1264.63	4.33%
	dry land	33.46	5.24%	8.87	296.79	1.02%
Total		638.25	100%	/	29198.66	100%

4. Vegetation characteristics

45. Horizontal Distribution Pattern of Vegetation. The area through which the project route passes is an economic forest area, timber forest area, and village residential area with frequent human activities. Long-term development activities and vegetation destruction have led to obvious artificial attributes and homogeneity of vegetation within the survey scope.

46. The vegetation within the survey scope is mainly artificially cultivated vegetation such as eucalyptus forests and Pinus massoniana forests. Natural vegetation is mostly secondary shrub-grasslands, widely distributed in areas such as roadsides and forest edges. Small patches of broad-leaved forests are sporadically distributed in local areas with inconvenient transportation, such as mountain tops and gullies.

47. The vegetation in the area where the project is located consists of natural vegetation and artificial vegetation. Natural vegetation is mostly secondary grasslands, such as *Miscanthus floridulus* grasslands and *Miscanthus sinensis* grasslands. Artificial vegetation includes timber forests, economic forests, paddy field crops, and dryland crops, with main species being eucalyptus, *Pinus massoniana*, *Mussaenda pubescens*, *Zea mays*, *Rhus chinensis*, *Miscanthus sinensis*, *Miscanthus floridulus*, etc.

48. Vertical Distribution Pattern of Vegetation. The project is generally in a narrow and linear direction. The project scope belongs to the same bioclimatic zone, and the areas through which the route passes are mainly low mountain and hilly areas with little difference in altitude, so the vertical differentiation of vegetation is not obvious. At the same time, long-term human agricultural and forestry production within the survey scope has led to the characteristics of strong human influence on vegetation in the vertical direction. Flatlands are used for agricultural production and residential areas, with vegetation mainly being paddy field crops, economic forests, and dryland crops; vegetation in low mountains and hills is mainly *Pinus massoniana* timber forests and eucalyptus timber forests.

49. The natural vegetation types within the survey scope are mainly secondary forests, which are greatly disturbed by human activities. The main forest vegetation in the survey area includes eucalyptus forests and *Pinus massoniana* forests; zonal vegetation only includes mountain evergreen shrub forests composed of *Rhodomyrtus tomentosa*, *Baeckea frutescens*, *Rhus chinensis*, *Ficus hispida*, etc., but the secondary phenomenon is obvious; shrub vegetation includes warm *Miscanthus floridulus*, *Dicranopteris linearis*, *Mussaenda pubescens* and other shrubs, mostly degraded shrubs, concentrated in the hilly areas within the survey scope. Grasslands include *Dicranopteris linearis*, *Miscanthus floridulus* and other grasslands, mostly grass slopes formed by overgrazing or abandonment, with a very small distribution area within the survey scope. In general, there is no continuous zonal primary vegetation in the survey area, and most of them are distributed in patches among farmlands, residential areas, and artificial forests. The natural vegetation reflects the secondary nature of different successional stages.

50. Artificial forests have a large distribution area, with mature forests and young forests alternately distributed. Artificial vegetation includes eucalyptus forests, *Pinus massoniana* forests, *Zea mays*, *Oryza sativa*, etc., with a wide distribution area and contiguous existence, which are the main vegetation types in the survey area.

51. The plant species diversity of natural vegetation in the survey area is relatively low, and the integrity and continuity of natural vegetation landscapes are average. There are many artificial vegetation such as eucalyptus forests, *Pinus massoniana* forests, and *Zea mays*, with strong human interference activities. The natural succession of shrub communities is slow. In addition, human interference such as grazing, firewood cutting, and collection of Chinese herbal medicines still exists. All these have adverse effects on the protection of

plant species diversity and ecosystem diversity.

5. Key Protected Plants and Ancient and Famous Trees

52. No wild plants under key protection at the national level of China or the regional level of Guangxi Zhuang Autonomous Region have been found within the project impact scope. No plants listed in the appendices of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) have been found, nor have plants listed in the IUCN Red List (2010). No ancient or famous trees have been found either. However, according to interview surveys, *Cibotium barometz*, a national second-class key protected wild plant, was once widely distributed in the project area. In recent years, due to the large-scale planting of eucalyptus in this area, the number of *Cibotium barometz* has decreased sharply. Residents in several villages along the project have stated that *Cibotium barometz* has not been seen within the project evaluation scope in recent years.

6. Investigation on Alien Invasive Species

53. Through on-site investigations and based on List of Invasive Alien Species in China (First Batch) (2003), List of Invasive Alien Species in China (Second Batch) (2010), List of Invasive Alien Species in China (Third Batch) (2014), and List of Invasive Alien Species in China (Fourth Batch) (2016), it is found that alien species are distributed in the area along the project, mostly unintentionally introduced. The main invasive species are as follows:

54. Terrestrial Alien Invasive Species. According to List of Invasive Plants in China (edited by Ma Jinshuang, 2013) and combined with on-site survey results, there are 5 main plant species from the alien invasive species list found within the project survey scope, namely *Mimosa sepium*, *Solanum torvum*, *Bidens pilosa*, *Ageratina adenophora*, and *Conyza canadensis*. Among them, *Ageratina adenophora*, *Bidens pilosa*, and *Conyza canadensis* have formed dominant communities along some roadsides, while other invasive species mostly appear in the impact scope in scattered forms.

55. Aquatic Alien Invasive Species. The main aquatic invasive species within the survey scope is *Eichhornia crassipes*, which is distributed in the ponds along the route.

7. Distribution of Ecological Public Welfare Forests and Natural Forests

56. In China, ecological public welfare forests refer to key protection forests and special-purpose forests that are of extremely important ecological locations or extremely fragile ecological conditions, play an important role in national ecological security, biodiversity conservation, and sustainable economic and social development, and mainly aim to provide forest ecological and social service products. They include water conservation forests, soil and water conservation forests, windbreak and sand-fixation forests, bank protection forests, forests in nature reserves, and national defense forests, etc. Natural

forests refer to forests of natural origin, including those formed naturally and those formed by artificially promoted natural regeneration or sprouting. Natural forests are the main body and essence of forest resources, the most stable communities, the most complete ecological functions, and the most biologically diverse terrestrial ecosystems in nature, and the most important ecological barriers for maintaining national land security.

57. According to the Forest Law of the People's Republic of China, "It is strictly prohibited to cut down trees in scenic spots, historical sites, revolutionary memorial sites, and forests in nature reserves within public welfare forests". "The state implements a comprehensive protection system for natural forests, strictly restricts the logging of natural forests, strengthens the construction of natural forest management and protection capabilities, protects and restores natural forest resources, and gradually improves the ecological functions of natural forests. Specific measures shall be formulated by the State Council".

58. According to the forestry survey along the project and consultation with the Forestry Bureau of Qinbei District, the project does not occupy public welfare forests or natural forests. There is 1 patchy natural forest near the project area, with the main vegetation type being *Pinus massoniana*; and 2 patchy public welfare forests, both of which are eucalyptus forests. The project has avoided these areas.

Table 8 Distribution of Public Welfare Forests and Natural Forests near the Project

Type	Relationship with the project location		Vegetation types
natural forest	Entrance Trunk Road	On the left side of K5+620 - K5+840, the closest distance is 7m	Masson pine forest
public welfare forest		On the right side of K6+200 - K6+360, the closest distance is 244m	Eucalyptus forest
		On the right side of K6+920 - K7+040, the closest distance is 187m.	Eucalyptus forest

D. Animals

a. Animal Resources in Qinzhou City

59. There are 271 species of terrestrial wild vertebrates belonging to 76 families naturally distributed in Qinzhou City. Among them, there are 7 species of amphibians, mainly including frogs, mountain frogs, marsh frogs, toads, etc.; 21 species of reptiles, mainly including cobras, banded krait, silver-ringed snake, hundred-step snake, *Elaphe radiata*, Gekko gecko, turtles, etc.; 186 species of birds, mainly including thrushes, partridges, tits, egrets, etc.; 62 species of mammals, mainly including wild boars, porcupines, masked palm civets, etc.

b. Wild animals in the project area

1. Wildlife Habitat

60. Habitats of terrestrial wild vertebrates. With reference to China's Wildlife Habitat Classification System (2019, Tian Jialong), the habitat types of terrestrial wild animals within the impact scope are mainly divided into 5 categories: forest, shrub-grassland, farmland, wetland and village residential area, as follows:

61. Forest habitat. The forest habitat is mainly composed of artificial forests and a small amount of secondary forests. This habitat is strongly disturbed by human activities, with few understory plants and a large proportion of forest birds. There are few natural forests distributed within the project survey scope, only 1 natural forest patch (with *Pinus massoniana* as the dominant species) with an area of 2.8 hm². The community structure is simple, the species are relatively single, the habitat quality is average, and there are wild animals such as birds and small mammals, with common species of wild animals mainly being birds. Artificial forests in the project area are widely distributed, including timber forests and economic forests. Timber forests are mainly distributed in low mountains and hills, with vegetation mainly including *Eucalyptus urophylla* forests and *Pinus massoniana* forests, etc. The species are simple, the heterogeneity is low, there are many human activities, and the habitat quality is not high. There are no important habitats or concentrated distribution areas, and there are few terrestrial wild vertebrates, with a small number of birds distributed in this area. Common wild animals include *Centropus sinensis*, *Parus major*, *Urocissa erythroryncha*, etc.

62. Shrub-grassland habitat. The shrubs in the survey area are mainly distributed in the area where carbonate rock mountains are distributed, and the vegetation type is mainly warm-temperate shrubs. The habitat heterogeneity is low, there is occasional human activity interference, and the habitat quality is not high. Wild animals include birds and small mammals, mostly general activity areas, and the number of wild animals is not large. The wild protected animals distributed here are mainly birds with a wide range of activities, such as *Cuculus micropterus*, *Centropus bengalensis*, *Leiothrix lutea*, etc. Human interference is obvious, with common activities such as logging, burning, and grazing.

63. Farmland habitat. It mainly includes dry land and paddy fields. Farmland such as paddy fields or corn fields are mostly distributed in low-lying and open areas on both sides of the highway. The landscape of paddy fields is seasonal, generally being paddy landscape in spring and summer, and bare land landscape after rice harvest in autumn and winter. Common animals in farmland include *Fejervarya multistriata*, *Acridotheres cristatellus*, *Passer montanus*, *Rattus norvegicus*, etc.

64. Wetland habitat. The wetlands within the project survey scope are mainly

a small number of ponds distributed along the Entrance Avenue, mainly for artificial breeding. The main organisms include phytoplankton and fish, etc. Amphibians are also distributed in tributaries, such as *Hylarana guentheri*, etc. Forest-dwelling and water-side reptiles are also distributed on both sides of the river. Some birds, such as *Ardeola bacchus*, *Amaurornis phoenicurus*, etc., are also found in streams, waters and nearby areas.

65. Village residential area habitat. There are few wild animals in residential areas, mainly rodents and reptiles, with occasional distribution of some birds.

2. Types of wild animals

66. Based on on-site surveys, interviews with local residents, local ecological environment bureaus and forestry bureaus to understand the local animal situation, combined with previous wildlife survey results in surrounding areas and relevant literature, the number of animal species and populations in the area where the project is located is small. No large wild animals were found within the project survey scope. The animal resources within the survey scope are mainly various migratory birds and a small number of amphibians, reptiles, and small mammals.

67. There may be 69 species of terrestrial wild animals in the project survey scope, among which 37 are protected wild animals. There are 18 national second-class protected wild animals, including *Spilornis cheela*, *Falco tinnunculus*, *Garrulax canorus*, *Centropus sinensis* and *Centropus bengalensis*; 19 species are listed in the List of Key Protected Wild Animals in Guangxi Zhuang Autonomous Region; 1 species (*Naja atra*) is listed in the International Union for Conservation of Nature (IUCN) Red List; 4 species are listed in the appendices of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) (some species are listed repeatedly). In terms of the groups of protected species, aves are the main ones, with 29 species distributed, accounting for about 78.4% of the total number of protected animal species; mammalia 1 species, accounting for 2.7%; reptilia 3 species, accounting for about 8.1%; amphibia 4 species, accounting for about 10.8%.

68. **Amphibians.** There are 5 species of amphibians in the survey scope, with no national protected wild animals. Among them, 4 are autonomous region-level protected animals: *Bufo melanostictus*, *Fejervarya multistriata*, *Hylarana guentheri*, and *Polypedates megacephalus*. They are mainly distributed in paddy fields, ditch villages, grasslands along rivers and woodlands along the route. Except for *Polypedates megacephalus* which is less in number, other frogs are more common.

69. **Reptiles.** There may be 11 species of reptiles distributed in the survey scope, mainly common species of *Serpentes*, *Lacertilia*, *Testudines*, such as *Pelodiscus sinensis*, *Gekko swinhonis*, *Amphiesma stolatum*, *Sphenomorphus indicus*, etc. There are no national protected wild animals, but 3 species of key protected wild animals in Guangxi Zhuang Autonomous Region are distributed, namely *Calotes versicolor*, *Bungarus multicinctus* and *Naja atra*. One species

listed as Vulnerable (VU) in the IUCN Red List, namely *Naja atra*. One wild animal listed in CITES Appendix II, namely *Naja atra*.

70. **Mammals.** There are 6 common mammalian species in the survey scope, with no national protected wild animals. Among them, 1 is a key protected wild animal in Guangxi Zhuang Autonomous Region, namely *Mustela sibirica*, which is also a wild animal listed in CITES Appendix III. The rest are mainly *Rattus norvegicus*, *Mus musculus*, *Rhinolophus macrotis*, etc. Among them, *Rhinolophus macrotis* is relatively large in number, while other mammals are rare.

71. **Birds.** For the current status survey of birds, while collecting scientific research works, papers and data from forestry departments, relevant data on birds from two major projects in the same region - the Second Line Project of Qinzhou to Fangchenggang Railway of the New Western Land-Sea Corridor and the Pinglu Canal (Pingtang River Estuary ~ Qinjiang Bridge Section) Project were studied. On-site surveys were conducted at dawn, dusk and during the day with fixed-point observations and patrol observations, covering the area along the route and nearby areas. The birds along the route are mainly common species, with the most Passeriformes. There may be 47 species of birds in the survey scope, including 18 national second-class key protected animals: *Spilornis cheela*, *Falco tinnunculus*, *Garrulax canorus*, *Centropus sinensis*, *Centropus bengalensis*, *Passer montanus*, *Prinia flaviventris*, *Leiothrix lutea*, *Corvus macrorhynchos*, *Acridotheres cristatellus*, *Pycnonotus sinensis*, *Hirundo daurica*, *Alauda arvensis*, *Cuculus canorus*, *Ixobrychus flavicollis*, *Egretta garzetta*, *Ardeola bacchus*, *Ardea cinerea*; 11 species of key protected wild animals in Guangxi Zhuang Autonomous Region are distributed, including *Emberiza lathami*, *Urocissa erythroryncha*, *Pycnonotus jocosus*, *Amaurornis phoenicurus*, *Bambusicola thoracicus*, *Bubulcus ibis*, *Parus major*, *Pycnonotus sinensis*, *Ardea cinerea*, etc., some of which are repeatedly listed as key protected wild animals in the autonomous region. Two wild animals are listed in CITES Appendix II, namely *Falco tinnunculus* and *Garrulax canorus*.

72. Among the 48 bird species in the survey area, there are 35 resident birds, accounting for 73% of the total number of bird species in the survey area; 13 migratory birds (7 summer migrants and 6 winter migrants), accounting for 27% of the total number of bird species. Among the resident birds, common ones include *Spilornis cheela*, *Lonchura punctulata*, *Streptopelia chinensis*, *Centropus sinensis*, *Zosterops japonicus*, *Pycnonotus jocosus*, *Passer montanus*. Among the migratory birds, common summer migrants include *Hirundo rustica*, *Pycnonotus sinensis*, etc.; common winter migrants include *Egretta garzetta*, *Egretta garzetta*, *Ardeola bacchus*, etc.

73. Table I-9 lists the possible wild animals in the project area found through data review and interview surveys, as well as the wild animals found in this on-site survey.

Table 9 List of Wild Animals within the Impact Scope

Taxonomic unit	quantity	Protection level	Floristic distribution	Residential type	Habitat distribution	Source of data
AMPHIBIA						
1.SALIENTIA						
Bufonidae						
1. Bufo melanosictus	+++	III	E		It inhabits the areas along rivers, fields, ponds, vegetable fields and villages within the survey area.	historical materials
Ranidae						
2.Ranajaponica	+		W		Often inhabit the paddy fields, grasslands or mud nests within the survey area, or in the stone crevices of the ridge, as well as under the nearby shrubs, the bases of banana leaves and the fallen leaves on the ground.	historical materials
3.R.guentheri	++	III	E		It inhabits paddy fields, pond sides, streams within the survey area, and low-lying areas with poor drainage.	historical materials
4.R.limnocharis	+++	III	E		It inhabits the swamps, paddy fields within the survey area and the fields nearby.	historical materials
Rhacophoridae						
5.Polypedates megacephalus	+	III	E		It often inhabits in the paddy fields, grasslands or mud nests within the survey area, or in the stone crevices of the ridge, as well as under the nearby shrubs, the bases of banana leaves and the decayed leaves on the ground.	historical materials
REPTILIA						
1.TESTUDINES						

Taxonomic unit	quantity	Protection level	Floristic distribution	Residential type	Habitat distribution	Source of data
Trionychidae						
1.Trionyx sinensis	+		E		Live in fresh water areas with gentle water flow such as rivers, streams, ponds, and reservoirs.	
LACERTIFORMES						
Agamidae						
2.Calotes versicolor	+++	III	E		It inhabits in the grass or under the trees within the survey area.	Historical materials/On-site investigation
Gekkonidae						
3.Hemidactylus bowringii	++		E		Inhabit the walls and rock faces within the survey area.	historical materials
Scincidae						
4.Sphemonorphus indicus	+		w		It inhabits in the grass or under the trees within the survey area.	historical materials
3.SERPENTIFORMES						
Megapodiidae						
5.Amphiesma stolata	+		E		It inhabits in the grass or under the woods within the survey area.	historical materials
6.Cyclophiops major	++		E		Live near rivers, lakes and ponds on hilly tablelands, plains and fields.	historical materials
7.Dinodon rufozonatum	+		w		Live in the soil of ponds, paddy fields, and streams.	historical materials

Taxonomic unit	quantity	Protection level	Floristic distribution	Residential type	Habitat distribution	Source of data
8. <i>Elaphe taeniura</i>	++		w		Often climbs on shrubs or bamboo thickets beside streams, paddy fields or ponds.	historical materials
9. <i>Sinonatrix percarinata chinensis</i>	++		E		It inhabits ponds, streams and paddy fields within the survey area.	historical materials
Elapidae						
10. <i>Bungarus ulticinctus</i>	+	III	E		It inhabits near water areas such as the edges of fields, roadsides, cemeteries and vegetable gardens within the survey area.	historical materials
11. <i>Naja atra</i>	+	III	E		It inhabits in the grass or under the trees within the survey area.	
MAMMLIA						
1. CHIROPTERA						
Rhinolophidae						
1. <i>Rhinolophus aldwelli</i>	++		P		Mainly inhabits houses and rock caves, and takes insects as the main food.	historical materials
2. RODENTIA						
Sciuridae						
2. <i>Tamiops swinhoei</i>	+		E		Live in fields, woodlands, etc.	historical materials
Muridae						
3. <i>Mus musculus</i>	++		P		It inhabits residences, warehouses, fields, woodlands, etc.	historical materials
4. <i>Rattus flavipeotus</i>	+		E		Mostly live on the ceiling, under the floor or in the wall	historical materials

Taxonomic unit	quantity	Protection level	Floristic distribution	Residential type	Habitat distribution	Source of data
					cavity.	
5.R.novegicus	+++		P		The habitats are very extensive, and they often live in association with humans.	historical materials
3. CARNIVORA						
Mustelidae						
6. Mustela sibirica	++	III	P		It inhabits the edges of mountains and basins, and likes to appear in stone piles in river valleys, thickets, and forest margins. It is active in the early morning and at night, mainly preys on rodents, also hunts frogs, small birds, etc., and sometimes sneaks into villages to steal and eat poultry.	historical materials
AVES						
1.PODICIPEDIFORMES						
Podicipedidae						
1.Tachybaptus ruficollispogge	+		E	R	It inhabits both sides of the riverbank and areas near fish ponds. It mainly feeds on animal foods such as small fish and insects.	historical materials
2.CICONIIFORMES						
Ardeidae						
Ardea cinerea	+	II	w	W	It inhabits both sides of the riverbank and areas near fish ponds. It mainly feeds on animal foods such as small fish and insects.	historical materials
3.Bubulcus ibis	+	II	E	R	It inhabits near bushes, ponds or paddy fields. Usually, it	historical materials

Taxonomic unit	quantity	Protection level	Floristic distribution	Residential type	Habitat distribution	Source of data
					lives in pairs, and sometimes in small groups. It builds nests in trees, ponds, swamps, etc.	
4.Ardeola bacchus	++	III	E	W	It inhabits banana plantations, thickets or areas near waterlogging pits, and feeds on insects.	Historical materials/On-site investigation
5. Egrett agarzetta	++	II	E	W	It inhabits both sides of the riverbank and waterlogging pits, and feeds on insects.	Historical materials/On-site investigation
6.Egretta garzetta	+		E	W	It inhabits both sides of the riverbank and water puddles, and feeds on insects.	Historical materials/On-site investigation
7.Ixobrychus flavicollis	+	II	w	W	It inhabits both sides of the riverbank and areas near fish ponds. It mainly feeds on animal foods such as small fish and insects.	historical materials
3.FALCONIFORMES						
Falconidae						
8.Falco tinnunculus	++	II	w	R	It inhabits woods and thickets and feeds on insects.	historical materials
4.GALLIFORMES						
Phasianidae						
9.Bambusicola thoracica thoracica	+++	III	E	R	It inhabits near woods, thickets, and grasslands, and feeds on plant buds, leaves, and seeds.	historical materials
5.GRUIFORMES						

Taxonomic unit	quantity	Protection level	Floristic distribution	Residential type	Habitat distribution	Source of data
Rallidae						
10. Amaurornis phoenicurus	++	III	E	R	It inhabits near cornfields, thickets, ponds or paddy fields.	historical materials
6.COLUMBIFORMES						
Columbidae						
11.Streptopelia chinensis chinensis	++		E	R	It inhabits cornfields, thickets and artificial forests.	Historical materials/On-site investigation
12.Streptopelia orientalis	++		w	R	It inhabits cornfields, thickets and artificial forests.	historical materials
7.CUCULIFORMES						
Cuculidae						
13.Clamator canorus bakeri	++	II	w		It inhabits forests and thickets, feeding on plant buds and seeds.	historical materials
14.Eudynamys scolopaceus chinensis	++		E		It inhabits forests and thickets, feeding on plant buds and seeds.	Historical materials/On-site investigation
15.Centropus sinensis	+	II	E	R	It inhabits the shrubbery at the forest edge, grassy slopes with scattered trees, riverside shrubbery, grasslands, and reed thickets.	Historical materials/On-site investigation
16.Centropus toulou	+	II	E	R	It inhabits the shrubs, grasslands, orchards and secondary forests in the low mountains, hills and open plains.	historical materials
8.APODIFORMES						

Taxonomic unit	quantity	Protection level	Floristic distribution	Residential type	Habitat distribution	Source of data
Apodidae						
17.Apus pacificus kanoi	++		P	S	It inhabits woods and thickets, feeding on plant buds and seeds.	historical materials
18.Apus nipalensis subfurcatus	+++		w	S	It inhabits forests and thickets, and feeds on plant buds and seeds.	historical materials
9.PASSERIFORMES						
Alaudidae						
19.Alauda gulgula	+	II	E	R	It inhabits cornfields, thickets and artificial forests.	historical materials
20.Zosterops palpebrosus	+		E	R	It inhabits near villages and often flies over fields, forests, and water areas.	Historical materials/On-site investigation
Hirundinidae						
21.Hirundo daurica	+	II	w	S	In summer, it inhabits near villages and often flies over fields, forests and water areas.	historical materials
22.H.rustica utturalis	++		P	S	In summer, it inhabits near villages and often flies over fields, forests and water areas.	Historical materials/On-site investigation
Motacillidae						
23.Motacilla alba	++		w	S	It inhabits areas near cultivated land close to water, grasslands, barren slopes, roadsides, etc.	historical materials
24.Pycnonotus jocosus	+	III	w	R	It inhabits banana plantations, riverside forests, thickets, and grasslands, and feeds on plant seeds.	Historical materials/On-site investigation

Taxonomic unit	quantity	Protection level	Floristic distribution	Residential type	Habitat distribution	Source of data
25.Pycnonotus sinensis	+	II	w	R	It inhabits banana plantations, riverside forests, thickets, and grasslands, and feeds on plant seeds.	Historical materials/On-site investigation
Pycnonotidae						
26.Pycnonotus aurigaster	+		w	R	It inhabits in thickets, masson pine forests and slash pine forests.	historical materials
Laniidae						
27.Lanius schach	++		w	R	It inhabits cornfields, thickets and artificial forests.	historical materials
Dicuridae						
28.Dicrurus macrocercus	+		w	R	It inhabits cornfields, thickets and orchards.	historical materials
29.Dicrurus hottentottus brevirostris	++		E	R		historical materials
Sturnidae						
30.Sturnus sericeus	++		w	R	It inhabits in bushes and woods, and feeds on plant seeds.	historical materials
31.Acridothores c.cristatellus	++	II	E	R	It inhabits the edges of mountain forests in plain villages and bamboo groves, and often moves in groups.	historical materials
Corvidae						
32.Corvus macrohynchus	+	II	w	R	Often active in villages, fields, and the edges of forests by mountains.	historical materials
33.Urocissa erythrorhyncha	+	III	E	R	It inhabits cornfields, thickets and artificial forests.	historical materials

Taxonomic unit	quantity	Protection level	Floristic distribution	Residential type	Habitat distribution	Source of data
Muscicapidae						
Turdidae						
34. Copsychus saularis	++		E	R	It inhabits near water puddles and feeds on aquatic animals and water plants.	historical materials
35. Phoenicurus aureus aureus	+		w	R	It inhabits cornfields, thickets and artificial forests.	historical materials
36. Turdus merula mandarius	+++		P	R	It inhabits cornfields, thickets and artificial forests.	historical materials
Timaliidae						
37. Leiothrix lutea	+	II	E	R	It often moves around in woods, thickets and grasslands, and feeds on plant seeds.	historical materials
38. Carrulax canorus	+++	II	E	R	It inhabits the shrubs on hills, near villages or in the shrubs and bamboo groves on the outskirts of cities. It often forages in the grass under the forest, feeds on insects and plant seeds, and breeds from April to July.	historical materials
Sylviidae						
39. Orthotomus sutorius	+		E	R	It inhabits cornfields, thickets and orchards.	historical materials
40. Prinia flaviventris	+	II	E	R	It inhabits the upper and middle layers of the forest. It often forms groups with other small insectivorous birds	historical materials

Taxonomic unit	quantity	Protection level	Floristic distribution	Residential type	Habitat distribution	Source of data
					and feeds on insects.	
Paridae						
41. Parus major commixtus	+	III	P	R	It inhabits woods and thickets, often forms groups with other small insectivorous birds, and feeds on insects.	historical materials
Nectariniidae						
42. Aethopyga christinae latouchii			E	R	It often moves around in woods, thickets and grasslands, and feeds on plant seeds.	historical materials
Ploceidae						
43. Passer montanus saturtus	+++	II	P	R	They inhabit buildings and trees in residential areas, mostly live in groups, and feed on plant seeds.	Historical materials/On-site investigation
44. Lonchura striata swinhoi	++		E	R	It often moves around in woods, thickets and grasslands, and feeds on plant seeds.	historical materials
45. Lonchura punctulata	++		E	R	Often active in woods, thickets and grasslands, it feeds on plant seeds.	Historical materials/On-site investigation
Fringillidae						
46. Melophus lathami lathami	+	III	E	R	It inhabits forests, open woodlands, villages, orchards, and sugarcane fields.	historical materials

Taxonomic unit	quantity	Protection level	Floristic distribution	Residential type	Habitat distribution	Source of data
9.ACCIPITRIFORMES						
Accipitridae						
47. <i>Spilornis cheela</i>	+	II	E	R	They mostly inhabit coniferous and broad-leaved mixed forests, monsoon evergreen broad-leaved forests and masson pine forests. They like to move alone or in pairs and mainly feed on snakes.	Historical data / on-site investigation

Note: "II" refers to wild animals under second-class national key protection; "III" refers to wild animals under the key protection of Guangxi Zhuang Autonomous Region. E: Oriental species, P: Palearctic species, W: Wide-ranging species; R: Resident bird, S: Summer migrant, W: Winter migrant and passage migrant.

3. Bird Migration Routes

74. According to Wild Animals in Guangxi (edited by Wu Mingchuan), there are 3 routes for migratory birds to migrate into Guangxi: First, the stopover and transit places of migratory birds on the bird migration route along China's coast, which goes south and north, i.e., the area along the Beibu Gulf coast. The important nodes are Xieyang Island, Guantouling, Sanniang Bay, Jiangshan Peninsula, etc. Second, the birds migrate into the mountainous areas of Liuzhou, Hechi and Baise in northwestern Guangxi from the northwest along the Yunnan-Guizhou Plateau, with the key areas being the Jiuzhou Mountains, Fenghuang Mountain, Duyang Mountain and Qinglong Mountain. Third, the third bird migration route passing through Guangxi from the northeast along Yuechengling, Tianping Mountain, Dupangling, Haiyang Mountain, etc., which, together with the second route, crosses the arc-shaped mountains of Dayao Mountain and Damingshan in central Guangxi and continues towards the Shiwandashan Mountains and the coastal southward migration route.

75. The overall layout of the project is north-south, with a total length of about 10 km. It is located in Qinbei District, Qinzhou City. The project is about 40 km away from the nearest Sanniang Bay. The project does not involve international bird migration corridors or bird migration corridors within Guangxi.

E. Main Ecological Issues in the Region

76. The main ecological and environmental issues faced along the proposed highway are as follows: The intensity of human activity interference is high, the forest structure is single, and the ecological service functions such as water conservation and soil and water conservation have declined; human interference has led to a decrease in the population of some animal species; alien invasive plants such as *Bidens pilosa* have seriously occupied the living space of native species.

77. There is a trend of further expansion in the area of agricultural land and forestry land in the areas along the route, resulting in a further reduction in the distribution area of natural vegetation. The area of large-scale contiguous planting of single species, such as *Eucalyptus urophylla* forests and *Pinus massoniana* forests, increases year by year, which is unfavorable to the protection of local species diversity.

II. Ecological and Environmental Impact Assessment

78. Most of the impacts of the project construction on the ecological environment occur during the construction period. The ways in which the construction period affects and damages the ecological environment mainly include: the main project occupies and divides the land, changes the nature of land use, reduces the cultivated land along the route, and lowers the vegetation coverage; subgrade leveling destroys the terrain, landform and vegetation, and damages the soil structure and fertility; engineering activities disturb the natural ecological balance, which will have certain adverse effects on the survival of organisms along the route.

A. Analysis on the Impact on Animal and Plant Habitats

79. The land occupation during the project construction leads to the loss of some terrestrial vegetation, resulting in the reduction of the habitat area of terrestrial animals, as well as the fragmentation of habitats. Since there are a large number of similar habitats distributed in the area around the project, wild animals can generally find suitable habitats in the surrounding area after being affected; the affected forest land is mainly artificial forests, which are frequently disturbed by human activities, and the types and quantities of wild animals distributed in them are limited, so the impact is small.

80. Most of the project scope and its adjacent areas are low hilly landforms with little change in altitude. For amphibians and reptiles, due to the partial destruction of their original distribution areas, they will shift horizontally to similar habitats far from the evaluation area. For birds and mammals, their habitats will be partially destroyed, but due to the strong migration ability of birds and mammals and the diversified food sources, the construction and operation of the project will not pose a major threat to their habitats. The project construction occupies a relatively large proportion of artificial forest habitats and farmland habitats, but the impact is small. However, it has basically no impact on habitats where wild animals are relatively concentrated, such as natural forest habitats and shrub habitats. The impact of various habitats within the evaluation scope is shown in the following table.

Table 10 Impact on Various Habitats within the Scope

Habitat type	Species situation	Habitat area impact	Duration	Reversibility	Degree of influence
Forest habitat	There are wild animals such as reptiles, birds, and mammals distributed. Common wild animals include Asian koels, red-whiskered bulbuls, greater coucals, and yellow weasels. Raptors also mainly move in secondary broad-leaved forests.	Since the occupied area is mainly for animal foraging and there is no concentrated habitat distribution; the forest land occupied by the project is all planted forest, and no natural forest is occupied, so the impact on this type of habitat is not significant.	Permanent (permanent land occupation), Temporary (temporary land occupation)	The loss of permanently occupied habitats is irreversible, while temporarily occupied land can be restored.	Have a relatively small impact
Shrub-grassland habitats	Common ones include <i>Prinia flaviventris</i> , <i>Lanius schach</i> , and <i>Calotes versicolor</i> .	The occupied area is limited, and there is no concentrated habitat for protected animals in the occupied area.	Permanent (permanent land occupation), Temporary (temporary land occupation)	Habitat loss due to permanent land occupation is irreversible, while that due to temporary land occupation can be restored.	have a relatively small impact
Wetland habitat	Common ones include the marsh frog, the Asiatic grass frog, etc. Some birds can also be seen in the stream	The wetlands along the project are mainly artificial ponds. This type of habitat is strongly affected by human	permanent	irreversible	Have a relatively small impact

	waters and nearby areas, such as the Chinese pond heron and the grey heron.	interference, has a single species structure, and there is no concentrated habitat for protected animals in the occupied area.			
Farmland habitat	Common wild animals include the Black-backed Woodpecker, Light-vented Bulbul, Red-whiskered Bulbul, Little Egret, etc.	This type of habitat is strongly affected by human interference, has a simple species structure, and the area does not have a concentrated habitat for protected animals.	permanent	irreversible	Have a relatively small impact
Village residential area	Rodents, reptiles, birds	This type of habitat is mainly distributed with birds and rodents. Some common bird activities can be seen. There is no concentrated habitat for protected animals in this area.	permanent	irreversible	Have a relatively small impact

B. Impact on terrestrial plants

a. Direct impact

81. **Impact of Project Land Occupation.** The permanent land occupation by the main project will convert part of the non-construction land in the project area into construction land, resulting in certain changes in the current status of land use. The original semi-natural ecological landscape dominated by artificial forests, farmland, and water areas within a certain range along the route will be transformed into an artificial landscape dominated by road transportation and warehousing.

82. The permanent land occupation of this project is approximately 112.80 hm², and the temporary works are within the scope of permanent land occupation, with no additional temporary land occupation. The area with vegetation within the permanent land occupation is 92.77 hm², accounting for 82.24% of the total land occupation area. The vegetation occupied by the project is mainly eucalyptus forests, paddy field crops, and bamboo forests, with areas of 48.01 hm², 19.64 hm², and [missing data] respectively, accounting for 51.75%, 21.17%, and [missing percentage] of the vegetated area. Followed by dryland crops, bamboo forests, and litchi orchards, with areas of 8.79 hm², 6.79 hm², and 5.09 hm² respectively, accounting for 9.48%, 7.32%, and 5.49% of the vegetated area. The least occupied type is Pinus massoniana forests, only 0.82 hm², accounting for 0.88% of the vegetated area. The occupation of natural vegetation is also relatively small, with shrublands and grasslands occupying 1.94 hm² and 1.69 hm² respectively, accounting for 2.09% and 1.82% of the vegetated area. The vegetation types within the project land use scope are detailed in the table below.

Table 11 List of Vegetation Types Occupied by This Project

Vegetation type	area (hm²)	Proportion of floor area	Proportion of the area of vegetated areas occupied
Masson pine forest	0.82	0.73%	0.88%
Eucalyptus forest	48.01	42.56%	51.75%
bamboo forest	6.79	6.02%	7.32%
shrubbery	1.94	1.72%	2.09%
Lychee orchard	5.09	4.51%	5.49%
grassland	1.69	1.50%	1.82%
paddy field crops	19.64	17.41%	21.17%
Dryland crops	8.79	7.79%	9.48%
Areas without vegetation	20.03	17.76%	/
Total	112.80	100.00%	/

83. Overall, the vegetation occupied by the project is mainly artificially cultivated vegetation, with a total area accounting for 99.27% of the total area of the vegetated area. Only 0.73% of the vegetated area is natural vegetation, which is mainly secondary shrubs and grasslands. No natural forests or public welfare forests are occupied. The cultivated land occupied by the project is mainly dry land and cultivated land, and no basic farmland is occupied. The project construction will have certain negative impacts on the local vegetation, but since almost all the occupied vegetation is artificial vegetation, the impact on regional vegetation types and biodiversity is small.

(3) Impact of project construction on vegetation.

84. Both permanent and temporary land occupation will have an impact on vegetation by clearing surface vegetation. Permanent land occupation changes the land use mode, resulting in the loss of the original ecological functions of vegetation, which is a direct and irreversible impact. The temporary land occupation of this project is within the scope of the project's permanent land occupation, and no new temporary land occupation is added.

85. In terms of the importance of the occupied vegetation, the project mainly occupies arbor forests (mainly timber forests based on on-site survey) and cultivated vegetation (cultivated land and orchards). The arbor forests are mainly artificial eucalyptus forests and *Pinus massoniana* forests, without occupying natural forests or public welfare forests. The cultivated land is mainly dry land, without occupying basic farmland. In addition, the vegetation on permanent land can be compensated to a certain extent through the greening of the project itself.

86. From the perspective of the biodiversity of the vegetation occupied by the project, the areas along the project are mostly agricultural and forestry ecological environments. The biodiversity characteristics of the communities along the route are as follows: the species in the arbor layer are single, mainly dominated by artificially planted eucalyptus, *Pinus massoniana*, bamboo forests, etc., and the diversity index of the arbor layer is low; the species composition of the shrub layer is also not rich; the dominant species in the herb layer are not prominent, and other species are unevenly distributed; the agricultural vegetation mainly includes rice, taro, cassava, corn, etc. Since the areas along the project are dominated by artificial forests, and the vegetation has strong secondary characteristics, the plants are mostly common species. The project land occupation and construction will not reduce the number of plant species, and the impact of project land occupation and construction on the plant species diversity along the route is small.

87. To sum up, the project construction land occupation and construction activities will inevitably damage the vegetation in the project area, but the areas along the route are areas with frequent human development activities. The project does not occupy natural forests, and the occupied vegetation is mainly arbor forests and cultivated vegetation. The natural vegetation involved is mainly shrub-grasslands. Therefore, the project construction has little impact

on the plant species diversity in the project area and will not lead to a reduction in the plant species diversity in the project area. The adverse impact of road construction on the vegetation in the project area can be reduced through the greening of the road, logistics park and other project areas, as well as the later vegetation restoration of temporary land.

88. Estimation of biomass loss. The implementation of the project requires vegetation clearance, which will lead to the loss of biomass of the damaged vegetation. According to the survey results of the biomass of major formations in Guangxi by the College of Forestry, Guangxi University, and combined with the reasonable correction based on the characteristics of the vegetation community structure in the project evaluation area, the estimation results of biomass loss in the permanent occupation area of the project are obtained. See the following table for details.

Table 12 Biomass Loss Caused by Permanent Land Occupation of the Project

Land occupation type	Vegetation type	Representative plants	Average biomass (t/hm ²)	Floor area (hm ²)	Loss of biomass (t)
Permanent land occupation	coniferous forest	Masson pine	0.82	75.85	62.20
	broad-leaved forest	eucalyptus	48.01	63.35	3041.43
	bamboo forest	Bambusa chungii	6.79	28.63	194.40
	shrubbery	Mimosa bimucronata, Ficus hispida, Rhus chinensis, Mussaenda pubescens, etc.	1.94	10.15	19.69
	garden	lychee	5.09	29.87	152.04
	grassland	Miscanthus floridulus, Blechnum orientale, Miscanthus sinensis, etc.	1.69	4.68	7.91
	paddy field	rice	19.64	10.69	209.95
	dry land	Corn, cassava, taro	8.79	8.87	77.97
Total				/	3765.59

89. According to estimates, the implementation of the project will result in a biomass loss of 3765.59 tons. The project area is located in a subtropical monsoon climate zone, with favorable water and heat conditions and a stable natural environment, which is suitable for plant growth. The permanent land occupation can compensate for part of the biomass through slope and greening restoration, which can largely compensate for the damaged biomass.

90. The project occupied land is mainly dominated by artificial forests and cultivated crops. The plant species include eucalyptus forests, bamboo forests, and cultivated food crops such as wheat and corn. These species are all common in Guangxi, with a very wide distribution range. No national or local key protected plant species, ancient or famous trees have been found, so it will not have an impact on key protected species and rare and endangered species. After the completion of construction, with the implementation of ecological restoration and greening measures, the vegetation along the route will be restored, and the impact on vegetation and plant diversity will be further reduced.

b. Indirect influence

91. **Impact on Plant Community Succession.** The project construction will change the original land use pattern. The vegetation on the restored slopes, due to the unique soil, moisture and topographic conditions, will remain in the grassland or shrub-grassland stage for a long time, which reduces the normal succession speed of vegetation and thus has a certain adverse impact on the continuity of regional vegetation. During the site selection and route alignment of the project, efforts have been made to avoid occupying natural forest lands and areas with well-developed vegetation, and no natural forests or public welfare forests are occupied, which minimizes the occupation of vegetation and protects the continuity of vegetation. With the passage of operation time and the gradual reduction of human interference, the vegetation along the road greening will show a positive succession from artificial vegetation to natural vegetation.

92. **Analysis on the Impact of Pollutant Emissions on the Growth and Development of Plants Along the Route.** Automobile exhaust and dust may have certain adverse effects on the growth and development of plants in the road green belt and nearby areas. The leaves of plants in the road green belt and near the road shoulder have obvious dust accumulation, but the plants grow normally, and no obvious adverse effects have been found. Studies have reported that in sections passing through agricultural production areas, pollutants emitted by roads have an impact on the growth and pollination of some crop species on both sides, which will have certain adverse effects on crop yield and quality, but this impact decreases with the increase of distance, and the impact range is generally 50 meters on both sides.

93. **Analysis on the Impact of Alien Species on the Local Ecosystem.** On-site investigations show that there are 5 species of terrestrial invasive alien species distributed within the evaluation scope, namely *Bidens pilosa*, *Mimosa sepriaria*, *Solanum torvum*, *Conyza canadensis* and *Ageratina adenophora*. *Bidens pilosa* and *Ageratina adenophora* have formed dominant communities along some roadsides, while the other invasive species mostly appear in the evaluation scope in scattered forms, with small areas and no obvious biological invasion. There is 1 species of aquatic alien invasive species, *Eichhornia crassipes*, which mainly grows in the artificial ponds within the evaluation scope.

94. The corridor effect during and after the project construction may lead to the expansion of the distribution range of existing alien species along the route. The project construction will form bare land. If local species are not used for greening in a timely manner, it may cause the invasion of alien species in local areas and gradually form a single dominant plant community, which will then have an adverse impact on local species. At the same time, the invasion of alien species will reduce the species diversity of the community, slow down the speed of normal community succession, and have a certain adverse impact on the continuous enhancement and play of the community's ecological functions. Targeted measures should be taken to prevent the explosive spread of alien species caused by the project construction, and to prevent the further aggravation of biological invasion, especially in the sections passing through natural forests, where the prevention efforts should be focused.

95. In general, in view of the invasiveness of existing alien plants, as long as protective measures are taken during the construction and operation periods, the possibility of large-scale biological invasion caused by the project implementation is small.

c. Impact analysis on key protected wild plants, ancient and famous trees

96. During this investigation, no national - level or autonomous - region - level key protected plants, ancient and famous trees were found within the project construction scope.

d. Impact analysis on natural forests and public - welfare forests

97. According to the forestry survey along the project and consultation with the Forestry Bureau of Qinbei District, none of the projects in this project occupy public welfare forests or natural forests. However, there is 1 patchy natural forest within the project evaluation scope, located on the east side of the Entrance Avenue, with the closest distance of about 7 meters from the road boundary of the Entrance Avenue; there are 2 patchy public welfare forests, both located on the right side of the Entrance Avenue, with the closest distance of 187 meters from the road boundary of the Entrance Avenue.

98. The project is far from the public welfare forests, and there is a railway separating it from the public welfare forests, so the project construction will not have an impact on the public welfare forests; while the Entrance Avenue is close to the natural forest, only about 7 meters away. If not paid attention to during the construction period, it may have adverse effects on the natural forest. Therefore, during the construction period of this project, it is necessary to control the construction boundary strictly, prohibit over-boundary construction

and unauthorized felling and destruction of trees, and prohibit the discharge of sewage, soil and slag in the natural forest; in addition, it is necessary to strengthen popular science publicity and education, popularize knowledge on biodiversity protection and relevant laws and regulations, and enhance the environmental protection awareness of construction personnel.

99. In conclusion, after taking the above measures during the construction period of this project, the project construction will have basically no impact on natural forests and public welfare forests.

C. Impact on terrestrial animals

a. Direct impact

100.**Impact of Construction Land Occupation on Animal Habitats.** The occupation of land for project construction leads to the loss of some terrestrial vegetation, resulting in a reduction in the area of terrestrial animal habitats and the fragmentation of their habitats. Since there are a large number of similar habitats distributed in the surrounding areas of the proposed project, wild animals can generally find suitable habitats in the vicinity after being affected; the affected forest land is mainly the valley forest edges, which are frequently disturbed by human activities, and the types and quantities of wild animals distributed there are limited, so the impact is relatively small.

101. Most of the project area and its surrounding regions are of hilly gentle slope terrain, with little variation in altitude. For amphibians and reptiles, due to the partial destruction of their original distribution areas, they will shift horizontally to similar habitats far from the evaluation area. For birds and mammals, their habitats will be partially damaged, but because birds and mammals have strong migration abilities and diverse food sources, the construction and operation of the proposed highway will not pose a significant threat to their habitats. The route construction has a relatively greater impact on shrublands, shrub-grasslands, and farmland habitats in the project area. However, these two types of habitats are of average quality with relatively simple species compositions, mainly serving as foraging grounds for common birds and reptiles, while having a smaller impact on habitats where wild animals are concentrated, such as forest habitats.

102.**Impact on Amphibians.** The main protected amphibian species distributed within the survey scope include 5 species: *Bufo melanostictus*, *Hylarana guentheri*, *Fejervarya multistriata*, *Polypedates megacephalus*, and *Rana zhenhaiensis*. Among the key protected animals that may appear along the route, *Fejervarya multistriata* has a relatively large population, *Bufo melanostictus* and *Hylarana guentheri* have a certain number, and the quantities of the other species are small.

103. Amphibians mainly inhabit the ditches, farmlands, and ponds along the

route. During the project construction period, subgrade occupation and construction activities may have certain adverse effects on the habitats of frogs, mainly manifested as habitat occupation, water pollution, and disturbance to their activities, causing them to migrate to other places. This may temporarily reduce the population of some frog species sensitive to human activities within the project survey scope. Since the impact range of highway construction is small and linearly distributed, and the land occupied by the intermodal freight yard and logistics park is mainly the distribution area of village residents, the impact range of the project construction on wild animals is small and the impact duration is short. At the same time, there are the same or similar suitable habitats distributed in the surrounding areas along the project, so the affected species can easily find habitats. Moreover, these frogs have strong reproductive capabilities and can make up for the loss of a small number of individuals through a large number of offspring, basically maintaining the stability of wild populations in the region. Therefore, the impact on amphibians during the construction period is small.

104. After the project enters the operation period, the amphibian habitats affected by construction along the project will gradually recover, and most of the affected species can return to their original areas to continue living and reproducing.

105. Since the project has set up culverts in areas such as ponds where animals are concentrated and densely distributed, these can serve as passages for amphibians on both sides, which can slow down the barrier effect to a certain extent.

106. **Impact on Reptiles.** There are 11 species of reptiles possibly distributed in the project area, including 3 key protected animals at the autonomous region level, namely *Calotes versicolor*, *Bungarus multicinctus* and *Naja atra*. On-site surveys show that the existing number of reptiles in the assessment area is not large. Relatively common ones are *Calotes versicolor* and *Sphenomorphus indicus*, etc. Protected animals are occasionally seen in some localities, with a small distribution quantity.

107. *Calotes versicolor* may appear in shrubs and forests along the entire line; protected snakes such as *Bungarus multicinctus* are mainly distributed in shrubs, woodlands along the route or near water in plains and hills. The Entrance Avenue of this project is equipped with 18 culverts, and the railway special line has 2 culverts, with an average of 2 culverts per kilometer. These culverts play a certain role in maintaining the continuity of ecological connections on both sides of the road and alleviating the blocking effect, effectively reducing the habitat isolation of *Calotes versicolor* and *Bungarus multicinctus*, thus having little impact on them. Moreover, such habitats are widely distributed in the region, and the actual habitat range occupied by the road is limited. Affected species can find suitable alternative habitats in the region through active movement and continue to survive, so the impact of habitat occupation is small.

108. The impact of hunting by construction personnel is significant, but it can be mitigated or avoided by taking effective measures such as strengthening publicity and education as well as supervision and management, so the actual impact is small. Construction activities will generate noise, and the frequent flow of vehicles and people will change the original quiet environment, scaring reptiles and causing them to leave their original activity areas. This will temporarily reduce the number and occurrence frequency of sensitive species in the survey range, and the impact will gradually disappear after the construction is completed.

109. **Impact on Mammals.** There is 1 species of key protected mammal at the autonomous region level possibly distributed along the project area, namely *Mustela sibirica*. *Mustela sibirica* can be seen in forests, shrubs and villages along the route. The project's site selection and route alignment are mainly in areas with frequent human activities, far from the concentrated distribution areas of protected mammal species. Generally speaking, the project construction has no direct impact on protected mammal species. However, the construction of this project will bring a large number of people and logistics, significantly increasing the intensity and density of human activities. Construction in some sections may cause certain disturbances to nearby protected mammal species. The main impact during the construction period is that the noise from construction vehicles may scare and disturb them. However, as the project progresses, they will leave the construction sections and find habitats nearby. Protected animals originally living along the proposed road and close to the road will migrate to other places, away from the construction area, and these animals will be relatively concentrated and redistributed in areas far from the road construction area.

110. **Impact on Birds.** There are 47 species of birds that may appear along the project area, including 5 national second-class key protected birds, namely *Spilornis cheela*, *Falco tinnunculus*, *Garrulax canorus*, *Centropus sinensis* and *Centropus bengalensis*, as well as 11 autonomous region-level key protected birds. Among them, *Ardeola bacchus*, *Pycnonotus sinensis*, *Egretta garzetta* and *Acridotheres cristatellus* are the most common, and most of the other protected birds are forest-dwelling birds. According to on-site surveys, the area along the project is not a main distribution area or activity area for protected animals, and no natural concentrated habitats of the above-mentioned protected birds have been found in the evaluation area. Forest-dwelling birds in the evaluation scope mainly move around for foraging, and some inhabit the evaluation scope. The ecosystem along the proposed highway is not unique to the region, and such habitats are widely distributed in the region. The actual habitat range occupied by the highway is limited, and the affected species can find suitable alternative habitats in the region through active migration to continue living, so the impact of habitat occupation is small. Overall, the impact on birds during the construction period is mainly reflected in the increase in human activities along the route, vibrations caused by subgrade excavation, and scaring and interference from construction machinery noise. However, these birds can avoid the impact of construction on their habitats and foraging through migration and flying, so the construction will not bring obvious adverse

effects on birds.

111. In general, the proposed highway will have a certain impact on wild animals along the route. After the construction of culverts and the implementation of protection measures proposed in the evaluation, the project will have little impact on the composition and normal reproduction of regional species, and the impact of the project construction on key protected wild animals along the route is within a controllable range.

b. Indirect influence

112. During the construction and operation of the proposed project, exhaust gas, noise, etc. from passing cars and trains will cause certain interference to animals, forming an interference channel and exerting disturbing effects on habitats. With the completion of the proposed project, the interference during the construction period will disappear. Animals with high vigilance in the region have already avoided activities in this area, while rodents, birds and other animals that live with humans have adapted to car noise and light. Therefore, the noise and light during the operation of the proposed highway have limited impact on animals in the evaluation area.

113. **Impact on amphibians and reptiles.** The indirect impact of the proposed project on amphibians and reptiles during the operation period is mainly the pollution of habitats by highway drainage. Pollutants (mainly SS and petroleum substances) from automobile exhaust and pavement materials may enter ditches and ponds along with road runoff formed by natural rainfall, thereby affecting the habitats of amphibians and reptiles. The project occupies ponds along the route, thus disturbing local water bodies and causing water turbidity, which will have a certain adverse impact on aquatic organisms, especially fish. According to the survey, the fish ponds along the route are all artificially cultivated common fish, and there are no concentrated spawning grounds, so the project will not affect the spawning of fish.

114. **Impact on birds.** The direct impact of the project on birds during the operation period is mainly the impact of car noise and light. According to the research by American scholar U. arctos in the Rocky Mountains of the United States, the density and diversity of birds in habitats adjacent to highways have decreased. Dutch scholars observed 43 species of birds for nearly 10 years and found that when the equivalent continuous A-weighted sound level of traffic noise exceeds 50 dB, the breeding density of birds in the habitat decreases. According to the noise prediction results, by the middle of the operation period, the noise at 186-282 m from the boundary of the main highway can reach 50 dB. According to the on-site survey, there are no concentrated breeding grounds for protected birds within 300 m on both sides of the highway, and there are scattered bird nests within this range. After the operation of the highway, due to the strong flying ability and large activity range of birds, they can avoid the impact by migrating and reselect suitable nesting sites. Overall, the impact of the highway on bird breeding is not significant. In addition,

domestic and foreign studies have shown that birds' perception range of sound is basically similar to that of humans, they have strong tolerance to noise and will adapt to it quickly. According to the on-site survey, there are *Ardeola bacchus* distributed near the starting point of the project (near S313 Provincial Highway) and Huangma Station, and they are not scared away when cars and trains pass by, indicating that birds such as *Ardeola bacchus* have strong adaptability to noise. After the greening of the proposed highway is completed, new habitats will be formed, and birds will return to these areas for foraging. Therefore, the operation of the proposed project has little impact on birds.

115.Impact on mammals. According to the research by American scholar U. arctos in the Rocky Mountains of the United States, mammals rarely use habitats within 100 m of highways. Due to the long-term impact of human activities in the area where the proposed highway is located, the mammal population in this area is small, and there are no concentrated habitats of protected animals within 100 m of the highway. Therefore, the proposed highway has little interference with mammals. The indirect impact of the proposed highway on key protected mammals during operation is mainly reflected in the fact that noise pollution and light will make these mammals avoid and stay away from the area when choosing habitats and establishing nesting areas. There are many similar habitats around the proposed highway, so the operation of the proposed highway has little impact on protected animals.

c. Cumulative impact

116.The cumulative impacts of this project are mainly reflected in the fragmentation of animal habitats by the highway and railway network, as well as the time cumulative effect of highways and railways on animal habitats. Although the wild animal habitats within the evaluation scope have been isolated by a large number of farmlands, villages, and highways, resulting in habitat fragmentation, the project construction will further aggravate the fragmentation of animal habitats.

117.The dominant groups of animal communities within the project survey scope are mainly small forest birds such as frogs and bulbuls. Frogs mainly inhabit near farmlands and ponds but are far from the highway. Birds have a wide distribution range and strong mobility, with strong adaptability to human activity interference, and can quickly avoid when disturbed. The main impact of the project construction on them is traffic barrier. In terms of plants, the vegetation occupied by the project is mainly artificial forests and cultivated plants. The project does not occupy natural forests or public welfare forests, so the impact of the project construction on plant species diversity is limited and within an acceptable range. In general, the project construction will not have a significant impact on the main components and richness changes of plant communities, so the overall impact of the project construction on important species of biological communities is within an acceptable range.

118.The existence of new highways and railways will form new divisions of

existing biological communities, and existing landscape patches will be cut by highways. However, after the project construction, the dominance value of landscape types will not change much, and the structure of the original ecological landscape system will remain as it is, without obvious changes in the stability of the current ecological system. The change in landscape diversity in the evaluation area is not very significant, and there will be no simplification of landscape types due to the construction of highways and railways, and the impact on landscape stability is also not obvious.

D. Analysis of the impact on agricultural and forestry ecosystems

119. After the temporary land occupied by the highway project is reclaimed or the vegetation is restored, it can basically reach the original production function, and the impact is generally not significant. After the agricultural land in the permanent land occupied by the highway is converted into construction land, it will lead to the loss of the original agricultural and forestry production functions of the land. Therefore, the impact of the highway project on agricultural and forestry land resources is mainly reflected in the permanently occupied areas.

120. In general, after the implementation of the proposed highway, the project will not cause major adverse impacts on the pattern of agricultural land. The changes in agricultural and forest land in the evaluation area caused by the permanent occupation of agricultural and forest land by the proposed highway are shown in the following table.

Table 13 Overview of Changes in Agricultural and Forest Lands in the Evaluation Area Caused by the Permanent Occupation of Agricultural and Forest Lands for the Project

impact area	cultivated land			woodland		
	Existing quantity (hm ²)	Project occupation (hm ²)	Reduce the proportion	Existing quantity (hm ²)	Project occupation (hm ²)	Reduce the proportion
Evaluation scope	151.76	28.43	18.73%	444.65	57.56	12.95%

121. According to the above table, in terms of cultivated land occupation, after the implementation of the proposed project, the cultivated land will decrease by 18.73%. Therefore, in the next stage, efforts should be strengthened to protect and restore the cultivated land. In terms of forest land occupation, after the implementation of the proposed highway, various types of forest land such as shrubs and trees along the line will decrease by 12.95%. Overall, the implementation of the project will not have a significant adverse impact on the

regional agricultural land pattern.

E. Impact analysis on the landscape ecosystem

122. The landscape pattern along the route is mostly a staggered distribution of artificial forests and villages, with some farmland and shrub-grassland landscapes. According to the characteristics of the landscape environment in the area where the project is located, the following sections of the project will have varying degrees of impact on the local natural and cultural landscapes.

123. For the subgrade section of the project, it occupies the regional landscape, blocks the continuity of the landscape, and causes landscape fragmentation, which has a certain impact on the regional landscape. However, the regional landscape is mainly composed of artificial forest landscapes, farmland landscapes, and grassland landscapes, with average landscape quality. Moreover, the impact can be partially alleviated through slope revegetation in the later stage.

124. The contiguous projects of the project's intermodal freight yard, logistics and production facilities have a certain impact on the regional landscape. However, the land occupied in this area is mainly village residential areas, and the regional landscape is mainly composed of village and town landscapes, artificial forest landscapes, farmland landscapes, and grassland landscapes, with average landscape quality. In the project design, greening and beautification designs have been strengthened, striving to achieve landscape diversity and coordination, avoiding single buildings, and further integrating with the existing surrounding environment to alleviate the impact on the landscape environment around the station yard.

125. Overall, the project construction has little impact on the regional landscape.

III. Impact on major ecological problems along the line

126. The main ecological and environmental issues along the project are the decrease in the area of natural forests, the increase in the area of artificial forests, and the single type of artificial forest land. There is a trend of further expansion in the area of agricultural land and forestry land in the areas along the route, with a further reduction in the distribution area of natural vegetation. The area of large-scale contiguous planting of single species, such as *Pinus massoniana* forests and eucalyptus forests, increases year by year, which is unfavorable to the protection of local species diversity. The natural forest land occupied by this project is relatively small, and through later ecological restoration, the impact of this project on biodiversity can be further reduced.

IV. Mitigation Measures

A. Mitigation measures in the design phase

a. Environmental impact mitigation measures already taken in the engineering design

127. During the route selection process of the project, multiple schemes were compared and the design was optimized. Based on the comparison results considering various aspects such as topographic and geological conditions, cultivated land resources and vegetation protection, soil and water conservation, landscape protection, mineral resources, as well as project quantity and investment, the K-line is selected as the recommended route scheme at this stage. The route fully avoids sensitive targets such as natural forests and centralized drinking water source protection areas, and adopts construction schemes with less environmental impact in terms of engineering forms and other aspects.

128. In the subgrade design, efforts are made to balance filling and excavation to avoid large-scale filling and excavation, and the waste materials in local sections are fully utilized; by setting roadside drains, intercepting drains, and various passages, culverts and other structures, it is ensured that the runoff from the subgrade and pavement does not directly discharge into farmland, thus preventing pollution and harm to local water resources, and ensuring the normal operation of the drainage and irrigation systems along the route.

129. Drainage ditch designs are considered for all filled subgrades along the entire line, and a complete drainage system is formed by connecting with the flood drainage ditches along the route through culverts. To ensure smooth drainage and facilitate maintenance, roadside drains, side ditches, etc., are all protected with full masonry of mortar rubble. On the slope platforms of cut roadbeds, platform drains are set according to the slope protection form to prevent rainwater from eroding the slopes.

b. Further environmental protection requirements in the design phase

(1) It is recommended that the slope protection on both sides of the road should adopt three-dimensional greening protection measures integrating arbors, shrubs, grasses and vines as much as possible;

(2) Local herbaceous plants should be planted under bridges and culverts to

make them animal corridors, so as to reduce the blocking impact of the proposed highway on wild animals;

(3) The project's greening is prohibited from using alien invasive species announced by the state, and fast-growing and deciduous tree species are not used; instead, common local species are used. The number of greening species should be as rich as possible, and a multi-species mixed planting form should be adopted to avoid large-area single-species greening, so as to improve the ability to resist alien species invasion;

(4) For the road filling sections, culverts or bridges should be added as much as possible to reduce the blocking impact of the road. In addition, both ends of the culverts should be designed into gentle slopes to facilitate the migration of amphibians and reptiles.

B. Mitigation measures during the construction period

130. The following measures will be taken in this project to minimize the impact on the project's vegetation during the construction period:

(1) If protected plants such as *Cibotium barometz* are found at the construction site, protection measures shall be taken after reporting to the project management department. There are a large number of trees at the construction site. During the construction process, if ancient trees over 100 years old and trees protected by the local forestry department with labels are found, they shall be protected after reporting to the project management department. Protected plants should be transplanted to a similar environment. Before transplantation, an investigation into the reproduction method of the species shall be conducted, and a reproduction method shall be established in advance to ensure the success of transplantation.

(2) Among the trees that need to be cut down, priority shall be given to the transplantation of protected tree species, followed by the transplantation of young trees;

(3) It is strictly forbidden to cut down trees outside the scope of the land used. At the same time, publicity and education on forest fire prevention shall be strengthened. Fire prevention warning signs shall be erected around the construction area, and emergency measures for forest fires shall be formulated;

(4) Preserve the cultivated soil or topsoil of permanent and temporary land occupation to provide good soil for vegetation. The topsoil of cultivated land and forest land permanently or temporarily occupied during project construction shall be collected and preserved for later reclamation and vegetation restoration;

(5) For the excavation of various pipelines in the project, it should avoid rainy days. Excavate the width of the pipeline trench according to the design requirements. The temporary soil piled on the side of the pipeline trench should

be covered. After the pipeline laying is completed, backfill should be carried out in accordance with relevant regulations, and vegetation should be restored after the construction is completed.

(6) For the compensation principle of permanent occupation of forest land, the principle of restoration nearby and on - site shall be followed. The restoration sites shall make full use of forest gaps, existing forest - suitable land, barren hills and slopes. The number of restored trees shall not be less than the area of forest land occupied by the project. Vegetation restoration shall be carried out under the guidance of the local forestry department.

(7) When selecting greening tree species, consideration shall be given as much as possible to native tree species suitable for the climatic characteristics of the region, and they shall be as consistent as possible with the surrounding tree species composition. Arbor species include *Pteroceltis tatarinowii*, *Radermachera sinica*, *Zenia insignis*, etc.; shrub species include *Cipadessa cinerascens*, *Pterolobium punctatum*, etc.; herbaceous plants include *Miscanthus floridulus*, *Miscanthus sinensis*, *Lophatherum gracile*, *Neyraudia reynaudiana*, etc. The use of alien invasive species announced by China, such as *Bidens pilosa*, *Ageratina adenophora*, etc., is prohibited. Moreover, the project's greening shall be completed as soon as possible to avoid long-term exposure providing conditions for the invasion of alien species. In terms of greening structure, the design shall be based on the arbor-shrub-herb structure as much as possible. The number of greening species shall be as rich as possible, and a multi-species mixed planting form shall be adopted to avoid large-area single-species greening, so as to improve the ability to resist alien species invasion.

(8) Publicize wild animal protection laws and regulations to enhance the protection awareness of construction personnel, and strictly prohibit hunting of wild animals;

(9) Try to avoid mechanical noise disturbing nearby protected birds and standardize construction behaviors, and prohibit construction personnel from hunting. Most wild birds go out for food in the morning, dusk or at night, and noon is the rest time for birds. The breeding time of birds and fish is generally from April to July. By controlling the construction methods and avoiding the key periods of wild animal activities and reproduction, the interference to wild animals can be reduced;

(10) Try to avoid using high-noise machinery for construction in the evening and at night to prevent adverse effects of light and noise on mammals.

131. After taking the above mitigation measures during the construction period, with the gradual restoration of vegetation, improvement of the ecological environment and reduction of human interference during the operation period, many migrated mammals will gradually return to their original habitats. To sum up, the impact of the project construction on animals is within the low-impact

and acceptable range, and the impact will gradually disappear with the completion of the project.

C. Mitigation measures during the operation period

132. The following measures will be taken in this project to minimize the impact on the project's biodiversity during the operation period:

(1) Strengthen the management and protection work in the initial growth stage of greening vegetation to ensure their survival rate, shorten the recovery time of greening vegetation, and compensate for the loss of vegetation biomass caused by construction as soon as possible; at the same time, pay attention to regularly inspecting the growth status of vegetation in the greening areas, and promptly replant dead plants to prevent the invasion of alien vegetation species.

(2) During the operation period, monitor the distribution dynamics of alien invasive species. Remove alien invasive species that enter the project's occupied area.

133. After the project takes the above measures, it will effectively control and alleviate the adverse impact on biodiversity, ensure the integrity of the vegetation ecosystem, maintain the stability of the local biological community, and realize the coordinated development of project operation and biodiversity protection.

Appendix 2: Table of the Gender Action Plan

Actions	Action Measures	Monitoring Indicators	Implementing Agency	Budget and sources
Increase employment opportunities for women	(1) During the project construction and operation period, priority will be given to providing employment opportunities, especially non-technical positions, to women in the village communities involved in the project area. For jobs that are not physically demanding, the age limit can be appropriately relaxed, and women who have difficulty finding non-agricultural employment opportunities should be given priority; and skills training can be used to increase employment opportunities for women. (2) Strictly implement the principles of equal employment and equal pay for equal work.	(i)The number of jobs provided during the construction period of the project, and disaggregated by gender. The proportion of female employees is not less than 20% (baseline: 0%) (ii)The target of female employment ratio in the park is set to no less than 30% (baseline: 0%)	Qinzhou Huangma Asset Management Group Co., Ltd. and contractors	Included in the construction budget, Qinzhou Huangma Asset Management Group Co., Ltd.'s own funds
Expand women's participation in decision-making	(3) Encourage and support all women in the project area to participate in project design, decision-making and various consultation activities, including information disclosure, land acquisition compensation, resettlement, construction progress, environmental and social impact communication, etc.	(iii)In project consultation, information disclosure and decision-making activities, ensure that the proportion of female representation is no less than 40% (baseline: 20%).	PMO, Qinzhou Huangma Asset Management Group Co., Ltd., Changtian Sub-district Office and affected communities and village	Included in the project funding

	(4) Timely announcement of project information to women through bulletin boards, WeChat groups, community announcements, etc., including proactive disclosure of key information such as compensation, resettlement, and livelihood restoration, ensures that information is conveyed comprehensively and effectively, and increases women's awareness rate to 75% (baseline: 40%). (5) During the land acquisition and demolition compensation consultation and resettlement plan formulation process, ensure that women participate in consultation activities and ensure that the proportion of female representatives is no less than 40% (baseline: 20%); (6) Set up full-time female positions in charge of gender affairs in the project implementation unit, and invite the Qinbei District Women's Federation to participate to ensure the effective implementation of environmental and social management plans (including GAPs). (7) Promote the establishment of a female-friendly community within the logistics park by setting up a women's organization and supporting facilities such as a "Women's Home," providing comprehensive services—including	(iv) Timely disclosure of project information, including project construction activities, progress, land acquisition and demolition compensation policies, detour notices, appeal mechanisms and other relevant information, has increased the female awareness rate to 75% (baseline: 40%). (v) Ensure that the participation rate of female representatives in LA and HD consultation activities reaches no less than 40% (baseline: 20%). (vi) Set up female positions dedicated to gender affairs in project implementation units. (vii) Develop a female-friendly community within the logistics park by establishing a women's organization and supporting facilities such as a "Women's Home."	(neighborhood) committees in Dadong Town, Qinbei District Women's Federation	
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	communication and mutual support, capacity building, and rights protection—for female workers in the park.			
Enhancing women's development capacity	(8) Ensuring that the proportion of women participating in vocational skills, occupational safety, and gender equality training reaches no less than 90% during the construction and operation phases (Baseline: 50%). (9) During the implementation of the project, relevant departments and communities such as the Women's Federation of Qinbei District and the Bureau of Human Resources and Social Security will organize employment training and knowledge lectures to improve women's employment and entrepreneurial skills and opportunities.	(viii~ix) During both the project construction and operation phases, ensure that women account for no less than 90% of participants in training programs covering vocational skills, occupational safety, gender equality, and the prevention of gender-based violence, sexual exploitation, and sexual harassment (baseline: 50%).	Qinzhou Huangma Asset Management Group Co., Ltd. and contractors, Qinbei District Women's Federation, Human Resources and Social Security Bureau	Included in the construction budget, Qinzhou Huangma Asset Management Group Co., Ltd.'s own funds
Reducing the risk of gender-based violence	(10) The Qinbei District Women's Federation will assist and participate in the project implementation unit to establish a project complaint mechanism, including a complaint mechanism for gender violence, sexual exploitation and sexual harassment, including complaint registration, data management, confidentiality requirements, etc., to ensure that the privacy and safety of the complainant are effectively protected, and at the same time protect the complaint handling	(x) Establish a grievance mechanism accessible to women. Throughout the project implementation period, track and report on the reception and handling of complaints, including the number of feedback entries received, complaints lodged, and complaints resolved. (xi~xii) 100% of female workers	PMO, Qinzhou Huangma Asset Management Group Co., Ltd., contractors, Changtian Sub-district Office and affected communities and village (neighborhood) committees of Dadong Town, Qinbei District	Included in the construction budget and the daily expenditure budget of Qinzhou Huangma Asset Management

	members from prejudice and retaliation. (11) Under the guidance of the Qinbei District Women's Federation, the project implementation unit regularly carried out gender equality and anti-sexual harassment publicity and education activities in the project workplace and community. At the same time, strengthen the supervision of construction sites to avoid harmful behaviors such as sexual violence, sexual exploitation and abuse. (12) In order to strengthen the protection of the rights and interests of female laborers, the project implementation unit will establish a collaborative mechanism with the Qinbei District Women's Federation to provide training and publicity for female workers through regular mental health counseling and rights protection training, so as to improve women's ability to protect their rights.	receive training on labor rights protection; zero incidents of gender-based violence have occurred.	Women's Federation	Group Co., Ltd. and relevant government departments
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