Guangxi Chongzuo Border Connectivity Improvement Project

Environmental and Social Management Plan

Guangxi Chongzuo City Construction Investment Development Group Co., Ltd.

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Contents

Project Background

ASEAN is an important part of China's in-depth cooperation with its neighboring countries. Guangxi is the most convenient gateway to the sea connecting the inland in the southwest and mid-south of China with ASEAN countries in the Indochina Peninsula, and has advantages in serving the open development of the region. As an important fulcrum of China-ASEAN cooperation, Vietnam plays a bridge role in promoting the development of China and ASEAN. Relevant parties in China and Vietnam are accelerating the construction of cross-border economic cooperation zones, which designate specific areas in the border areas between the two countries. Special policies such as goods trade, technology trade, and open-up in investment are given, and special cross-border customs supervision is implemented in the region to attract people flow, materials flow, capital flow and other production factors to gather. By integrating the surrounding resources, we can realize the full interaction and make use of complementary advantages of the border areas between the two countries to promote the rapid economic development of the region, and then radiate and drive the surrounding areas.

Cross-border economic cooperation zone is a specific area designated in the border areas of the two countries, which is endowed with special policies for business such as goods trade, technology trade, investment opening, etc., and is subject to special cross-border customs supervision to attract flows of people, material, and capital as well as other production factors. By integrating the surrounding resources, we can realize the full interaction and make use of complementary advantages of the border areas between the two countries to promote the rapid economic development of the region, and then radiate and drive the surrounding areas.

The construction of the China-Vietnam Cross-border Economic Cooperation Zone has made positive progress. Taking infrastructure construction as an example, within the planning scope of Dongxing-Mong Cai Cross-border Economic Cooperation Zone, it has started the construction of the Beilun River Second Bridge connecting China and Vietnam on April 1st of this year, and it is planned to be completed and opened to traffic in 2017; within the planning scope of Dong Dang-Pingxiang Cross-border Economic

Cooperation Zone, Pingxiang Comprehensive Bonded Port Area, as a priority project of cross-border cooperation, was closed and operated in 2011. Shenzhen-Nanning-Pingxiang-Hanoi logistics line has been opened, realizing cross-border traffic of transport vehicles and official vehicles between the two countries, and the preliminary work of Pingxiang-Hanoi Expressway is progressing smoothly.

Although great progress has been made in the construction of border port traffic facilities for Guangxi, the requirements of opening up and development along the border have not been met yet. Therefore, many bottleneck problems such as the single road network restricting the hinterland transportation shall be solved. The proportion of high-grade highways in border counties and cities is generally low, and most highways are of Class III or below, which is difficult for large vehicles to pass through. And there is a lack of cross-border bridge facilities, which limits the passage of people and goods. The structure of the regional road network is simple, and main trunk lines have low grades and an overly concentrated layout, which limit the interconnection between ports and the hinterland, and restrict the open development of border trade economy and society.

Therefore, to speed up the development of Guangxi border ports, we must take Xi Jinping's Thought on Socialism with Chinese Characteristics for a New Era as the guide, transformation and upgrading as the main line, reform and innovation as the driving force and major projects as the carrier, fill up the shortcomings of infrastructure, improve the efficiency of customs clearance services, and effectively let the border ports to play the leading role in the development of border opening. Class-I highways shall be built at ports near urban areas and ports with large cargo flow, and Class-II highways or above should be built at other ports and trade points. Border highways shall be upgraded and constructed as per the standards for Class-II highways, promoting and strengthening infrastructure connectivity. Meanwhile, we must speed up the construction of cross-border tourism cooperation zones between China and Vietnam, such as Detian–Ban Gioc, Dongxing–Moncay, Friendship Pass–Youyi, and Jingxi–Longbang tourism cooperation zones, and jointly promote cooperation in the entry-exit facilitation, infrastructure construction, public service system construction, cross-border self-driving tour development, and tourism safety management, so as to create a new high ground and demonstration zone for international cross-border tourism cooperation.

The Project is located in Chongzuo City, southwest of Guangxi, and in the middle of the Zuojiang River Basin. Chongzuo borders Nanning to the northeast, Baise to the north, and Fangchenggang to the southeast. Four counties of Chongzuo, including Pingxiang, Ningming, Longzhou, and Daxin, share boundaries with Vietnam in the west and south. Chongzuo City has location advantages in terms of transportation as being close to the border, being close to expressway, adjacent to the capital, adjacent to ASEAN and close to the gulf. Nanning-Friendship Pass Expressway, Chongzuo-Qinzhou Expressway and Chongzuo-Jingxi Expressway have been completed and put into service, Hunan-Guangxi Railway, national highways G322, G358, G359 and G219 run through the city from north to south. It is one of the few land port cities on China's southern border where railways and highways are connected to the domestic major transportation network. The borderline of Chongzuo is 533 kilometers in length, accounting for 52% of the total length of the land border between Guangxi and Vietnam. It has the longest borderline among prefecture-level cities in Guangxi. There are five Category-1, namely Pingxiang (Railway) Port, Youyiguan Port, Shuikou Port, Aidian Port and Shuolong Port. There are two Category-2 ports, namely Pinger and Kejia. The 14 cross-border trade points are convenient international passageways for connecting Guangxi to Vietnam and other ASEAN countries, and are the windows and frontiers for Guangxi’s opening-up.

At present, the border ports in Chongzuo are mainly connected by the border highway G219, a national highway stretching 387 km within Chongzuo. The Chongzuo section of the highway G219 is mainly constructed as per the standards for Class-III highways in mountainous and hilly areas. It was built many years ago and was limited by the harsh terrain conditions and complicated geological and hydrological conditions along the route. On the one hand, the technical standards are low, so that local sections cannot meet the technical standards for Class-III highways, full of detours and steep slopes on the narrow road, with imperfect security facilities and many potential safety hazards. On the other hand, it is difficult for road maintenance and repair. Over the years, it has suffered from washouts and geological disasters many times, resulting in

pavement desertification, unevenness, and poor traffic capacity, and even local road sections were interrupted by geological disasters. The current highways are unable to meet the requirements of economic development and people's life in border areas, and at the same time restrict the development of border ports.

In order to enhance the all-round opening-up capability of transportation, strengthen the construction of expressways going out of the province, borders and sea, promote connectivity with neighboring regions and countries, and further strengthen the development of border ports, the Expressway Network Planning of Guangxi (2018-2030) approved by the Guangxi People's Government in 2018 plans to connect major border ports as important traffic hub nodes with expressways to ensure that each major port has access to expressways. Component A of the Project is a section of the Wuzhou (Longyanzui) to Shuolong Expressway, which is the planned 7th horizontal line. The construction of the Project has opened up the "last kilometer" of Guangxi's interconnection with Vietnam through the Shuolong port and features short construction mileage and remarkable construction benefit. It will open up a convenient passage from Guangdong-Hong Kong-Macau Greater Bay Area to Vietnam and ASEAN countries via Nanning, improve the regional highway network, promote the effective development and utilization of tourism resources and mineral resources along the line and promote the local economic and social development.

In view of these factors, it is proposed to seek support from the Asian Infrastructure Investment Bank for the construction of the Guangxi Chongzuo Border Connectivity Improvement Project, which is of great significance to speed up the fight against poverty in border areas, improve the road network of border ports, promote interconnection with neighboring regions and countries, develop the economy of the Shuolong Port, and accelerate the development of China-ASEAN Free Trade Area.

Guangxi Chongzuo Border Connectivity Improvement Project consists of three components, of which Component A is Wuzhou (Longyanzui) – Shuolong Highway (Chongzuo–Jingxi Expressway to Shuolong Port Section), Component B is Detian - Shuolong Highway, and Component C is Shuolong Port (Shuolong Main Gate) (Phase

II) under Shuolong Port Infrastructure (Upgrading) Project in Daxin County.

Component A - Wuzhou (Longyanzui) - Shuolong Highway (Chongzuo - Jingxi Expressway to Shuolong Port Section) is "west-east road 7" among the "1 ring road, 12 west-east roads, 13 north-south roads, and 25 connecting lines" as planned in the Guangxi Expressway Network Plan (2018-2030). The road consists of two parts: the main line and the Shuolong Connecting Line. The main line starts from the vicinity of Neitun, Liliang Village, Fuxin Town, Tiandeng County, connects Long'an-Shuolong Expressway under construction, extends southwestwards via Bulitun of Xuanjie Village and Longrun and Baidou of Yining Village, Shuolong Town, Daxin County, crosses the Xialei River at Bangtun of Yixian Village, and finally reaches the end point. Shuolong Connecting Line connects the end point of the main line and extends southwards to the vicinity of Rentun of Shuolong Community in the southeast corner of Shuolong Town via Guitun and Mengtun of Yixian Village. Then, it crosses Detian (Daxin)-Huashan (Ningming) Highway (Shuolong to Tianxi Section) at the same level, and finally reaches the end point of the Project. Component A is an important part of the inter-provincial channel "West-East Road 7"—Wuzhou (Longyanzui)–Shuolong Highway (Guangdong Yunfu–Cenxi–Guiping–Guigang–Qintang–Binyang–Wuming–Long'an–Shuolong) in the planning layout of the highway network. The construction of the Project is of great significance for building a convenient international channel from Guangxi to Vietnam and other ASEAN countries, and further strengthening the connection between Guangxi and Gaoping, Vietnam; The Project will facilitate the economic development of ethnic minority areas involved, help win the battle against poverty, promote the integration of all ethnic groups, drive forward cross-border labor cooperation of China and Vietnam, provide employment opportunities for women, boost the circulation of goods among ASEAN countries, speed up the development of China-Vietnam port trade. Therefore, it is necessary to construct the Project in order to build a sea-land corridor connecting ASEAN countries, enhance cooperation in the Pan-Pearl River Delta Area, forge ahead with the development of China-ASEAN Free Trade Area, improve China-Vietnam cooperation in infrastructure connectivity, achieve mutual benefit and win-win results, support the economic and social development of contiguous poor areas and ethnic minority and border areas, implement the Guangxi Expressway Network Plan (2018-2030), improve the regional highway network, upgrade the International Corridor of Shuolong Port, implement the national strategy

of western development, drive forward the revitalization and development of the Zuojiang River and Youjiang River Former Revolutionary Base Areas, push ahead with the construction of China-Vietnam Detian • Ban Gioc Waterfalls International Tourism Cooperation Zone, and turn Detian Waterfalls into a world waterfalls park.

Component B, the Detian–Shuolong Highway, is a tourist highway directly serving the Detian Waterfall Scenic Area. The line starts from the entrance of Detian Waterfalls Scenic Area, Detian Village, Shuolong Town, Daxin County, and connects the starting point of the existing Detian-Renai Highway. It extends eastwards along the existing border roads, passes through Liudeng of Detian Village, Wanlong of Aijiang Village, as well as Longhong and Gutun of Shuolong Community, ends at the vicinity of Rentun of Shuolong Community in the southeast corner of Shuolong Town. It crosses the Shuolong Connecting Line of Component 1 at the same level. It is an important collector-distributor road connecting Shuolong Town and the Detian Scenic Area, and it is also an important tourism infrastructure road serving the Detian 5A Scenic Area. It organically connects the Detian Waterfall Scenic Area with the proposed Shuolong Connecting Line, and even with the Wuzhou (Longyanzui)–Shuolong Highway (Chongzuo–Jingxi Expressway to Shuolong Port Section) through the Shuolong Connecting Line, which is an important traffic corridor for tourists to enter and exit the scenic area and for residents to travel along the route. The route starts from the entrance of the Detian Scenic Area, connecting with the starting point of the Detian–Ren'ai Highway, and ends at the north end of the Shuolong Medium Bridge near the Shuolong Port, connecting with the proposed Shuolong Connecting Line. Component B is a tourist highway that directly serves the Detian Scenic Area and residents traveling along the route. Its development is of urgent practical significance and profound strategic importance to strengthen regional foreign exchanges, improve the regional investment environment, and promote the development and utilization of tourism resources. The construction of the project will further optimize the regional road network, enhance the traffic capacity of regional highways, promote the connectivity of regional scenic areas and scenic spots, provide effective traffic support for regional economic development and tourism, and further improve the functions and status of scenic areas.

Component C is the Shuolong Port (Shuolong Main Gate) (Phase II) under Shuolong Port Infrastructure (Upgrading) Project in Daxin County. It functions as an integrated service area, mainly to provide customs clearance and passenger boarding and alighting services, parking of customs passing vehicles and the development of

border port tourism services. The planning land area of Phase II is about 18,533.72 ㎡, with a total floor area of 11,668.03 ㎡, including the Port Service Center, service station, public restroom, ecological parking lot and ancillary road revegetation project, Guichun River revetment landscape park and basement. After completion, Component C will vigorously drive China-Vietnam trade and tourism cultural exchanges, to achieve mutual complementarity by advantages and mutual benefits in economic development, so that the people in the two countries can actually enjoy the benefits of economy and trade. The cross-border trade economy between China and Vietnam involves a wide variety of commodities, with complementary structures and resources. The trade covers northern Vietnam, Central China, Southwest China, and Beibu Gulf Economic Zone, with huge market potential, which is conducive to promoting industrial upgrading and resource integration between the two countries, advancing bilateral cooperation in agricultural development, transportation, electricity, fertilizer, cement, and communication, and speeding up investment and construction between the two countries, and bringing more benefits to the Chinese and Vietnamese people.

The Phase II works of the Detian (Daxin)–Huashan (Ningming) Highway (Shuolong–Tianxi Section), with a total length of 355 m, is the only channel connecting Component C and Component A, which is necessary and related to the project. Detian (Daxin)-Huashan (Ningming) Highway (Shuolong-Tianxi Section) is located in Daxin County, Longzhou County and Ningming County of Chongzuo City in southwest Guangxi. Running from north to south, the route starts near Bami, Shuolong Town and ends at Tianxi Interchange Exit of Nanning-Friendship Pass Expressway in Tingliang Township, Ningming County, with a total design length of 84.171 km. The Project will be constructed in three phases. Among them, Phase II is the Shuolong-Yanying Section, which starts near the main passage gate of Shuolong Port in the southeast of Shuolong Town, Daxin County and ends in Yanying, connecting to Phase I, with a total design length of 9.092 km. It adopts Class-I highway technical standard, with a design speed 60 km/h, and a subgrade width of 22.5 m.

Abstract

The Environmental and Social Management Plan is a part of project management, and it is an important link to effectively implement the environmental protection and social risk assessment of the project. The Environmental and Social Management Plan of the Guangxi Chongzuo Border Connectivity Improvement Project is to ensure the smooth implementation of environmental protection measures and social risk prevention measures, reduce the adverse impact of the project implementation on the environment and society, and realize the coordination of environmental protection, social sustainable development, and economic development.

The Environmental and Social Management Plan is prepared on the basis of social-environmental impact assessment, mainly including the legal framework, environmental and social management system, project profile, environmentally sensitive objects, environmental impact analysis and mitigation measures, environmental management and monitoring plan, social impact and management plan, monitoring and evaluation of resettlement action plan, public consultation and information disclosure, and environmental and social management training.

The plan is implemented by Guangxi Chongzuo City Construction Investment Development Group Co., Ltd., and the responsible organization should update and adjust the environmental and social management of the project, and constantly improve the environmental and social management system in accordance with the *Environmental Protection Law of the People's Republic of China, Environmental Impact Assessment Law of the People's Republic of China, Regulations on the Administration of Construction Project Environmental Protection,* and *Environmental and Social Framework*. The Environmental and Social Management Plan of the Project mainly covers the following aspects:

1. Legal framework

The preparation bases of the project mainly include the provisions of the *Environmental Protection Law of the People's Republic of China, Environmental Impact Assessment Law of the People's Republic of China, Regulations on the Administration of Construction Project Environmental Protection* and *Notice on Reinforcing Environmental Impact Assessment Management of Construction Project Funded by International Finance Corporation,* as well as the requirements in the

Environmental and Social Framework of the AIIB. The EIA activities shall not only conform to relevant domestic laws, regulations, policies and standards, but also follow relevant AIIB policies.

2. Environmental and social management system

According to the administration privileges stipulated in the *Environmental Protection Law of the People's Republic of China* and *Regulations on the Administration of Construction Project Environmental Protection*, Component A is approved by Chongzuo Ecological Environment Bureau, and Component B and Component C are approved by Daxin Ecological Environment Bureau. Chongzuo Ecological Environment Bureau and Daxin Ecological Environment Bureau are the environmental agencies governing local projects. Their responsibilities are to put forward environmental protection requirements according to the environmental impact assessment reports and coordinate the environmental management among different departments. Under the framework of project management, the AIIB loan project office is responsible for managing the overall implementation of the project, while the Owner is responsible for implementing specific affairs. In order to ensure the smooth implementation of environmental management measures, the Project Office, the Owner, the Contractor, and the Operator shall be equipped with a group of full-time or part-time environmental management personnel to implement the Environmental and Social Management Plan.

The Project is located in Tiandeng County and Daxin County, Chongzuo City, Guangxi Province. The environmental and social management and supervision institutions include project offices and natural resources bureaus at regional, city, and county levels, ecological and environmental bureaus at city and county levels, labor and social security bureaus, and housing and urban-rural development bureaus at the county level.

The implementing agency of the Environmental and Social Management Plan is Guangxi Chongzuo City Construction Investment Development Group Co., Ltd. (the Employer).The environmental and social management institution is the Project Executive Office of Guangxi Chongzuo Border Connectivity Improvement Project.

3. Project Overview

Component A, the Wuzhou (Longyanzui)–Shuolong Highway (Chongzuo–Jingxi Expressway to Shuolong Port Section), is a newly built project, with a total occupied area of 2004.96 mu, including a permanent land area of 1391.96 mu and a temporary

land area of 613 mu. In the recommended scheme (Route K), the total length of the mainline is 12.263 km. The whole line is constructed as a two-way four-lane highway with a design speed of 100 km/h, a subgrade width of 26 m, and asphalt concrete pavement. The 5.416 km long connecting line (Route A) starts from the Bangtun Intersection at G359. It goes south along the Liliang–Shuolong Section (Class-II highway) of the Tiandeng Connecting Line, passes through Sanjiatun, then turns to the southeast, passes through Longmei, and ends at Rentun toward Longzhou in the east of Shuolong Town. It connects with border highways in front of the proposed bridge head of the Guichun River, and it is constructed as a two-way four-lane Class-I highway with a design speed of 80 km/h, a subgrade width of 25.5 m, and asphalt concrete pavement. There are 8 bridges (5,211m), 7 tunnels (5,075.5m), 1 toll station, 1 maintenance work area (built together with toll station), 20 culverts and 3 passages along the whole highway. The total investment is RMB 2,705,091,232 only. The Project will be commenced in October 2021 and completed in October 2024, with a construction period of three years.

Component B (Detian–Shuolong Highway) is an upgrading project, is an upgrading project, with a length of 13.632 km, which is divided into 2 sections: Detian to Tourist Center and Tourist Center to the north end of the Shuolong Medium Bridge. The route from Detian to Tourist Center (K0+000 ~ K9+362.310) is 9.362 km in length and is built as a class II highway with a design speed of 40 km/h and a subgrade width of 10 m. The road section (K3+860 ~ K5+260) near the class I water source conservation area is built as a Class-III highway with a design speed of 30 km/h and original subgrade width (7.5m). At the urban section (K7+050 ~ K7+280), considering the road profile, the road is built as a class II highway with a design speed of 40 km/h, a road width of 16 m, and sidewalks on both sides. At the restricted section (K8+400 ~ K8+700), the road is designed with a speed limit of 30 km/h and a subgrade width of 10 m to avoid large filling and excavation. The road section (K9+362.310~K13+632.053) from the Tourist Center to the north end of the Shuolong Medium Bridge is 4.270km in length and is built as a class II highway with a design speed of 40 km/h and a subgrade width of 16 m. Separated subgrade section (left line: K9+362.310~K10+155.050; right line: YK0+000 ~ YK1+053.383) is built as a class II highway with a design speed of 40 km/h and a single subgrade width of 8.5 m. At the urban section (K12+520~K13+632.053), considering the road profile, the road is built as a class II highway with a design speed of 40 km/h, a road width of 17.5 m, and the

sidewalk on one side (inner side). There is no bridge on the whole line, but only one 395m long one-way two-lane tunnel. The total investment is RMB 270,227,837 only. The Project is scheduled to start in October 2021 and completed for operation in June 2023, with a construction period of 20 months.

Component C is the Shuolong Port (Shuolong Main Gate) (Phase II) under Shuolong Port Infrastructure (Upgrading) Project in Daxin County. It functions as an integrated service area, mainly to provide customs clearance and passenger boarding and alighting services, parking of customs passing vehicles and the development of border port tourism services. The planning land area of Phase II is about 18,533.72 ㎡ (about 27.83 mu), with a total floor area of 11,668.03 ㎡, including the Port Service Center, service station, public restroom, ecological parking lot and ancillary road revegetation project, Guichun River revetment landscape park and basement. The total investment is RMB 107,938,400 only. The Project is scheduled to start in December 2021 and completed in February 2023, with a construction period of 15 months.

In the recommended scheme for the Detian (Daxin)–Huashan (Ningming) Highway (Shuolong–Tianxi Section), Route K starts from the vicinity of Bami, southeast of Shuolong Town, Daxin County, and is located near the main entrance to the Shuolong Port. It can connect the planned Detian–Shuolong Highway through the existing bridge. The route runs from north to south, passing through Shuolong Town, Kanxu Township, and Baoxu Township within Daxin County, Zhubu Township and Xiangshui Town within Longzhou County, and Tingliang Township within Ningming County, and ends at Tianxi Interchange Exit of Nanning-Friendship Pass Expressway in Tingliang Township, Ningming County. The route is 84.171 km in length and is constructed in three phases. The Phase II works refer to the K0+000~K0+400 section of the Detian (Daxin)–Huashan (Ningming) Highway (Shuolong–Tianxi Section), connecting Component A and Component C, which is constructed as a Class-I highway with a design speed of 60 km/h and a subgrade width of 22.5 m.

4. Environmental Sensitive Objects

Acoustic environment and atmospheric environment: 12 within the evaluation scope of Component A (8 main lines, including 2 schools and 6 villages; 4 villages of Shuolong Connecting Line); 12 objects within the evaluation scope of Component B (1 school and 11 villages); 1 object within the evaluation scope of Component C;

Water environment: the surface water protection targets of Component A are

surface water bodies such as Baidou River, Xialei River and Guichun River, and the drinking water source conservation area in Shuolong Town, Daxin County. The Neitun Hub Interchange, which is the main line of the project and with chainage K0+000~K1+320, crosses Bukan water source conservation area in Liliang Village, Fuxin Town. To reduce the impact of project construction on this water source, the People's Government of Tiandeng County agreed in principle to relocate the Bukan water source in Liliang Village, Fuxin Town, Tiandeng County in accordance with the Reply of the People's Government of Tiandeng County on Adjusting the Bukan Water Source in Liliang Village, Fuxin Town, Tiandeng County (TDH [2019] No.134), and issued a letter of commitment on April 7, 2021, promising to relocate the water intake of Bukan water source in Liliang Village, Fuxin Town to Bulitun. After the relocation, the nearest distance from the water source to the project is about 2.5 km, which is not within the evaluation scope of this project, and the relocation is going through procedures at present. The surface water protection targets of Component B are the drinking water sources of Aitun in Shuolong Town and Shuolong Community in Shuolong Town (K0+460~K5+360 passes through the secondary protection zone of Aitun drinking water source protection zone in Shuolong Town and K9+400~K10+000 passes through the secondary protection zone of Shuolong Community drinking water source protection zone in Shuolong Town).

Ecological environment: There are 2 ecologically sensitive areas (the Guangxi Xialei Nature Reserve and the Huashan Scenic Area). Within the evaluation scope of Component A, there are 3 species of national Class II protected plants (Excentrodendron tonkinese, Cibotium barometz, and Zenia insignis), 4 species of protected plants at the autonomous region level (Acampe rigida, Cymbidium bicolor Lindl, Cheirostylis chinensis, and Spiranthes sinensis), 10 ancient trees, 14 species of national class-II protected animals, 58 species of protected animals at the autonomous region level, occupying 15.7 hm2 of priority non-commercial forest. Within the evaluation scope of Component B, there are 2 species of national Class II protected plants (Excentrodendron tonkinese and Cibotium barometz), 1 species of protected plants at the autonomous region level (Cymbidium bicolor), 2 ancient trees, 3 species of national class-II protected animals, 21 species of protected animals at the autonomous region level, occupying 1.08 hm2 of priority non-commercial forest. Component C is located in the landscape coordination area of the Huashan Scenic Area, and no national or regional-level protected plants are found.

5. Environmental impacts, mitigation measures, and management monitoring plan

In view of the possible adverse environmental impacts of the project, the Owner and relevant organizations shall take appropriate environmental protection and mitigation measures to eliminate or alleviate the impact of the project construction on the environmentally sensitive areas. Environmental impacts and mitigation measures include all impacts and mitigation measures related to ecosystem, water environment, noise, vibration, atmospheric environment, solid wastes, environmental risks, and so on.

6. Social impact and management plan

In order to promote and enhance the social benefits of the project and eliminate or mitigate the negative impact of the project, the management plan formulated by the Owner and relevant organizations must do the following: vigorously publicize the content and significance of the project; give priority to employing local labor in the affected area and project area, especially the worker from poor families and female workers; fully consider public service facilities such as parking lots and bus transfer stations in the design, and run or increase public transport vehicles; further optimize the route, minimize the occupation of fertile land, and bypass schools and dense residential areas for less house demolition; reduce the land occupation by renting local houses and building them in permanent land; occupy wasteland, abandoned land or unavailable land to reduce the adverse impact on local residents; set up more traffic signs and provide guidance signs at intersections with local roads, and make use of variable message signs, cable broadcasts and other methods to guide traffic to prevent congestion in the construction section. The temporary access road built by the Employer shall be incorporated into the local highway system, and shall be constructed and maintained in accordance with relevant standards for rural roads. These roads can be used by the masses during construction to improve public travel conditions.

In order to eliminate or alleviate the adverse effects of the project on vulnerable groups and restore their livelihood and income level as soon as possible, the management plan formulated by the Owner and relevant organizations will put forward a series of measures, such as monitoring the availability of government subsidies and

providing temporary employment opportunities for poor families as much as possible.

It is estimated that about 1,973 women are affected, accounting for 11.38% of the total number of women in the project area. Most of the women interviewed already know that the Project will be built. All women hope that the compensation for land acquisition can be paid in time according to the standards set by the government. The young and middle-aged women hope to take good care of their families and do some work within their ability. In order to enhance women's awareness and ability to participate in public affairs, increase women's employment, improve women's social status, and make women benefit from the project according to the principle of “equal opportunities between men and women”, the Gender Action Plan is formulated as follows: to disseminate information through radio and television, billboards and brochures to ensure women's right to know about issues related to project construction; fully grasp and determine the number of female-headed households, the family population, economic and social conditions, women's employment needs and work aspirations in the preparation stage of the project.

The occupational health and work safety management plan mainly covers the following: to establish strict occupational health and work safety management system; to cooperate with the government management system to conduct safety inspection; to take strict security measures during construction to ensure the safety of construction workers and community people; to implement prevention and control measures against COVID-19; to establish an employee grievance mechanism to protect their legitimate rights and interests.

In order to solve the specific problems in the process of project construction in a timely and effective manner and protect the legitimate rights and interests of resettled people and related interest groups, this project has established a public complaint channel, including village committees, forest farm resettlement team, township government, land requisition and demolition sub-headquarters of the project, county natural resources bureau, housing and urban-rural construction bureau, county human resources and social security bureau, ecological environment bureau, compliant handling bureau, project resettlement leading group, Executive Office of Guangxi Chongzuo Border Connectivity Improvement Project, court, etc.

7. Monitoring and evaluation of resettlement action plan

The implementation of the Resettlement Action Plan will be subject to internal supervision and external M&E. The RAP executing agency of the project is responsible for internal supervision, and prepares a quarterly report and submits it to the project owner, external monitoring and evaluation agency and AIIB, focusing on supervising whether the compensation and resettlement work of land requisition and demolition of the project meets the requirements of resettlement plan and compensation policy. Guangxi Chongzuo City Construction Investment Development Group Co., Ltd. recruits experienced third parties through open means for external monitoring and evaluation, and evaluates whether the resettlement targets have been achieved from the outside of the resettlement agency. Such independent agency will regularly prepare evaluation reports on the resettlement progress, compensation payment and other measures and submit them to AIIB until the resettlement is completed to ensure that the affected people, especially the subsistence allowance households, low-income households, and other vulnerable groups, can maintain their living standards and are not suffer from the Project.

The external monitoring and evaluation report shall be submitted by the external monitoring agency to the Project Owner and AIIB at the same time every six months until the resettlement work is completed. A summary report will be submitted to AIIB after the completion of resettlement.

8. Public consultation and information disclosure

Interested parties of the project can be roughly divided into five groups: governments at all levels and relevant agencies in the project area, project implementing agencies and contractors, various groups served by the project, households affected by land acquisition and demolition, and groups affected by construction.

In the preparation stage, the Employer has organized nine large-scale public consultations and information disclosure: During the environmental and social impact assessment, two rounds of public consultation and information disclosure were conducted, in which the first round started after screening environmental problems and before finalizing the EIA work outline, and the second round started after completing

the first draft of the EIA report. Then, public consultation and information disclosure have been conducted once again during the social stability risk assessment, and public consultation has been conducted six times during the Resettlement Action Plan (including the public participation and consultation during the field visits by AIIB in August, October 2020 and March 2021).

During project implementation, the implementing agency will further conduct public consultation and information disclosure.

9. Environment and Social Management Training

The environmental and social management training aims to ensure smooth and effective environmental and social management, familiarize relevant personnel with the contents and procedures of environmental and social management, improve the abilities of environmental and social managers, and ensure the effective implementation of impact mitigation measures. It is the environmental and social managers and supervisors who need to improve their environmental and social management capabilities, and staff training is part of the technical support of the project. In addition, the Employer and construction workers should receive training during project implementation. Prior to the commencement of works, all contractors and management organizations shall receive environmental health and safety training.

10. Reporting Mechanism

It is important to exchange necessary information among different departments and posts of the project office, the Owner, the Contractor, and the Operator, and inform external parties (interested parties, the public, etc.) of relevant information.

During the operation of the environmental and social management system, relevant records will be kept.

The contractor, operator, monitoring unit, construction supervision engineer and project office shall record the project progress, ESMP, RAP implementation, environmental monitoring results, RAP implementation monitoring results, etc. during the project implementation and report them to relevant departments in time.

1 Legal and Regulatory Framework

The preparation bases of the project mainly include the provisions of the *Environmental Protection Law of the People's Republic of China*, *Environmental Impact Assessment Law of the People's Republic of China*, *Regulations on the Administration of Construction Project Environmental Protection* and *Notice on Reinforcing Environmental Impact Assessment Management of Construction Project* Funded by International Finance Corporation, as well as the requirements in the *Environmental and Social Framework* of the AIIB. The EIA activities shall not only conform to relevant domestic laws, regulations, policies and standards, but also follow relevant AIIB policies.

1.1 China's Environmental Protection Related Laws and Regulations and Departmental Regulations

(1) *Environmental Protection Law of the People's Republic of China* (Enforcement Date of Amendment: January 1, 2015);

(2) Environmental Impact Assessment Law of the People's Republic of China (Enforcement Date of Amendment: December 29, 2018);

(3) Forest Law of the People's Republic of China (Enforcement Date of Amendment: March 19, 2018);

(4) Law of the People's Republic of China on Air Pollution Prevention and Control (Enforcement Date of Amendment: January 1, 2016);

(5) Law of the People's Republic of China on Water Pollution Prevention and Control (Enforcement Date of Amendment: January 1, 2018);

(6) Law of the People's Republic of China on Noise Pollution Prevention and Control (Enforcement Date of Amendment: December 29, 2018);

(7) Law of the People's Republic of China on Solid Waste Pollution Prevention and Control (Enforcement Date of Amendment: September 1, 2020);

(8) Land Administration Law of the People's Republic of China (Enforcement Date of Amendment: August 28, 2004);

(9) Law of the People's Republic of China on Water and Soil Conservation (Enforcement Date of Amendment: March 1, 2011);

(10) Urban and Rural Planning Law of the People's Republic of China (Enforcement Date of Amendment: April 24, 2015);

(11) Highway Law of the People's Republic of China (Enforcement Date of Amendment: November 4, 2017);

(12) Agriculture Law of the People's Republic of China Enforcement Date of Amendment: January 1, 2013);

(13) Wild Animal Conservation Law of the People's Republic of China (Enforcement Date of Amendment: October 26, 2018);

(14) Law of the People's Republic of China on Road Traffic Safety (Enforcement Date of Amendment: May 1, 2011);

(15) Law of the People's Republic of China on Cultural Relics Protection (Enforcement Date of Amendment: November 4, 2017);

(16) Flood Control Law of the People's Republic of China (Enforcement Date of Amendment: July 2, 2016);

(17) Regulations on the Administration of Construction Project Environmental Protection (Enforcement Date of Amendment: October 1, 2017);

(18) Regulations on the Implementation of the Forest Law of the PRC (Enforcement Date of Amendment: March 19, 2018);

(19) Regulations on Implementation of Land Administration Law of the People's Republic of China (Enforcement Date of Amendment: July 29, 2014);

(20) Regulations on Protection of Basic Farmland (Enforcement Date of Amendment: January 8, 2011);

(21) Regulations on Implementation of Law of the People's Republic of China on Water and Soil Conservation (Enforcement Date of Amendment: January 8, 2011);

(22) Regulations on Implementation of Law of the People's Republic of China on Cultural Relics Protection (Enforcement Date of Amendment: January 13, 2016);

(23) Regulations of the People's Republic of China on River Management (Enforcement Date of Amendment: March 19, 2018);

(24) Law of the People's Republic of China on Response to Emergencies (Enforcement Date of Amendment: November 1, 2007);

(25) Regulations on Safety Management of Hazardous Chemicals (Enforcement Date of Amendment: December 7, 2013);

(26) Regulations of the People's Republic of China on Protection of Basic Farmland (Enforcement Date of Amendment: January 8, 2011);

(27) Regulations of the People's Republic of China on Nature Reserves (Enforcement Date of Amendment: October 7, 2017);

(28) Regulations of the People's Republic of China on Implementing Protection of Terrestrial Wild Animals (Enforcement Date of Amendment: February 6, 2016);

(29) Regulations of the People's Republic of China on Wild Plants Protection (Enforcement Date of Amendment: October 7, 2017);

(30) Labor Law of the People's Republic of China (Chinese Presidential Decree No. 28, second amendment on December 29, 2018);

(31) Production Safety Law of the People's Republic of China (Chinese Presidential Decree [2014] No. 13);

(32) Law of the People's Republic of China on Prevention and Control of Occupational Diseases (Chinese Presidential Decree [2011] No. 52).

(33) Notice of the State Council on Issuing the Program for National Ecology and Environment Protection (GF [2000] No. 38 State Council Document);

(34) Classification Management List of Environmental Impact Assessment of Construction Projects (2021 edition) came into force on January 1, 2021;

(35) Notice on Improving Nature Reserve Management (GBF [2010] No. 63);

(36) Notice on Further Strengthening Supervision and Management over Development and Construction Activities Involving Nature Reserves (HF [2015] No. 57);

(37) Notice on Issuing the Guidelines for Preparing Special Reports on Ecological Impact of Construction Projects Involving National Nature Reserves (for Trial Implementation) (HBH [2014] No. 1419);

(38) Opinions on Further Improving Protection of Basic Farmland (GTZF [2005] No. 196);

(39) Notice of the Ministry of Natural Resources on Doing a Good Job in Pre-examination of Land for Major Construction Projects Occupying Permanent Basic Farmland (ZRZG [2018] No.3), December 20, 2018;

(40) Notice on Strengthening and Improving the Protection of Permanent Basic Farmland (ZRZG [2019] No.1), May 20, 2019;

(41) List of Wild Plants under Special Protection of the State (First Batch, 1999);

(42) List of Wild Animals under Special Protection of the State (issued in 1989 and amended in 2002);

(43) Guidelines for Environmental Protection of Centralized Drinking Water

Sources (for Trial Implementation) (HB [2012] No. 50);

(44) Notice of the State Council on Issuing the Action Plan for Air Pollution Prevention and Control (GF [2013] No. 37);

(45 Notice of the State Council on Issuing the Action Plan for Water Pollution Prevention and Control (GF [2015] No. 17);

(46 Notice on Implementing Environment Supervision over Transportation Projects (JHF [2004] No. 314);

(47) Notice on Setting Additional Content of Construction Safety Supervision and Construction Environmental Protection Supervision in Construction Supervision over Highway and Waterway Projects (JZJF [2007] No. 158);

(48) Notice on Strengthening Environmental Impact Assessment for Highway Planning and Construction (HF [2007] No. 184);

(49) Notice of the Ministry of Environmental Protection on Issuing the Technical Policy for Prevention and Control of Ground Traffic Noise Pollution (HF [2010] No. 7);

(50) Measures for Environmental Protection Management of Transport Construction Projects (Decree No.5 of the Ministry of Transport, enforced on June 1, 2003);

(51) Notice on Issues Concerning Environmental Noise in Environmental Impact Assessment of Such Construction Projects as Highways and Railways (including Light Rails) (State Environmental Protection Administration, HF [2003] No. 94);

(52) Opinions on Implementing the Strictest Cultivated Land Protection System in Highway Construction (JGLF [2004] No. 164);

(53) Instructions on Further Strengthening Ecological Protection and Water & Soil Conservation in Mountainous Highway Construction (JGLF [2005] No. 441);

(54) Notice on Strengthening Environmental Impact Assessment for Highway Planning and Construction (State Environmental Protection Administration, National Development and Reform Commission, and Ministry of Transport, HF [2007] No. 184);

(55) Response Plan for Unexpected Traffic Incidents of Highways (Ministry of Transport of the People's Republic of China, JGLF [2009] No. 226);

(56) Opinions on Further Strengthening Ecological Environment Protection (State Environmental Protection Administration, HF [2007] No. 37);

(57) Announcement on Defining National Key Areas for Prevention and

Control of Soil Erosion (announcement No. 2 of 2006 issued by the Ministry of Water Resources of the People's Republic of China);

(58) Notice on Further Strengthening Management of Environmental Impact Assessment and Prevention of Environmental Risks (HF [2012] No. 77);

(59) Notice on Effectively Strengthening Risk Prevention and Strictly Managing Environmental Impact Assessment (HF [2012] No. 98);

(60) Measures for Public Participation in Environmental Impact Assessment (Decree No.4 of the Ministry of Ecology and Environment, July 16, 2018).

(61) Regulations on Management of Pollution Prevention and Control in Drinking Water Source Conservation Areas (amended by Decree No.16 of the Ministry of Environmental Protection on December 22, 2010);

(62) Notice on Further Strengthening Environmental Protection of Decentralized Drinking Water Sources (HB [2010] No.132, September 26, 2010);

(63) Notice of the Ministry of Land and Resources on Conscientiously Implementing Regulations on Protection of Basic Farmland and Further Improving Protection of Basic Farmland (GTZF [1999] No. 122);

(64) Instructions on Further Strengthening Ecological Protection and Water & Soil Conservation in Mountainous Highway Construction (JGLF [2005] No. 441, September 23, 2005);

(65) Measures for Management of National Public Welfare Forests (State Forestry Administration, Ministry of Finance, LZF [2013] No.71, put in force on April 27, 2013);

(66) Instructions on Strengthening the Prevention and Control of Environmental Noise Pollution and Improving the Urban and Rural Sound Environmental Quality" (HF [2010] No.114, December 15, 2010);

(67) Notice on Issuing the Technical Policy for Prevention and Control of Ground Traffic Noise Pollution (HF [2010] No. 7, January 11, 2010);

(68) National Response Plan for Unexpected Environment Incidents (GBH [2010] No. 119, December 29, 2014);

(69) Management Measures for Response to Unexpected Environment Incidents (Decree No. 34 of the Ministry of Environmental Protection, June 5, 2015);

(70) Regulations on Management of Road Transport of Dangerous Goods (Decree No.36 of 2016 of the Ministry of Transport, amendment put in force on April 7, 2016);

(71) Appendixes I, II, and III to Convention on International Trade in Endangered Species of Wild Fauna and Flora (2017);

(72) List of the First Batch of Invasive Alien Species in China (2003);

(73) List of the Second Batch of Invasive Alien Species in China (2010);

(74) List of the Third Batch of Invasive Alien Species in China (2014);

(75) List of Invasive Alien Species in Natural Ecosystems of China (Fourth Batch) (2017);

(76) Interim Measures of National Development and Reform Commission for Assessment of Social Stability Risk of Major Fixed Asset Investment Projects (FGTZ [2012] No. 2492), August 2012;

(77) Notice of General Office of National Development and Reform Commission on Issuing the Program for Preparing the Chapter and the Assessment Report of Social Stability Risk of Major Fixed Asset Investment Projects (for Trial Implementation), February 2013;

(78) Interim Measures of Development and Reform Commission of Guangxi Zhuang Autonomous Region for Assessment of Social Stability Risk of Major Fixed Asset Investment Projects (GFGTZ [2013] No. 833);

(79) Regulations on Work Safety Management of Construction Projects (Decree No. 393 of the State Council);

(80) Regulations of the People's Republic of China on Highway Management (Decree No. 543 of the State Council);

(81) Regulations on Work-related Injury Insurance (Decree No. 586 of the State Council);

(82) Regulations on Highway Safety Protection (Decree No. 593 of the State Council);

(83) Regulations on Work Safety Management of Construction Projects (Decree No. 393 of the State Council).

1.2 Technical Guidelines and Codes for Environmental Impact Assessment

(1) Technical Guideline for Environmental Impact Assessment of Construction Project – General Program (HJ 2.1-2016);

(2) Technical Guidelines for Environmental Impact Assessment – Atmospheric Environment (HJ2.2-2018);

(3) Technical Guidelines for Environmental Impact Assessment – Surface Water Environment (HJ/T 2.3-2018);

(4) Technical Guidelines for Environmental Impact Assessment – Groundwater Environment (HJ610-2016);

(5) Technical Guidelines for Noise Impact Assessment (HJ 2.4-2009);

(6) Technical Guidelines for Environmental Impact Assessment - Ecological Impact (HJ 19-2011);

(7) Technical Guidelines for Environmental Risk Assessment on Projects (HJ 169-2018);

(8) Specification for Environment Impact Assessment of Highways (JTGB 03-2006);

(9) Design Specifications of Highway Environmental Protection (JTG B04-2010);

(10) Indexes of Land for Construction of Highway Engineering Projects (JB [2011] No.124);

(11) Code for Design of Sound Insulation of Civil Buildings (GB 50118-2010);

(12) Technical Specifications for Urban Fugitive Dust Pollution Prevention and Control (HJ/T 393-2007);

(13) Technical Specifications Requirements for Monitoring of Surface Water and Waste Water (HJ/T 91-2002);

(14) Technical Specifications for Regionalizing Environmental Noise Function (GB/T 15190-2014);

(15) Technical Guideline of Biodiversity Impact Assessment (DB 45/T 1577-2017).

1.3 Guangxi Laws, Regulations and Codes on Environmental Protection

(1) Regulations of Guangxi Zhuang Autonomous Region on Environmental Protection (the amendment was put in force on September 1, 2016);

(2) Measures of Guangxi Zhuang Autonomous Region for Protection of Wild Plants (put in force on February 1, 2009);

(3) List of the First Batch of Wild Plants under Special Protection of Guangxi Zhuang Autonomous Region (GZF [2010] No. 17, March 30, 2010);

(4) Regulations of Guangxi Zhuang Autonomous Region on Management of Protection of Terrestrial Wild Animals (4th amendment on March 23, 2012);

(5) Regulations of Guangxi Zhuang Autonomous Region on Management of Protection of Aquatic Wild Animals (4th amendment on March 23, 2012);

(6) Measures of Guangxi Zhuang Autonomous Region for Management of Forests (2nd amendment on June 3, 2004);

(7) Regulations of Guangxi Zhuang Autonomous Region on Protection of Agricultural Environment (amendment on June 3, 2004);

(8) Measures of Guangxi Zhuang Autonomous Region for Implementing the Fishery Law of the People's Republic of China (amendment enforced on March 31, 2010);

(9) Measures of Guangxi Zhuang Autonomous Region for Implementing the Flood Control Law of the People's Republic of China (enforced on January 1, 2005);

(10) Regulations of Guangxi Zhuang Autonomous Region on River Management (enforced on January 1, 2001);

(11) Regulations of Guangxi Zhuang Autonomous Region on Cultural Relics Protection (enforced on January 1, 2014);

(12) Regulations of Guangxi Zhuang Autonomous Region on Protection of Old and Famous Trees (enforced on June 1, 2017);

(13) Implementation Plan of Guangxi Zhuang Autonomous Region for Joint Prevention and Control of Air Pollution to Improve the Regional Air Quality (GZBF

[2011] No. 143, August 3, 2011);

(14) Response Plan for Unexpected Environment Incidents of Environmental Protection Department of Guangxi Zhuang Autonomous Region (January 18, 2014);

(15) Notice on Issuing Measures for Management of Examination and Approval at Levels of Environmental Impact Assessment Documents of Construction Projects of Guangxi Zhuang Autonomous Region (Amendment 2018), GHF [2018] No. 8;

(16) Regulations of Guangxi Zhuang Autonomous Region on Protection of Drinking Water Sources (January 8, 2017);

(17) Working Program of Action Plan for Prevention and Control of Water Pollution of Guangxi (GZBF [2015] No. 131);

(18) Measures for Management of Public Welfare Forests of Guangxi Zhuang Autonomous Region (July 6, 2011);

(19) List of Wild Animals under Special Protection of Guangxi Zhuang Autonomous Region (GZF [1993] No. 17);

(20) Biodiversity Protection Strategy and Action Plan of Guangxi Zhuang Autonomous Region (2013-2030) (GHF [2014] No. 12);

(22) Regulations on the Administration of Forest and Wildlife Nature Reserves in Guangxi Zhuang Autonomous Region (revised in 2016);

(23) Comments of the People's Government of Guangxi Zhuang Autonomous Region on Implementing the "Three Lines and One Single" Zoning Control of Ecological Environment (GZF [2020] No.39).

1.4 Relevant Requirements of AIIB

This Report is prepared in accordance with the Environmental and Social Framework issued by AIIB. Relevant policy requirements set out in the Environment and Social Framework include:

(I) Basic definitions and provisions in the Environmental and Social Framework

Client: means the recipient of the Bank financing for a Project and any other entity responsible for implementation of the Project.

Project: means the specific set of activities for which the AIIB financing is

provided, as defined in the agreement governing such financing, regardless of the financing instrument or the source of such financing or whether the Project is financed in whole or in part by the AIIB.

The environmental and social framework includes:

Environmental and Social Policy (ESP), including the compulsory environmental and social requirements of a Project.

Environmental and social standards. Three associated mandatory environmental and social standards (ESSs) set out more detailed environmental and social requirements relating to the following:

ESS 1: Environmental and Social Assessment and Management;

ESS 2: Involuntary Resettlement;

ESS 3: Indigenous People.

Environmental and Social Exclusion List. The Bank will not knowingly finance a Project that involves activities or items specified in this list (Exclusion List).

Scope of Application of Environmental and Social Policy (ESP): All projects. The AIIB requires each client to manage the environmental and social risks and impacts associated with its Project in a manner designed to meet the ESP and the applicable ESSs in accordance with the environmental and social management plan (ESMP), and environmental and social management planning framework (ESMPF), as applicable, required for the Project under this ESP and ESSs.

(II) Classification of Items

AIIB classifies the proposed projects into four categories as follows:

Category A. A Project is categorized A if it is likely to have significant adverse environmental and social impacts that are irreversible, cumulative, diverse or unprecedented.

Category B. A Project is categorized B when: it has a limited number of potentially adverse environmental and social impacts; the impacts are not unprecedented; few if

any of them are irreversible or cumulative; they are limited to the Project area; and can be successfully managed using good practice in an operational setting. AIIB requires the Client to conduct an initial review of the environmental and social implications of the Project.

Category C. A Project is categorized C when it is likely to have minimal or no adverse environmental and social impacts.

Category F1. A Project is categorized FI if the financing structure involves the provision of funds to or through a financial intermediary (FI) for the Project.

(III) Requirements for Environmental and Social Standards

When AIIB has determined, in consultation with the Client, that the Project has potentially adverse environmental or social risks and impacts, it requires the Client:

• To conduct an environmental and social assessment relating to these risks and impacts, and design appropriate measures to avoid, minimize, mitigate, offset or compensate for them, all as required under ESS 1.

• If the Project would result in Involuntary Resettlement, to address this in the social section of the assessment report, complemented by more in-depth coverage, as required under ESS 2. The Client covers Involuntary Resettlement in a Resettlement Action Plan or resettlement planning framework (RPF) which is provided to the AIIB as a freestanding document, an annex to the assessment report, or incorporated into the report as a recognizable element.

• If the Project would affect Indigenous Peoples, to address this in the social section of the assessment report, complemented by more in-depth coverage, as required under ESS 3. The Client covers impacts on Indigenous Peoples in an Indigenous Peoples plan (Indigenous Peoples plan) or Indigenous Peoples planning framework (IPPF), which is provided to AIIB as a freestanding document, an annex to the assessment report, or incorporated into the report as a recognizable element.

1.5 Relevant Planning

1.5.1 Planning Documents

(1) Guangxi Expressway Network Plan (2018-2030) (November 2018);

(2) Working Program for Construction of Expressways Passing through Every County (July 2014);

(3) Water Function Zoning of Guangxi (amended) (Water Resources Department of Guangxi Zhuang Autonomous Region, 2016);

(4) Ecological Function Zoning of Guangxi Zhuang Autonomous Region (GZBF [2008] No. 8, February 14, 2008);

(5) Main Function Zoning of Guangxi Zhuang Autonomous Region (GZF [2012] No. 89, November 21, 2012);

(6) The 13th Five-Year Plan for Environmental Protection and Ecological Construction of Guangxi;

(7) Water Function Zoning of Chongzuo City (Water Resources Bureau of Chongzuo City, January 2017);

(8) The 13th Five-Year Plan for Highway and Waterway Transportation Development of Guangxi (2016-2020);

(9) Master Plan for Ports of Chongzuo City;

(10) Master Plan for Land Use of Tiandeng County (2006-2020);

(11) Master Plan for Land Use of Daxin County (2006-2020);

(12) Master Plan for Shuolong Town of Daxin County and Master Plan for Port Economic Zone of Shuolong Town (2016-2030);

(13) Master Plan for Huashan Scenic Area (October 1993) and the official reply to the report;

(14) Master Plan for Xialei Nature Reserve at the Level of Guangxi Autonomous Region (2017-2026) (Guangxi Forest Inventory & Planning Institute, January 2018);

(15) Technical Report on Division of Protection Areas of Drinking Water Sources in Urban Area of Tiandeng County and the official reply to the report;

(16) Technical Report on Division of Protection Areas of Drinking Water Sources

in Townships and Towns of Tiandeng County and the official reply to the report;

(17) Technical Report on Division of Protection Areas of Centralized Drinking Water Sources in Rural Area of Tiandeng County and the official reply to the report;

(18) Technical Report on Division of Protection Areas of Drinking Water Sources in Townships and Towns of Daxin County and the official reply to the report;

(19) Technical Report on Division of Protection Areas of Centralized Drinking Water Sources in Rural Area of Daxin County and the official reply to the report;

1.5.2 Environmental Functional Zoning

1.5.2.1 Function Zoning for Atmospheric Environment

No function zone in terms of atmospheric environment is identified within the assessment area. According to Ambient Air Quality Standards (GB 3095-2012), Class I zones include natural reserves, scenic spots and other areas in need of special protection; Class II zones include the residential quarters designated in town planning, mixed areas of business, transportation and living, cultural areas and rural areas. Therefore, Class I standard in Ambient Air Quality Standard (GB3095-2012) are adopted for Xialei Nature Reserve and Huashan Scenic Area, while Class II standard in Ambient Air Quality Standard (GB3095-2012) for other areas.

1.5.2.2 Surface Water Environment

The surface waters near the highway mainly include the Xialei River, the Guichun River and the Baidou River. According to the *Water Function Zoning of Chongzuo City* (issued on January 2017), the highway crossing the Xialei River is within the Xialei River Daxin Development and Utilization Zone–Xialei River Daxin Yixian Transitional Zone, while the highway crossing the Guichun River is within the China-Vietnam Heishui River Nature Reserve, and the Baidou River has no water function zoning. The river section that finally flows into the Heishui River belongs to the Xialei River Daxin Development and Utilization Zone–Xialei River Daxin Yixian Transitional Zone. Therefore, the water quality standards of Leihe Daxin Development and Utilization Zone- Xialei River Daxin Yixian Transition Zone shall be followed. See Table 1.5-1 for specific standards.

Table 1.5-1 Water Function Zoning of Rivers and Reservoirs Crossing the Project

S/N	Name of Crossing/adjacent Rivers And Reservoirs	Water Function Zoning of River Reaches	Water Quality Target
1	Xialei River	Xialei River Daxin Development and Utilization Zone–Xialei River Daxin Yixian Transitional Zone	Ⅲ
2	Guichun River	Heishui River Reserved Area between China and Vietnam	Ⅲ
3	Baidou River	/	Ⅲ

1.5.2.3 Groundwater Environment

No function zone in terms of groundwater environment is identified within the assessment area. According to Standard for Groundwater Quality (GB/T 14848-2017), Class III criteria are adopted for centralized domestic drinking water sources and industrial and agricultural water.

1.5.2.4 Acoustic Environment

The main areas along the Project are towns, townships and rural areas, and no acoustic environment function zone is identified. According to the requirements in Environmental Quality Standard for Noise (GB 3096-2008) and Technical Specification for Regionalizing Environment Noise Function (GB/T 15190-2014), the villages along the Project but not accessible by traffic arteries are identified as Class 1 acoustic environment function zones, and the following standards are adopted for villages with traffic trunk passing.

① If the buildings by the highway are mainly higher than three floors (inclusive), the area of the first row of buildings facing the highway is identified as Category 4a acoustic environment function zone, and the area behind as Category 2 acoustic environment function zone.

② If the buildings by the highway are mainly lower than three floors (including open ground), the area within 35m of the ROW is identified as Category 4a acoustic environment function zone, and the area beyond as Category 2 acoustic environment function zone.

This Project is a traffic artery, and the function zones will be identified as

mentioned above after being put into operation.

1.5.2.5 Ecological Environment

According to the Ecological Function Zoning of Guangxi Zhuang Autonomous Region (2008), the Project is located in an important biodiversity protection function zone in karst mountain areas of southwest Guangxi.

Table 1.5-2 Characteristics of Ecological Function Zoning in Project Area

Class I Zone	**Class II Zone**	**Class III Zone**	**Location and Area**	**Main Ecological Problems**	**Eco-environmental Sensitivity**	**Dominant Eco-service Function**	**Ecological Conservation and Development Direction**
Ecological regulation function zone	Biodiversity Protection Function Zone	Biodiversity protection function zone in karst mountain areas of southwest Guangxi	This area involves 14 districts and counties in southwest Guangxi and covers an area of 19,500 km^2.	Severely damaged natural forests, resulting to low forest coverage and prominent rocky desertification; relatively fragmented habitats, with serious invasion of foreign species such as fragrant eupatorium herb, threating biodiversity; ecological damage and serious soil erosion resulting from steep slope reclamation and disordered exploitation of local minerals; and frequent occurrence of	Extremely sensitive to soil erosion and rocky desertification	Biodiversity Protection	Accelerating the development of water source conservation forests and soil and water conservation forests; protecting natural ecosystems and habitats of important species; handling drought; ecological restoration of mining areas.

				drought damage.			

1.6 Environmental Quality and Pollutant Emission Standards

Based on the preliminary investigation of the regional environmental conditions of the Project, the scale and characteristics of the Project construction, the environmental function zoning along the highway, and the Environmental Quality Standard for Noise (GB 3096-2008), the EIA standards for the Project are as follows:

1.6.1 Environmental Quality Standards

1.6.1.1 Ambient Air Quality Standard

Wuzhou (Longyanzui) to Shuolong Expressway (Chongzuo–Jingxi Expressway to Shuolong Port Section): Section K7+885~K10+715 of the main line and Section AK3+600~AK4+600 of the connecting line pass through the pilot area of Xialei Nature Reserve of Guangxi; Section K11+500~K12+263 (end point) of the main line chainage and Section AK0+000~AK5+416 of the connecting line of the Project pass through Class II conservation area of Guangxi Huashan Scenic Area, and Class I criteria in Ambient Air Quality Standard (GB3095-2012) are adopted for the sections passing through the nature reserve and scenic area, while Class II criteria for the other sections that do not pass through the nature reserve.

Detian-Shuolong Highway: The whole line is located in the Class II conservation area of Guangxi Huashan Scenic Area, and Class I criteria in *Ambient Air Quality Standard* (GB3095-2012) are adopted to assess the environmental air quality in the region.

Shuolong Port (Phase II of Shuolong Main Gate): The project is located in the landscape coordination area of the Huashan Scenic Area in Guangxi, and the air quality of the assessment area shall reach the Class I criteria stipulated in the Ambient Air Quality Standard (GB3095-2012).

Table 1.6-1 *Ambient Air Quality Standard* (GB 3095-2012) (Excerpt)

S/N	Pollutants	Average Time	Concentration limit		Unit
			Level I	Level II	
1	Sulfur dioxide (SO2)	Annual average	20	60	μg/m^3
		24hr average	50	150	
		1hr average	150	500	
2	Nitrogen dioxide (NO2)	Annual average	40	40	
		24hr average	80	80	
		1hr average	200	200	
3	Carbon monoxide	24hr average	4	4	mg/m^3

	(CO)	1hr average	10	10	
4	Ozone (O3)	Daily maximum of average 8h	100	160	μg/m^3
		1hr average	160	200	
5	Particulates (≤ 10μm)	Annual average	40	70	
		24hr average	50	150	
6	Particulates (≤ 2.5μm)	Annual average	15	35	

1.6.1.2 Environmental Quality Standards for Surface Water

The proposed Project crosses surface waters including the Xialei River, the Guichun River and the Baidou River, and Class III criteria in Environmental Quality Standards for Surface Water (GB 3838-2002) are adopted, and Class III criteria in Resources Quality Standards for Surface Water (SL 63-94) are adopted for the assessment of suspended substances.

Table 1.6-2 *Environmental Quality Standards for Surface Water* (GB 3838-2002) (Excerpt)

S/N	Pollutant Index	Limit Value of Class III Standard	Unit
1	Water temperature	Artificially caused ambient water temperature change shall be limited at: Maximum weekly average temperature rise ≤ 1; maximum weekly average temperature drop ≤ 2.	℃
2	pH value	6～9	Dimensionless
3	Dissolved oxygen	≥5	mg/L
4	Permanganate index	≤6	
5	Biochemical oxygen demand for five days	≤4	
6	Chemical oxygen demand	≤20	
7	Ammonia nitrogen	≤1.0	
8	Total phosphorus	≤0.2	
9	Suspended substance	≤30	
10	Petroleum	≤0.05	
Remark: Refer to Class III criteria in Resources Quality Standards for Surface Water (SL 63-94) for the criteria of suspended substances.			

1.6.1.3 Environment Quality Standard for Groundwater

Class III criteria in Standard for Groundwater Quality (GB/T 14848-2017) are adopted for the groundwater quality in the region of the Project, and the details are shown in Table 1.6-3.

Table 1.6-3 *Standard for Groundwater Quality* (GB/T 14848-2017) (Excerpt) Unit: mg/L, except for pH

S/N	Item	Class Ⅲ
1	pH value	6.5~8.5
2	Total hardness (in terms of CaCO3) ≤	450

S/N	Item	Class Ⅲ
3	Oxygen consumption ≤	3.0
4	Nitrate (in terms of N) ≤	20.0
5	Nitrite (in terms of N) ≤	1.0
6	NH3-N ≤	0.50
7	TC (MPNb/100mL or CFUc/100mL) ≤	3.0
8	Fe ≤	0.3
9	Mg ≤	0.1

1.6.1.4 Environmental Quality Standard for Noise

According to *Environmental Quality Standards for Noise* (GB 3096-2008), *Technical Specifications for Regionalizing Environmental Noise Function* (GB/T 15190-2014) and *Notice on Issues Concerning Environmental Noise in Environmental Impact Assessment of Such Construction Projects as Highways and Railways* (including Light Rails) (State Environmental Protection Administration, HF [2003] No. 94), the acoustic environment assessment standard for the Project is determined as follows:

1. Assessment of Current Conditions

Status assessment: according to the *Environmental Quality Standard for Noise* (GB 3096-2008), Class 1 criteria are adopted for villages in principle, and Class 2 criteria in the Environmental Quality Standards for Noise are adopted for the acoustic environment status of villages along the Project (areas other than the Category 4 acoustic environment function zone) where there are highways, provincial roads and other traffic arteries pass through; and the following standards are adopted for the current situation of the regional acoustic environment of sensitive points that are located near the existing traffic arteries:

(1) For the areas within the assessment scope on both sides of the existing traffic arteries, if the buildings by the highway are mainly higher than three floors (inclusive), Class 4a criteria in the Environmental Quality Standards for Noise are identified to be applicable to the area of the first row of buildings facing the highway, and Class 2 criteria in the Environmental Quality Standards for Noise to the area behind.

(2) If the buildings by the highway are mainly lower than three floors (including open ground), Class 4a criteria in the Environmental Quality Standards for Noise are

identified to be applicable to the area within 35m of the ROW, and Class 2 criteria in the Environmental Quality Standards for Noise to the area beyond.

Class 1 criteria are adopted in rural areas along the Project but not accessible by grade roads.

2. Impact Assessment

(1) For the areas within the assessment scope on both sides of the Project, if the buildings by the highway are mainly higher than three floors (inclusive), Class 4a criteria in the Environmental Quality Standards for Noise are identified to be applicable to the area of the first row of buildings facing the highway, and Class 2 criteria in the Environmental Quality Standards for Noise to the area behind.

(2) If the buildings by the highway are mainly lower than three floors (including open ground), Class 4a criteria in the Environmental Quality Standards for Noise are identified to be applicable to the area within 35m of the ROW, and Class 2 criteria in the Environmental Quality Standards for Noise to the area beyond.

(3) According to the requirements in the document HF [2003] No.94, the outdoor noise criteria of 60dB (A) during the daytime and 50dB(A) during the nighttime are adopted for schools, hospitals (sanatoriums, nursing homes) and other special sensitive buildings within the assessment scope.

See Table 1.6-4 for the above environmental quality standards for noise.

Table 1.6-4 Quality Standard for Acoustic Environment (GB3096-2008) (Excerpt), HF [2003] No.94

Unit: dB(A)

Category	Daytime	Nighttime	Area of Application
1	55	45	Areas mainly for residential purpose and villages not accessible by grade roads
2	60	50	Areas mainly for commercial finance and trade markets, or mixed zones of residential areas, business areas, and industrial areas where quietness for residential areas needs to be maintained.
Schools and hospitals	60	50	Schools, hospitals (nursing homes, old people's homes) and other special sensitive buildings
4a	70	55	Areas on both sides of a traffic artery where the impact of traffic noise on environment needs to be prevented.

1.6.2 Discharge Standards for Pollutants

1.6.2.1 Waste Gas Emission Standard

The relevant emission standards in the Integrated Emission Standard of Air

Pollutants (GB 16297-1996) are adopted for the emission of air pollutants during the construction period, and the details about the standard limits are shown in Table 1.6-5.

Table 1.6-5 ***Integrated Emission Standard of Air Pollutants*** **(GB16297-1996) (Excerpt)**

S/N	Pollutants	Concentration limit		
		Monitoring Point	Concentration	Unit
1	Particulates (TSP)	The highest concentration point outside perimeter	1.0	mg/m^3
2	Sulfur dioxide (SO2)		0.40	
3	Nitrogen oxide (NOx)		0.12	
4	Asphalt fume		No obvious unorganized emission from the production equipment shall exist	

1.6.2.2 Wastewater Discharge Standard

The production wastewater and domestic wastewater during the construction period will be reused after being treated or used as agricultural fertilizer, and will not be discharged. The sewage discharged from service facilities during the operation period will be reused after being treated to the standard for flushing toilets, road cleaning and urban greening (Table 1.6-6) in accordance with The Reuse of Urban Recycling Water - Water Quality Standard for Urban Miscellaneous Water Consumption (GB/T 18920-2002).

Table 1.6-6 ***The Reuse of Urban Recycling Water - Water Quality Standard for Urban Miscellaneous Water Consumption*** **(GB/T 18920-2002) Unit: mg/L**

S/N	Item	Toilet Flushing	Road Sweeping	Urban Greening
1	pH (dimensionless)	6~9		
2	TDS ≤	1500	1500	1000
3	Anionic surfactant ≤	1.0	1.0	1.0
4	Coliform group (Nr./L)	3	3	3
5	DO ≥	1.0	1.0	1.0
6	*Suspended substance (SS)	70	70	70
7	*COD≤	50	50	50
8	BOD_5≤	10	15	20
9	NH_3-N≤	10	10	20
10	*Petroleum ≤	1.0	1.0	1.0

*Note: Class I discharge criteria in Integrated Wastewater Discharge Standard (GB 8978-1996) are adopted for suspended substances, and the discharge standards in Wastewater Reuse of Highway Service Area - Water Quality (JT/T 645.1-2016) are adopted for COD and petroleum.

1.6.2.3 Nose Emission Standard

Emission Standard of Environment Noise for Boundary of Construction Site (GB12523-2011) should be executed during the construction period.

Table 1.6-7 *Emission Standard of Environment Noise for Boundary of Construction Site* (GB 12523-2011) Unit: dB(A)

Category	Daytime	Nighttime
Emission standard	70	55

2 Environmental and Social Management System

According to the spirit of management authority stipulated in the Environmental Protection Law of the People's Republic of China and Regulations on Environmental Protection Management of Construction Projects, the environmental impact report form of Component A is approved by Chongzuo Ecological Environment Bureau, and the environmental impact report form of Component B is approved by Ecological Environment Bureau of Daxin County. The environmental impact reports of Component A and Component B are planned to be submitted for review at the end of April 2021 and are expected to get a reply by the end of May. The environmental impact report form of Component C has been approved by Ecological Environment Bureau of Daxin County and has received a reply on May 23, 2017 (XHGP [2017] No.7). Chongzuo Ecological Environment Bureau and Daxin Ecological Environment Bureau are the environmental agencies governing local projects. Their responsibilities are to put forward environmental protection requirements according to the environmental impact assessment reports and coordinate the environmental management among different departments. Under the framework of project management, the AIIB loan project office is responsible for managing the overall implementation of the project, while the Owner is responsible for implementing specific affairs. In order to ensure the smooth implementation of environmental management measures, the Project Office, the Owner, the Contractor, and the Operator shall be equipped with a group of full-time or part-time environmental management personnel to implement the Environmental and Social Management Plan.

2.1 Composition of the Environmental and Social Management Organization

Since the environmental management is quite different during construction and operation, and the work is divided into temporary and long-term types, the Contractor and the Operator will establish their own organizations and assume their own responsibilities according to different stages. After the completion of the construction, the relevant management organization will be revoked immediately, and another

management organization will begin to operate during the operation period. Guangxi Chongzuo City Construction Investment Development Group Co., Ltd. (the Owner) shall update and adjust the environmental and social management of the project, and further improve the environmental and social management organization and system in accordance with the *Environmental Protection Law of the People's Republic of China*, *Environmental Impact Assessment Law of the People's Republic of China*, *Regulations on the Administration of Construction Project Environmental Protection*, and *Environmental and Social Framework*. See Figure 2.1-1 for the environmental management organization during construction and operation.

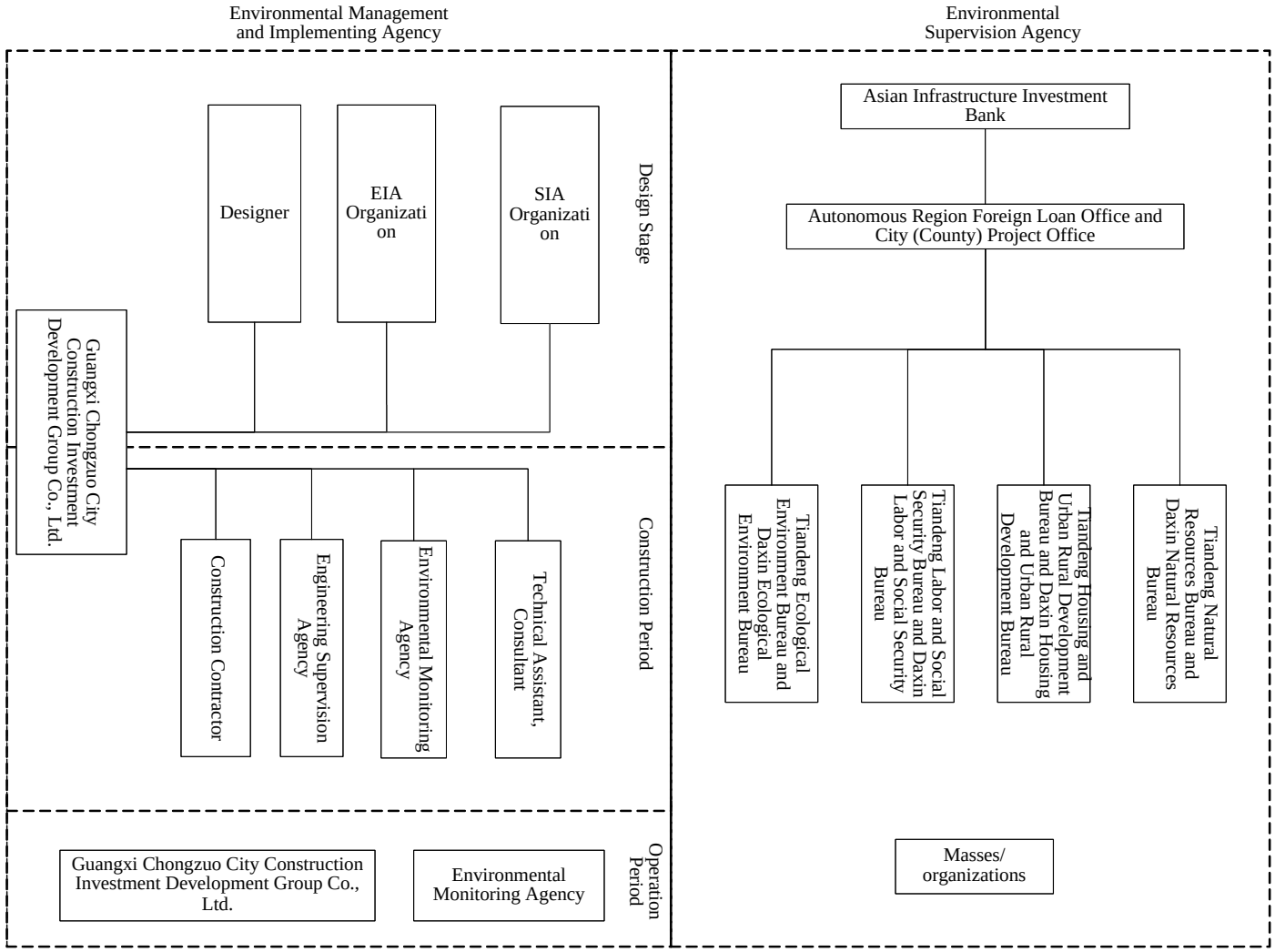

Figure 2.1-1 Composition of Environmental and Social Management and Supervision Organizations in Each Stage

2.2 Management Responsibilities and Objectives

Since environmental and social management is quite different during construction and operation, the environmental and social management plan will be implemented by different departments. See Table 2.2-1 for the work content and staffing of environmental and social management organizations in stages.

Table 2.2-1 Environmental and Social Management Work in Stages

Stage	Related Parties	Work Contents
Design and preparation	Project office at the region level	Assign an environmental officer to take charge of environmental protection during the project planning, design, and implementation, ensure that the working procedures meet the environmental assessment and management requirements of the state and AIIB, and support and supervise the implementation of the environmental management plan.
	Project office at county or city level	Maintain contact with environmental departments and coordinate with them to handle matters on environmental management.
	Employer	1. Be responsible for a series of environmental and social protection management in project design and preparation; 2. Prepare environmental and social impact assessment report, environmental and social management plan and resettlement action plan; entrust a qualified unit to prepare the social stability risk assessment report of land requisition. 3.Allocate environmental protection and resettlement cost in place; 4. Coordinate with environmental departments to handle matters on environmental management; 5. Hire supervision and monitoring organizations and collect records.
	Designer	1. Incorporate environmental protection measures into the design scheme and the costs for the preparation and monitoring of environmental protection and resettlement plans. In the budget; 2. Include the mitigation measures in the environmental and social management plan and resettlement plan into the design.
	EIA Organization	1. Provide technical support for environmental protection of engineering design; 2. Prepare the environmental impact assessment documents; 3. Formulate environmental management plan.
	SIA Organization	1. Provide technical support for assessing the social stability risk of engineering design; 2. Prepare documents on the social stability risk assessment; 3. Formulate social management plan.
	County (municipal) ecological environment bureau	1. Responsible for the EIA approval of the project; 2. Responsible for the daily environmental supervision and management of the project.

Stage	Related Parties	Work Contents
Construction Period	Employer	1. Take charge of environmental and social protection during construction and deal with matters related to the funds of environmental protection and resettlement; 2. Conduct internal monitoring and submit regular monitoring reports on the implementation of the resettlement plan; entrust an independent third party agency to conduct external monitoring and evaluation and publicly disclose external monitoring reports; submit all monitoring reports to AIIB on a regular basis. 3. Manage and supervise the environmental protection, and investigate and deal with the nuisances or pollution problems during construction; 4. Coordinate with environmental departments to handle matters on environmental management; 5. Follow up the implementation of the environmental and social management plan, and report to the competent department at the same level, the provincial project office, and AIIB regularly. 6. Receive and handle complaints from the public.
	Contractor	1. Formulate the environmental management plan based on EMP, as a part of the technical specifications; 2. Perform responsibilities in relation to environmental protection under the contract, including environmental, social, health and safety measures; 3. Accept the guidance and supervision of the Owner's environmental managers, supervision engineers, and relevant government departments; 4. Accept the technical support provided by an environmental consulting firm; 5. Take protective measures, such as setting up prompt signs at the construction site, and erecting enclosures along the boundary of the construction site, and establish communication channels available to the public to ensure construction safety.
	Construction Supervisor	1. Supervise the Contractor to perform the contract and implement the environmental management plan, and implement the mitigation measures in the contract; 2. Supervise the Contractor's work at the site; 3. Cooperate with the Employer in environmental management; 4. Record the implementation results of the environmental management plan to prepare a report and submit it to the Owner regularly.
	External monitoring organization	1, According to the project owner's entrustment and environmental monitoring plan and resettlement monitoring plan put forward by environmental and social impact assessment report and resettlement action plan, complete the monitoring work during the project construction and operation period; 2. In case of abnormal conditions, conduct monitoring under the entrustment of the Owner.
	County (municipal) ecological environment bureau	1. Supervise and inspect the environmental protection measures of the Owner and the Contractor; 2. Receive the implementation report on the environmental management plan submitted by the Owner and the Project Office, and carry out administrative management according to the report; 3. Take emergency measures in case of abnormal circumstance during construction; 4. Receive complaints from the public and handle them.

Stage	Related Parties	Work Contents
	Technical Assistant/Consultant	1. According to the entrustment of the project owner, environmental and social impact assessment report, resettlement action plan and environmental protection design results, provide technical support for environmental protection and resettlement work during the construction period; 2. Provide the Contractor with technical guidance and relevant training in environmental protection during the construction period.
Operation Period	Owner/Operator	1. Conduct environmental protection management after the operation ends, and implement mitigation measures and monitoring of the environmental management plan during operation; 2. Maintain contact with government departments and coordinate with them to handle matters on environmental management. 3. Give emergency response to environmental accidents; 4. Regularly train employees to improve their ability, exchange experience in environmental protection technologies, and further improve environmental management.
	External monitoring organization	1. According to the environmental monitoring plan, complete the monitoring work during operation under the entrustment of the Owner; 2. Conduct routine monitoring related to the project.
	County (municipal) ecological environment bureau	1. According to the environmental monitoring plan, complete the monitoring work during operation under the entrustment of the Owner; 2. Conduct routine monitoring related to the project.
	Masses/organizations	Social supervision

2.3 Environmental and Social Management Organization of the Employer

Guangxi Chongzuo City Construction Investment Development Group Co., Ltd. (the Employer) is responsible for implementing the Environmental and Social Management Plan of the project. In order to strengthen the environmental and social management, the Employer has set up the environmental and social management organization -Guangxi Chongzuo Border Connectivity Improvement Project Executive Office (hereinafter referred to as the "Project Executive Office"), which should be deployed with full-time management staff and should adjust the environmental and social management of the project, and further improve the environmental and social management system during the project implementation. The environmental and social management organization is set as follows:

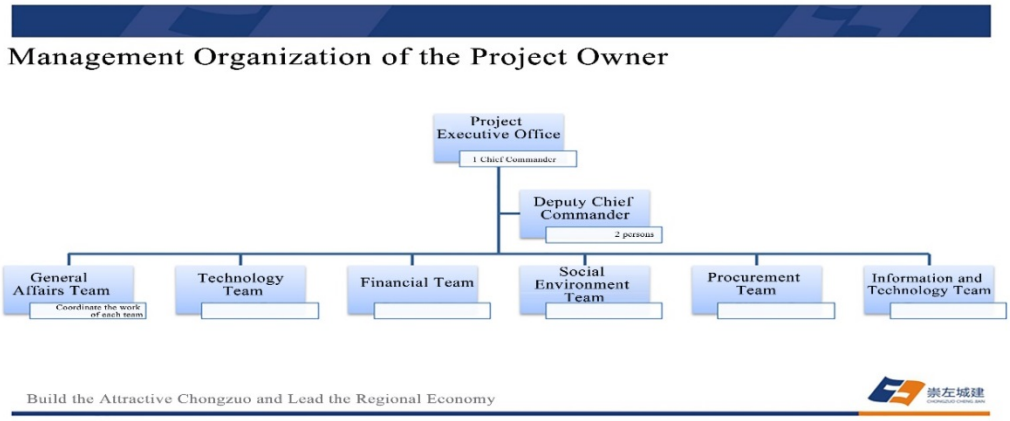

Figure 2.3-1 Schematic Diagram of Project Owner Management Organization

The number of people in teams of the Project Executive Office and their responsibilities are as follows:

I. Comprehensive team: 2 persons

Be responsible for the overall management of the project, coordinating the work of each team, dealing with documents, arranging the preparation of implementation report and logistics work, coordinating and assisting in the management of the project work, and ensuring the orderly connection and smooth development of various businesses of the project.

II. Technical team: 8 persons (2 bridge and tunnel experts are hired additionally)

Be responsible for the technical review of the project, preparing the technical implementation report, communicating for the preliminary work of the project, comprehensively managing the safety, quality, progress and other matters during the construction period, reviewing the withdrawal and reimbursement materials, organizing the project completion acceptance and filing and collecting the project data.

III. Social Environment Team: 5 persons (another expert is hired)

Be responsible for the progress supervision of environmental monitoring work such as environmental impact, hydrology, soil and water conservation and humanities required for project approval, and reporting to relevant departments to obtain the

approval documents of various environmental impact reports of the project; be responsible for communication and contact with the land requisition and demolition sub-headquarters of each county, women's federations at all levels, county civil affairs bureaus, poverty alleviation offices, departments of natural resources, ecological environment, forestry, water conservancy, hydrology as well as town government and other departments, and preparing the resettlement action plan, environmental and social impact assessment report and environmental and social management plan required by AIIB with the help of technical assistance units; be responsible for communication and contact with relevant departments of land requisition and demolition of the project, reviewing and confirming the appropriation data of land requisition and demolition, and promoting the land requisition and demolition work of project resettlement; be responsible for internal monitoring of resettlement action plan, and providing relevant monitoring implementation progress to external monitoring institutions; be responsible for coordinating with the competent department of ecological environment to implement environmental management matters; be responsible for the environmental and social protection management of the project; managing and supervising the environmental and social work during the construction period, and accepting and handling public complaints; following up the implementation of environmental and social management plan and reporting to relevant departments regularly; organizing regular training on resettlement action plan and environmental and social management plan.

IV. Finance Team: 4 persons (another financial consultant is hired)

The finance team is fully responsible for the financial work of the project and establishment of the project financial management system; implementing domestic matching funds, reviewing withdrawal and reimbursement materials, and paying related expenses such as resettlement and environmental monitoring, as well as project payment work; preparing financial reports, cooperating with audit work, carrying out financial management and supervision, and preventing potential risks.

V. Procurement Team: 3 persons (another expert is hired)

Be responsible for the project's design, supervision, construction, resettlement monitoring, environmental monitoring and other third-party services, goods and equipment, and other related procurement bidding services.

VI. Information Team: 2 persons

Be responsible for the information processing of the project informatization

management and control platform, communicating with service providers and the social environment team, ensuring the normal operation of the informatization management and control platform, urging each team of the Executive Office to upload and update relevant information in time, and providing information support for the schedule of each sub-project of the project.

2.4 Related Requirements After Project Adjustment

The Project involves 2 ecological sensitive areas and 2 drinking water source protection areas. At this stage, the Project crossing ecological sensitive areas and drinking water source protection areas has been approved by the relevant authorities. However, the current route is in the stage of engineering feasibility study. With the recommendations in the implementation of the Project, the route may change in the construction drawing stage, which may lead to changes in the impact of the Project on ecological sensitive areas and drinking water sources, resulting in the infeasibility of ecological environmental protection measures in the first stage. Therefore, it is required here to refer to the *Notice on Printing and Distributing the List of Major Changes of Construction Projects in Some Industries in Environmental Impact Assessment Management* (HB [2015] No. 52) and its Attachment: List of Major Changes of Expressway Projects before the commencement. If the route changes constitute major changes, the environmental impact assessment documents shall be submitted for approval again according to Article 24 of the Environmental Impact Assessment Law of the People's Republic of China (revised on December 29, 2018).

If the adjustment of the Project does not constitute a major change, it will be included in the management of completion acceptance of environmental protection according to the requirements of Completion Acceptance Of Environmental Protection of the Construction Project of the *Law on the Management of the Environmental Inspection of Completed Construction Projects* (Decree No.13 of the State Environmental Protection Administration) and *Measures for Environmental Protection Management of Transport Construction Projects* (Decree No.5 of the Ministry of Transport in 2003). In the stage of environmental protection acceptance after completion, the feasibility and effect of environmental protection measures of the

Project will be monitored, and targeted corrective measures will be put forward if the mitigation effect is not achieved, ensuring that new impacts caused by project adjustments are effectively controlled.

3 Project Overview

3.1 Wuzhou (Longyanzui)-Shuolong Expressway (Chongzuo–Jingxi Expressway to Shuolong Port Section)

3.1.1 Basic Information of the Project

Project Name: Wuzhou (Longyanzui)– Shuolong Highway (Chongzuo–Jingxi Expressway to Shuolong Port Section)

Project nature: new project;

Construction site: Tiandeng county and Daxin county, Chongzuo City;

Land acquisition and demolition: The total land area of the Project is 2004.96 mu, and permanent LA occurs in subgrade works area, bridge works area, tunnel works area and facilities area along the line, with an area of 1391.96 mu. Temporary land occupation occurs in spoil area, temporary dump, construction, production and living areas and construction access road, with an area of 613 mu.

Construction period: It is planned to be commenced in October 2021 and completed in October 2024, with a construction period of three years.

Construction scale: the mainline is of expressway standard, with construction mileage of 12.263km, two-way four lanes, design speed of 100km/h and subgrade width of 26m. The connecting line is of Class-I highway standard, and the construction mileage of the connecting line is 5.416km, with two-way four lanes, design speed of 80km/h, subgrade width of 25.5m.

Main quantities: there are 7 bridges (3,768m)(excluding connectivity), 7 tunnels (5,075.5m), 1 toll station, 1 maintenance work area (built together with toll station), 20 culverts and 3 gates along the whole highway.

Project investment: the estimated investment is RMB 2,705,091,232, 20% of which is the capital owned by the owner and 80% of which is from bank loans.

3.1.2 Construction Contents in Recommended Scheme

The construction contents of the Project mainly include road engineering, bridge and culvert engineering, tunnel engineering, crossing engineering, connecting line engineering, traffic engineering and facilities engineering along the line.

Mainline of the Project: The mainline is of expressway standard, with construction mileage of 12.263km in Phrase I, two-way four lanes, design speed of 100km/h and subgrade width of 26m. One toll station, one control station and maintenance station are provided on the whole line. It will be constructed in the range of Chainage K5+800~K6+100.

Project connecting line: The connecting line is of Class-I highway standard, and the construction mileage of the connecting line is 5.416km, with two-way four lanes, design speed of

80km/h, subgrade width of 25.5m.

Table 3.1-1 List of Main Economic and Technical Indicators

S/N	Description of Index		Unit	Main line	Shuolong Connecting Line	Remarks
1	Route length		Km	12.263	5.416	
2	Subgrade Earthwork	Excavation	m^3	589533	430249	Excluding earthwork and stonework such as road relocation, connectivity and appurtenance
		Filling	m^3	1829355	331740	
3	Asphalt concrete pavement		km^2	72.318	87.08	Excluding connectivity
4	Special subgrade (soft foundation)		km	5.091	1.988	Calculated according to one side of division subgrade
5	Protection and drainage works (masonry)		km^3	26.358	16.566	Excluding connectivity
6	Super major and major bridges		m/Nr.	3669.5/6	98.5/1	
7	Medium bridge		m/Nr.	-	-	
8	Total bridges		m/Nr.	3669.5/6	98.5/1	
9	Super long tunnel		m/Nr.	-	-	
10	Long tunnel		m/Nr.	1182.5/1	1430/1	
11	Medium tunnel		m/Nr.	642.5/1	-	
12	Short tunnel		m/Nr.	1820.5/4	-	
13	Total tunnel		m/Nr.	3645.5/6	1430/1	
14	Interchange		Nr.	1	-	Jointly constructed with the Long'an - Shuolong Expressway
15	Neitun Hub Interchange	Subgrade excavation	m^3	352214	-	Scope of connectivity main line
		Subgrade filling	m^3	139	-	
		Asphalt pavement	km^2	7.946	-	
		Protective drainage (masonry)	km^3	2.814	-	
		Major bridge	m/Nr.	1443/1	-	
		Medium bridge	m/Nr.	-	-	
		Ramp bridge	m/Nr.	3026/6		Interchange ramp range
		Ramp tunnel	m/Nr.	201/1		
16	Culvert		Nr.	9	11	
17	Overpass		Nr.	-	-	
18	Corridor		Nr.	3	-	
19	Monitoring and communication branch center		Nr.	1	-	
20	Maintenance work area		Nr.	1	-	
21	Service area		Nr.	-	-	
22	Rest area		Nr.	-	-	
23	Mainline toll station		Nr.	1	-	
24	Floor area		Mu	1062	330	
25	Demolished buildings		m^2	329.2	0	
26	Investment estimate		(RMB 100 million)	22.37	4.68	27.05

Table 3.1-2 List of Recommended Bridge Schemes

S/N	Chainage		Bridge Name	Bridge Length (m)	Hole Number × Hole Diameter (m)	Structure Type
Main line						
1	Left breadth	ZK2+468	Nongwan No. 1 Viaduct	408	10×40	Fabricated prestressed concrete small box beam
	Right Breadth	YK2+428		328	8×40	
2	Left breadth	ZK3+555	Nongwan No. 2 Viaduct	450	11×40	Fabricated prestressed concrete small box beam
	Right Breadth	YK3+566		450	11×40	
3	Left breadth	ZK5+165	Buxuan Viaduct	607	20×30	Fabricated prestressed concrete small box beam
	Right Breadth	YK5+187		577	19×30	
4	Left breadth	ZK6+960	Dunli Viaduct	848.5	28×20	Fabricated prestressed concrete small box beam
	Right Breadth	YK6+950		878.5	28×30	
5	Left breadth	ZK8+795	Lonkalang Super Viaduct	1248	3×40	Fabricated prestressed concrete small box beam
	Right Breadth	YK8+815		1288	3×40	
6	Left breadth	ZK12+075	Bangtun Heishui River Major Bridge	128	3×40	Fabricated prestressed concrete small box beam
	Right Breadth	YK12+117		128	3×40	
		Total	6 bridges	3669.5		
Connector						
1	Left breadth	LZK5+353	Shuolong Guichun River Major Bridge	98.5	3×30	Fabricated prestressed concrete small box beam
	Right Breadth	LYK5+337		98.5	3×30	
		Total	1 bridge	98.5		

Table 3.1-3 List of Tunnels for the Project

S/N	Tunnel Name and Structure Type		Start and End Chainages			Length (m)	Tunnel Type
I	Main line						
1	Nongwan Tunnel	Left line	ZK1+790	～	ZK2+261	471	Small interval
		Right line	YK1+860	～	YK2+261	401	
2	Buli No.1 Tunnel	Left line	ZK3+786	～	ZK4+230	444	Small interval
		Right line	YK3+793	～	YK4+243	450	
3	Buli No.2 Tunnel	Left line	ZK4+410	～	ZK4+860	450	Small interval
		Right line	YK4+390	～	YK4+895	505	
4	Longkalang Tunnel	Left line	ZK7+700	～	ZK8+172	472	Small interval
		Right line	YK7+725	～	YK8+173	448	
5	Longdong No.1 Tunnel	Left line	ZK9+560	～	ZK10+205	645	Separated
		Right line	YK9+580	～	YK10+220	640	
6	Longdong No.2 Tunnel	Left line	ZK10+300	～	ZK11+480	1180	Separated
		Right line	YK10+340	～	YK10+933	1185	
II	Shuolong Connecting Line						
1	Shuolong Tunnel	Left line	AZK3+570	～	AZK4+990	1420	Separated
		Right line	AYK3+540	～	AYK4+980	1440	

Table 3.1-4 List of Service Management Facilities for the Project

S/N	Service Facility	Chainage (location)	Position relationship with sensitive areas
1	Toll station, communication monitoring sub-center, maintenance work area and bridge and tunnel management station are jointly built	K5+800~K6+100	Ecological sensitive areas and water source protection areas are not involved.

3.1.3 Forecast of Traffic Volume of the Project

(1) Forecast of traffic volume of each road section

See Table 3.1-5 for the traffic forecast of each section of the Project in each characteristic year according to the Feasibility Study Report of Wuzhou (Longyanzui) – Shuolong Highway (Chongzuo – Jingxi Expressway to Shuolong Port Section) Project.

Table 3.1-5 Traffic Forecast Results of Each Road Section (unit: pcu/d)

Road Section		Forecast Period		
		2025 (the 1st year after operation)	2031 (the 7th year after operation)	2039 (the 15th year after operation)
Main line	K1+693~K11+763	6177	14068	26421
Connector	AK0+000~AK2+500	4438	10177	19451
	AK2+500~AK5+410	2787	6389	12214

(2) Structure of Vehicle Types

See Table 3.1-6 for the vehicle type ratio of the Project according to the Feasibility Study Report of Wuzhou (Longyanzui) – Shuolong Highway (Chongzuo – Jingxi Expressway to Shuolong Port Section) Project.

Table 3.1-6 Vehicle Type Ratio and All-day to Daytime Ratio of Traffic Flow

Year / Vehicle Type	Year 2025 (the 1st year after operation)	Year 2031 (the 7th year after operation)	Year 2039 (the 15th year after operation)
Small freight vehicle	8.87%	7.01%	2.97%
Medium freight vehicle	10.47%	9.62%	6.76%
Large freight vehicle	10.77%	10.75%	11.89%
Combination Vehicles	3.79%	8.05%	17.30%
Small Passenger Vehicle	59.09%	58.71%	58.12%
Large Passenger Vehicle	7.01%	5.86%	2.97%

3.1.4 Setting of Earthwork Balance and Temporary Land

(1) Basic information of earth and stone fill and cut

The cut volume of the whole line (including the main line, connecting line, interchange ramp and maintenance work area) is about 1.86 million m3, and the fill volume is about 2.53 million m3, It includes: (1) about 590,000 m3 cut for the main line, mainly in Section Z(Y)K2~Z(Y)K4; and about 1.83 million m3 fill evenly distributed along the main line; (2) about 280,000 m3 cut and 220,000 m3 fill for the maintenance work area + tunnel management station + Monitoring and communication branch center + mainline toll station, which are mainly on Ramp A; (3) about 490,000 m3 cut for Neitun Hub Interchange (including for the ramps), mainly in Section Z(Y)K1+000~Z(Y)K1+790, with little fill for the interchange; and (4) about 430,000 m3 cut for the connecting line, mainly concentrated in Section AK0+000~AK2+900, and 330,000 m3 fill, evenly distributed along the main line. In addition to the cut for subgrade, the cut volume for the tunnels on the main line and connecting line is about 1.23 million m3, and 1.224 million m3 will be used for rolling stone, subgrade filling and soft foundation replacement as designed in the project feasibility study report, with a utilization rate of about 100%.

(2) Cut-fill balance scheme:

①The principle of proximity shall be implemented for cut-fill balance. In order to make full use of the excavated stone to prepare the crushed stone and other materials required by the Project, and to meet the requirement that the high-quality stone in the tunnel excavation and roadbed excavation shall be used as the structural crushed stone in the Project, the remaining subgrade excavation and the tunnel excavation slag shall be transported to backfill the embankment. In case of insufficient filling, it is considered to borrow soil from off-site borrow pits.

② Balance plan

Table 3.1-7 Earthwork Allocation Schedule (unit: 10,000m^3)

Chainage	Cut from subgrade used for rolling yard and soft foundation	Cut from subgrade used for road relocation	Cut from tunnel used for subgrade	Cut from tunnel used for rolling yard and soft foundation	Remarks
K0+000-K5+000	46.7		40.68	3.02	From ramp D of Neitun Interchange, Nongwan Tunnel, Buli No. 1 and No. 2 Tunnels
K5+000-K7+000	10.1	1.39			This section including the yard for the facilities along the line
K7+000-K10+000				13.44	Output from Longchang Tunnel
K10+000-K12+604			36.5		From Longdong No. 1 and No. 2 tunnels and Output from Shuolong Tunnel
AK0+000-AK5+416	11.7	3.8	10.42	18.38	Output from Shuolong Tunnel

Note: The earth-stone work of the subgrade includes the earth-stone work of the main line, connecting line, interchange ramp and maintenance work area.

③ The cut from subgrade and tunnels of this Project are fully utilized, and there is no spoil.

(3) Utility of machines for cut-fill balance:

① The pile is constructed by bulldozer

② The use of excavator and loader to cooperate with automobile construction

(4) Setting of borrow and disposal sites:

In order to further save investment, the prior usage of the cuts in the Project is to ensure the self-made stone, for cut-fill balance. Therefore, no cut from subgrade and tunnels of the whole line of the Project (including interchange ramps, field areas and connecting lines) will be spoiled. 355,000m3 soft foundation and subgrade will be replaced. The topsoil from site clearing of the whole route shall be placed at the temporary topsoil stacking yard, and then used for ridging of greening for medial strips and reclamation of spoil grounds. The quantity of ridging soil is 135,000 m3. There is a large cut volume from tunnel, and it can be temporarily stacked in the spoil site before being transported to the rolling yard. In this scheme, there are 3 spoil areas: 1# spoil area is located on the left side of K2+900; 2# spoil area is located on the right side of K4+330; 3# spoil area is located on the left side of AK0+350. Those spoil areas are set based on the branch ditches

near the line, and there is no large catchment around. The spoil area covers a total area of 139.2 mu with a capacity of 665,000 m^3, and the forest land, dry land and wasteland are occupied.

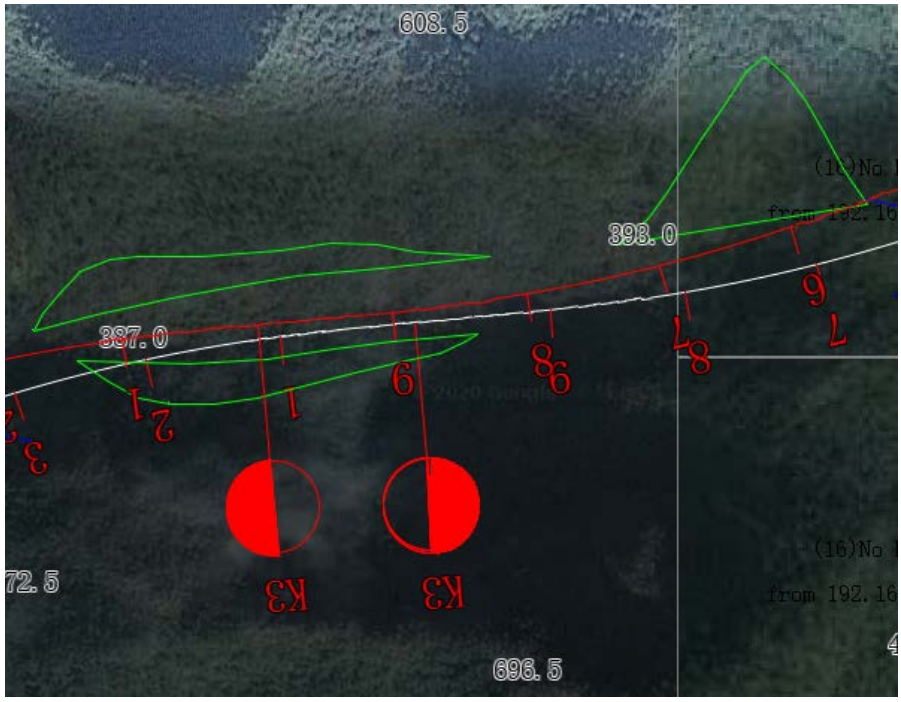

Figure 3.1-1 Site Selection of 1 # Spoil Area

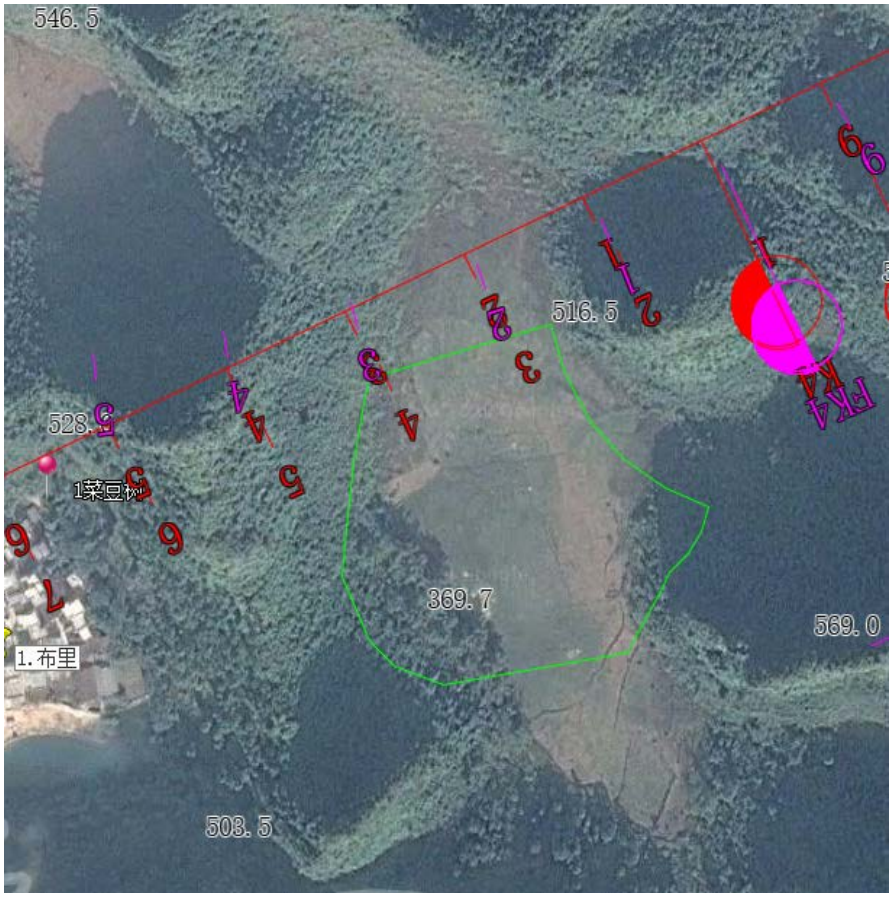

Figure 3.1-2 Site Selection of 2 # Spoil Area

Figure 3.1-3 Site Selection of 3 # Spoil Area

(5) Location of construction, production and living areas

It is proposed to provide two construction, production and living areas for the Project. The No.1 construction, production and living area is located near YK6+000, covering an area of about 100 mu. It is expected to install 2 mixers of model 180 with 10 bins, and an asphalt mixing station, equipped with at least one set of automatic metering asphalt concrete mixing station with capacity of 320t/h and above; it is provided with prefabricated house for the operators of the mixing station, concrete truck drivers and some project management personnel.

The No. 1 construction, production and living area is located near AK0+300 road section, covering an area of about 55 mu. The concrete mixing station is expected to be provided with two mixers of model 120 with 8 bins. In addition, two concrete mixing plants will be built at Neitun Interchange and Shuolong ending point to facilitate in the construction.

Figure 3.1-4 Site Selection of No.1 Construction, Production and Living Area

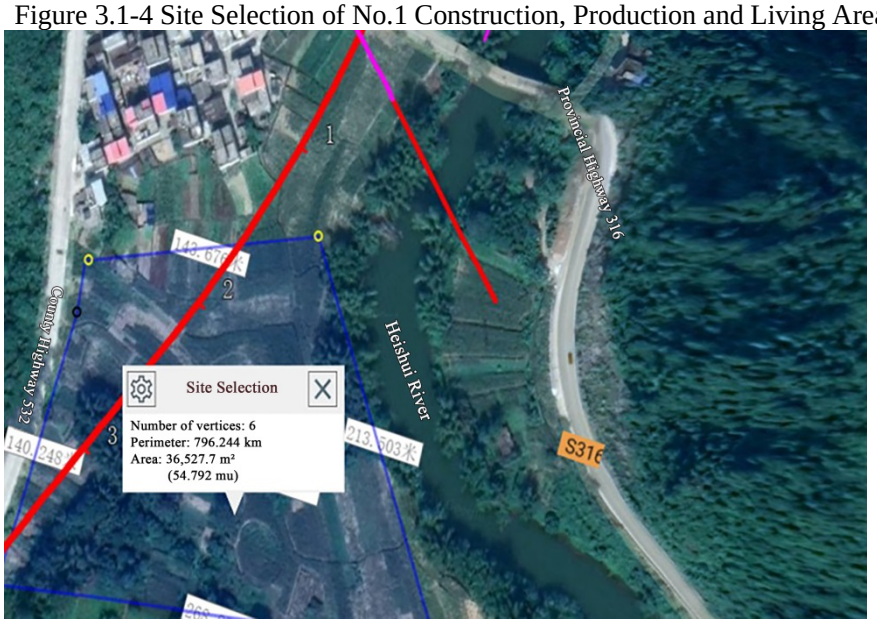

Figure 3.1-5 Site Selection of No.2 Construction, Production and Living Area

(6) Construction temporary access

The existing highways along the vertical and horizontal directions of the Project are mainly national highway G359 (the former S316), Tiandeng Connecting Line of Chongzuo–Jingxi Expressway, border highway (the former S325), county road X532. The main highway pavement is asphalt pavement and cement. These Class II highways are close to or intersected or parallel to the Project, so the traffic on most road sections is convenient. Due to the undulating terrain, the steep mountain cross-slope, and the bad traffic in some sections of the Project, it is necessary to build longitudinal access roads. The setting of the construction access road should be combined with the construction of the rural road network to adapt to the needs of the new rural construction. For materials such as sand and gravel used for thwart highway construction, the Owner is required to sign an agreement with the supplier to ensure the supply. For the access roads for the entire route, most of the temporary vehicle access roads are considered, and some are existing roads. In the design, temporary land for access roads, prefabrication yards, mixing stations and rolling yards are

included. The bridge-tunnel ratio of the Project is large, the terrain is complex, and the slope gradient needs to be considered in the construction of the access roads. Therefore, the actual access roads will be built in the form of curves, the long access roads need to be provided with meeting points, and the final construction length of the access road will have an error value of 15% ~ 20%. According to preliminary estimation in the early stage, it is necessary to build 7.5 kilometers of transverse access roads, widen 1.5 kilometers of existing township roads and build 360 meters of trestles. All routes of construction access roads are as follows:

Table 3.1-8 List of Construction Routes and Access Roads

S/N	Route	Length (km)	Remarks
1	Ramp G of Neitun Interchange	1.5	New access road
2	Entrance of Nongwan Tunnel	1.5	New access road
3	Entrance of Buli Tunnel	1	New access road
4	Longdong No.1 Tunnel	0.35	New access road
5	Entrance of Longdong No.2 Tunnel	0.5	New access road
6	Exit of Longdong Tunnel	1	New access road
7	Entrance of Shuolong Tunnel	1.2	New access road
8	Exit of Shuolong Tunnel	0.45	New access road
9	Existing village road K4	1.5	Village road widening
10	Longdong No.1 Tunnel	0.06	New trestle
11	Heishui River Major Bridge	0.1	New trestle
12	Guichun River Medium Bridge	0.2	New trestle

There is a village road near the ramp bridge, but because the height of the gate is only 3 meters, the construction machinery cannot access the site through the gate. Therefore, it is necessary to build a new access road at G Ramp.

Figure 3.1-6 Location of New Access Road (1.5 km) at G Ramp

During the visit, it was found that the mountain near the entrance of the new Nongwan Tunnel is a rocky mountain, the construction of the access road would take a long time, and the construction length would be about 1.5 Km long. See Figure 8-2 for its location plan.

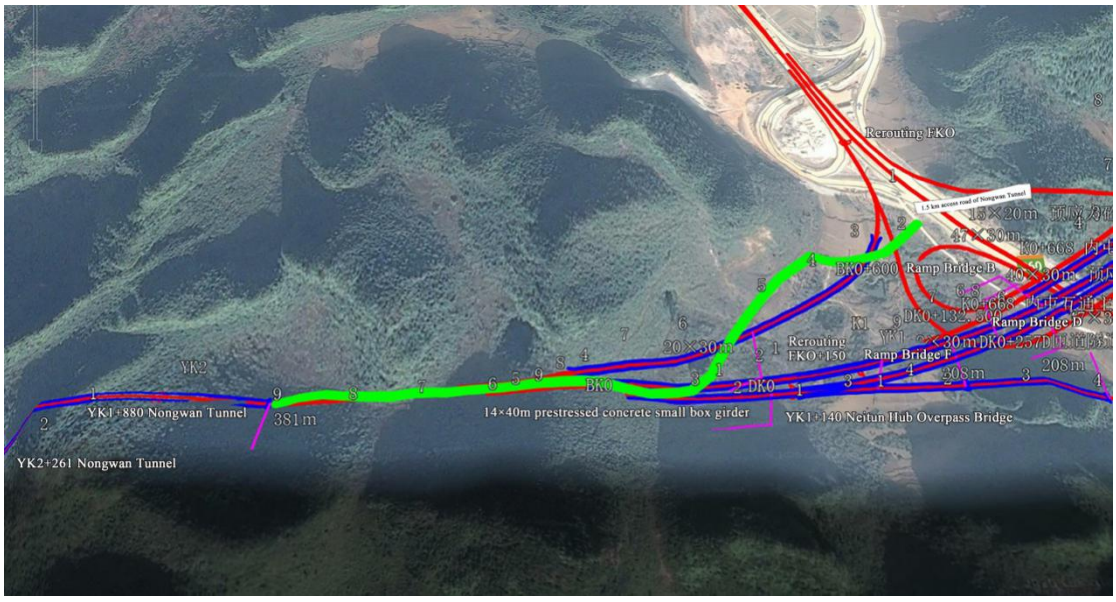

Figure 3.1-7 Location of New Access Road (1.5 Km) at Entrance of Nongwan Tunnel

There is a village road in K4 section, which is considered to be widened and built to the entrance of Buli Tunnel. In this case, there are residential areas nearby, and the noise and dust generated by construction may cause dissatisfaction among residents.

Figure 3.1-8 Village Road to be Widened in K4 Section for Building Access Road

Figure 3.1-8 shows the location of the new access road to the entrance of Buli Tunnel, in which the green line is the 1.5 km village road to be widened on K4 section, and the yellow line is the 1 km new access road to the entrance of Buli Tunnel.

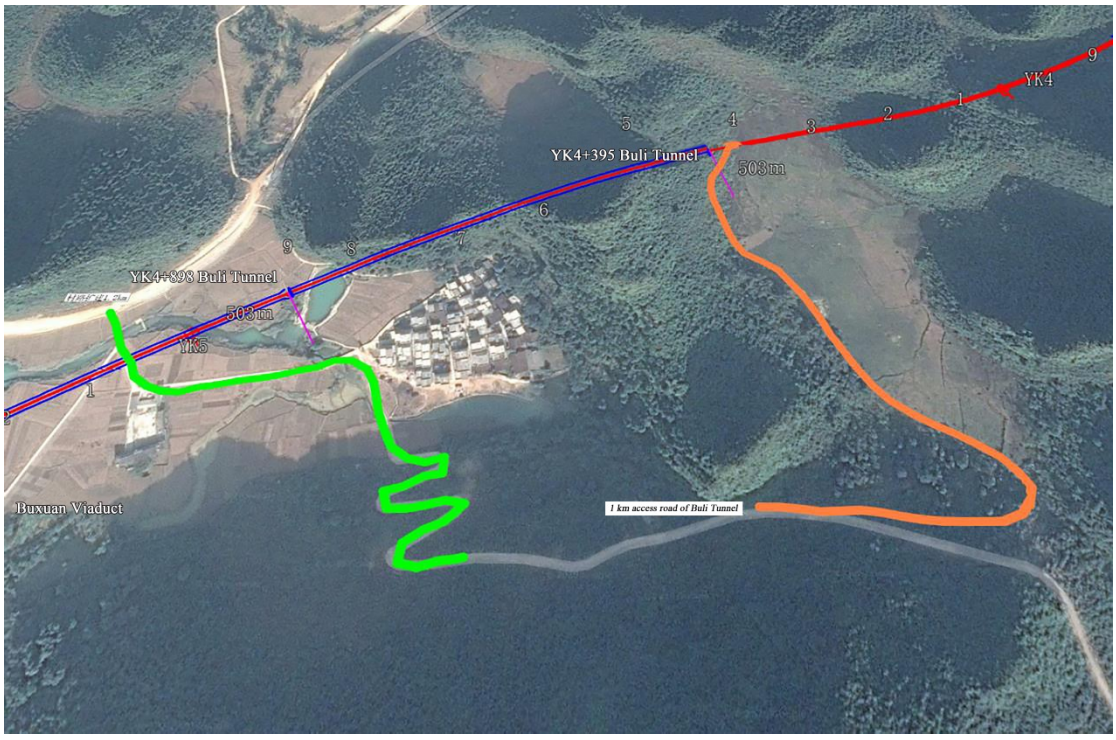

Figure 3.1-9 Location of New Access Road to Entrance of Buli Tunnel

Figure 3.1-9 shows the location of the new access road to the entrance of Longdong No.1 Tunnel, in which the red line is the 60m trestle to be built, and the yellow line is the 350m new access road to the entrance of Longdong No.1 Tunnel.

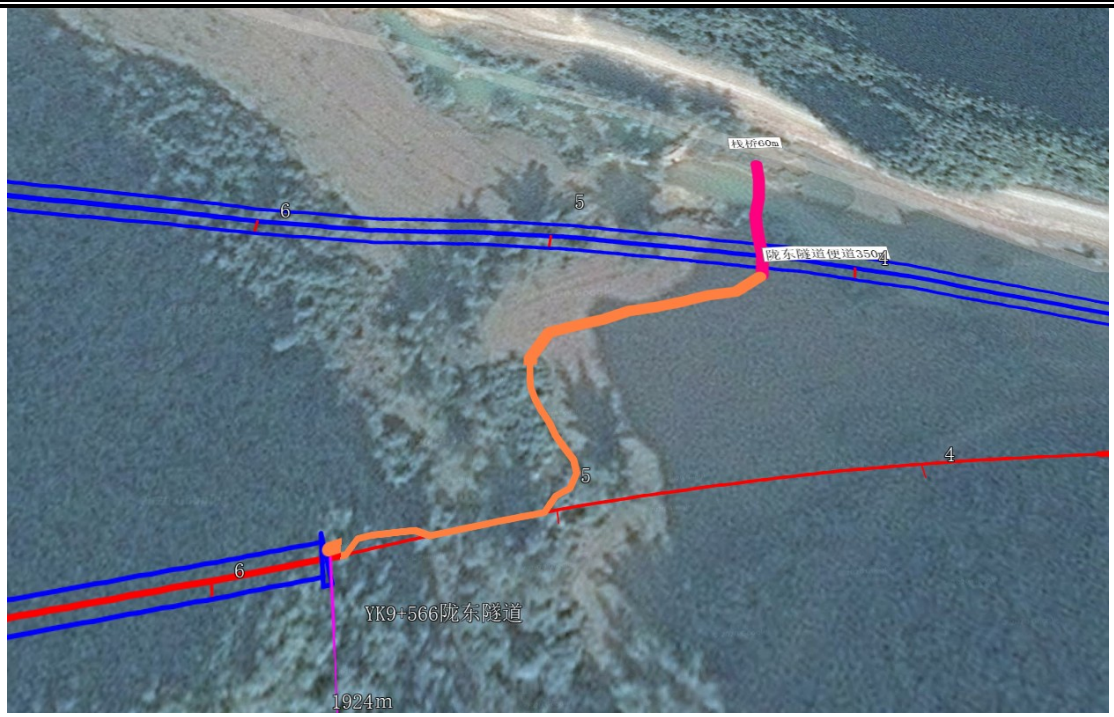

Figure 3.1-10 Location of New Access Road to Entrance of Longdong No.1 Tunnel

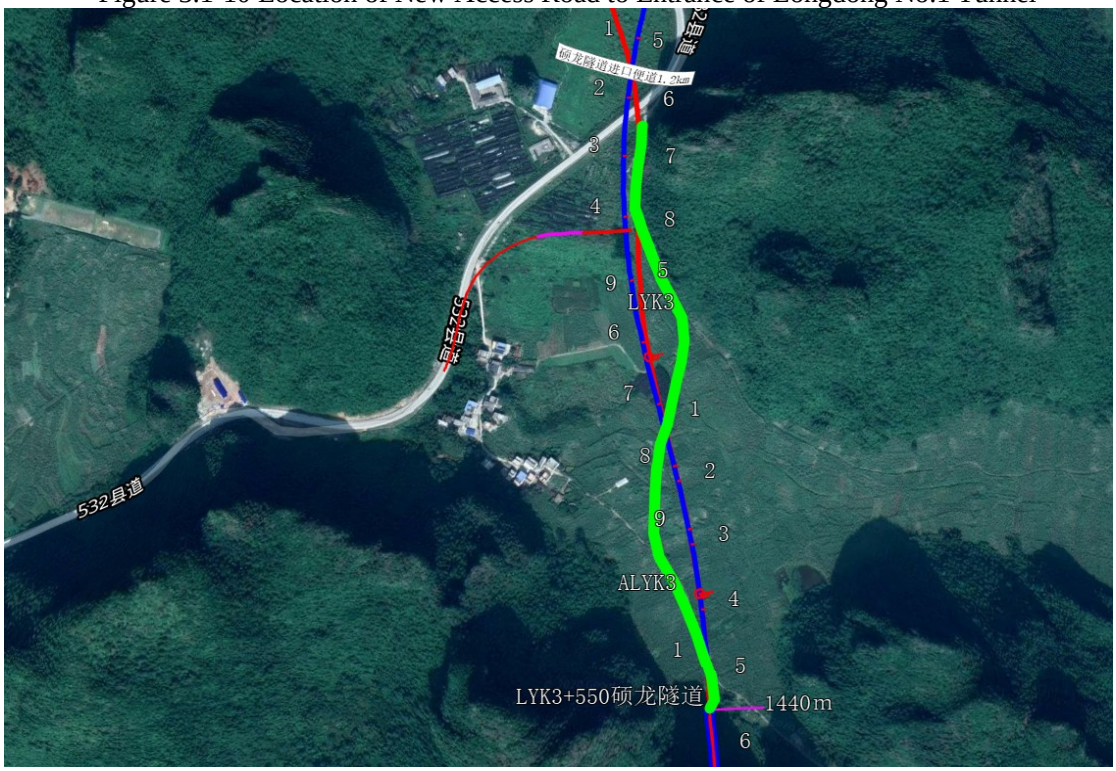

Figure 3.1-11 Location of New Access Road to Entrance of Shuolong Tunnel

The yellow line in Figure 3.1-11 is an existing village road. As the widening requires house requisition and demolition, the cost is relatively high, so it is considered to rebuild the access road along the main line; The green line is the 450m new access road to the exit of Shuolong Tunnel; The red line is the 200m trestle of Shuolong Guichun River Medium Bridge.

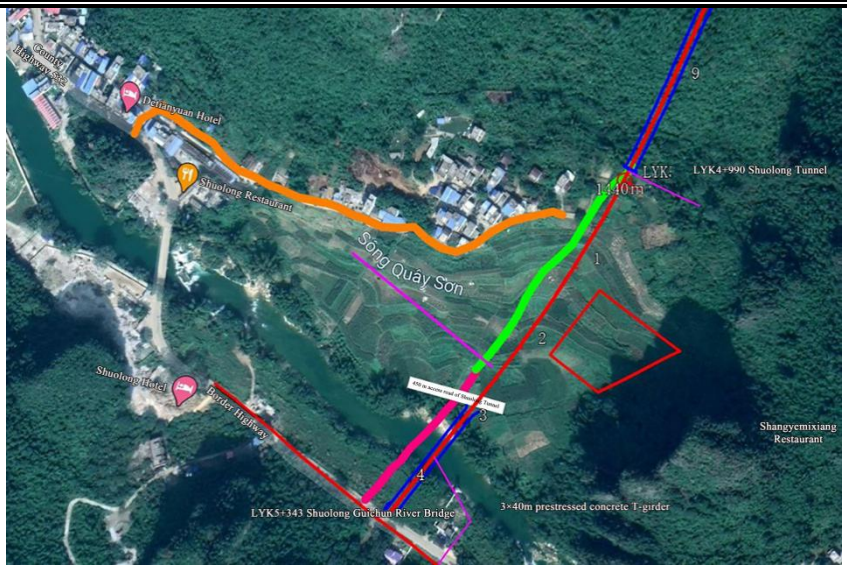

Figure 3.1-12 Location of New Access Road to Exit of Shuolong Tunnel and Trestle of Shuolong Guichun River Medium Bridge

For the wading section of Shuolong Guichun River Medium Bridge, a trestle with a height of 15 meters and a length of 200 meters is required according to the floodwater level line over the years.

Figure 3.1-13 Wading Section of Shuolong Guichun River Medium Bridge

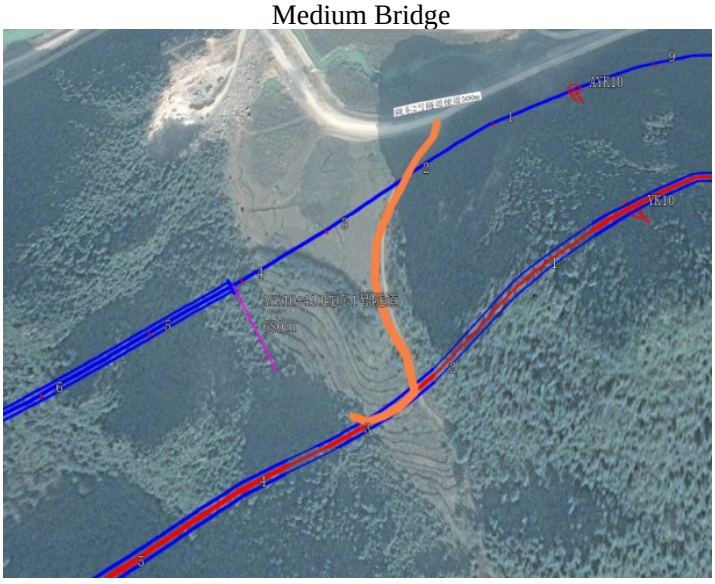

Figure 3.1-14 Location of New Access Road (500m) to Entrance of Longdong No.2 Tunnel

Figure 3.1-14 shows the location of the new access road to the exit of Longdong Tunnel and the trestle of Bangtun Heishui River Major Bridge, in which the red line is the 100m trestle to be built of Bangtun Heishui River Bridge, and the green line is the 1 km new access road to the exit of Longdong Tunnel.

3.1.5 Summary of Pollution Source Strength

Table 3.1-9 Summary of Main Pollution Sources in Construction Period

Pollution Sources	Pollution Stage	Main Pollution Sources	Source Strength and Influence
Waste gas	Construction dust	TSP	It has a great adverse impact on the atmospheric environment within 150m of the roadside.
	Dust from mixing station	TSP	It has an adverse impact on the ambient air in the downwind direction of 150m
	Asphalt paving	Asphalt fume	It is mainly produced in the paving process; as the asphalt sets, the effect disappears.
Noise	Noise of construction machinery	Leq	76~98dB(A); the instantaneous sound level of sudden blasting can reach 130dB(A)
Wastewater	Domestic sewage produced by construction personnel	SS,COD,BOD	The total output is 8640t; it is used for forest land fertilization after septic tank treatment.
	Production Wastewater	SS	Short-term increase of SS in receiving water body
Solid waste	144t of domestic garbage produced by construction personnel		It is collected by the contractor, and placed in the local sanitary landfill for landfill or other harmless treatment.
	Permanent spoil: 214,700 m^3		It is placed in the spoil area, and then the vegetation is restored or greened.

Table 3.1-10 Summary of Main Pollution Sources in Operation Period

Pollution Sources	Emissions (t/d)	Annual Emission t/a	Main Pollutants	Generation Amount t/a	Discharge Amount t/a	Disposal Method
Wastewater (total from service facilities)	4.05	1478.25	COD	0.44	0.07	After it is treated to meet the standards for flushing toilets, road cleaning and urban greening in the Reuse of Urban Recycling Water - Water Quality Standard for Urban Miscellaneous Water Consumption (GB/T 18920-2002) and Wastewater Reuse of Highway Service Area - Water Quality (JT/T 645.1-2016), it can be reused for greening, road cleaning and flushing toilets.
			BOD_5	0.37	0.01	
			SS	0.44	0.1	
			NH_3-N	0.007	0.007	
			Petroleums	0.003	0.001	
Solid waste	0.03	10.95	Mainly domestic waste of service facilities;			
Waste gas	Automobile exhaust CO and NO_2;					
Noise	In the near term, the traffic noise is 76.2-86.4dB(A) in daytime and 76.2-86.2dB(A) at night					
	In the medium term, the traffic noise is 76.1-86.6dB(A) in daytime and 76.2-86.4dB(A) at night					

	In the long term, the traffic noise is 75.9-86.9dB(A) in daytime and 76.1-86.6dB(A) at night

3.2 Detian-Shuolong Highway

3.2.1 Basic Information of the Project

Project name: Detian – Shuolong Highway;

Project nature: reconstruction and extension;

Construction site: Daxin County, Chongzuo City;

Land acquisition and demolition: the total land area of the Project is 420.5 mu, and permanent LA occurs in subgrade works area and tunnel works area. Temporary land occupation occurs in spoil area, temporary dump, and construction, production and living areas, with an area of 60 mu.

Construction period: It is planned to be commenced by the end of October 2021 and completed in June 2023, with a construction period of 20 months.

Construction scale: Detian – Shuolong Highway has a total length of 13.632km; it is constructed in 2sections: section of Detian – Tourist Center and section of Tourist Center – north end of the Shuolong Medium Bridge. The section of Detian – Tourist Center (K0+000 – K9+362.310) is 9.362km long; in the section, the general road section is of Class-II highway standard, with a design speed of 40km/h and a subgrade width of 10m; the road section near the Grade I water source protection area (K3+860 – K5+260) is of Class-III highway standard, with a design speed of 30km/h and the current subgrade width (7.5m); the urban road section (K7+050 – K7+280) refers to the Class-II highway standard, with a design speed of 40km/h, a road width of 16 m, and sidewalks on both sides taking into account the urban road sections; the road section restricted by the terrain (K8+400 – K8+700) is designed with the speed limit of 30km/h and the subgrade width of 10 m to avoid large-scale filling and excavation. The section of Tourist Center – north end of the Shuolong Medium Bridge (K9+362.310 – K13+632.053) is 4.270km long; in the section, the general road section is of Class-II highway standard, with a design speed of 40km/h and a subgrade width of 16m; the road section with separated subgrade (left line K9+362.310 – K10+155.050, right line YK0+000 – YK1+053.383) refers to the Class-II highway standard, with a design speed of 40km/h and a single subgrade width of 8.5m; the urban road section (K12+520 –

K13+632.053) refers to the Class-II highway standard, with a design speed of 40km/h, a road width of 17.5m, and sidewalks on both sides taking into account the urban road sections.

There is no bridge in the whole line of the Project, but 1 unidirectional two-lane tunnel of 395m.

The total investment of the Project is RMB 270,227,837, and the average investment per kilometer is estimated to be RMB 19,823,051.

3.2.2 Construction Contents in Recommended Scheme

The Project is an upgrading project of Detian – Shuolong section in the upgrading of Shuolong – Renai Class-II highway. It starts at the entrance of parking lot in Detian Scenic Area and ends at Rentun, Shuolong Community, southeast corner of Shuolong Town. It crosses the Shuolong Connecting Line of Component 1 at the same level, with a total length of 13.632km. See Table 3.2-1 for the main technical and economic indicators and quantities of the Project.

Table 3.2-1 Main Technical and Economic Indicators and Quantities in Recommended Scheme

S/N	Description of Index	Unit	Section of Detian – Tourist Center (K0+000 – K9+362.310)	Section of Tourist Center – north end of the Shuolong Medium Bridge (K9+362.310 – K13+632.053)	Total
1	Route length	km	9.362	4.270	13.632
2	Highway class	Class	Class II (Class III)	Level II	/
3	Design speed	km/h	40(30)	40	/
4	Number of Lanes		Two-way two-lane	Two-way four-lane	/
5	Subgrade width	m	10 (Common road section) 7.5 (Level 1 water source conservation area) 16 (Urban road section)	16 (Common road section) 2*8.5 (separated subgrade) 17.5 (Urban road section)	/
6	Occupied land	Mu	250.3	170.2	420.5
7	House demolition	m^2	-	-	3528.96
8	Quantities of earthwork and stonework	$1000m^3$	84.615	72.341	156.955
9	Average	$1000m^3$	9.038	16.942	11.514

S/N	Description of Index	Unit	Section of Detian – Tourist Center (K0+000 – K9+362.310)	Section of Tourist Center – north end of the Shuolong Medium Bridge (K9+362.310 – K13+632.053)	Total
	earthwork and stonework per kilometer				
10	Drainage works	1000m^3	15.84	8.37	24.21
11	Protection	1000m^2	21.60	6.82	28.42
12	Pavement	1000m^2	81.81	63.23	145.04
13	Culvert	m/set	33	21	54
14	Tunnel	m/Nr.	-	395/1	395/1
15	Level crossing	Nr.	14	9	23
16	Total estimate	(RMB 10,000)	15510.1747	11512.609	27022.7837
17	Average cost per kilometer	(RMB 10,000)	1656.7159	2696.1614	1982.3051

3.2.3 Prediction of Traffic volume of the Project

(1) Forecast of traffic volume

See Table 3.2-2 for the traffic forecast of the Project based on the Feasibility Study Report.

Table 3.2-2 Traffic Forecast Results unit: pcu/d (equivalent to passenger cars)

Road Section	Forecast Period		
	2023 (the 1st year of operation)	2029 (the 7th year of operation)	2038 (the 15th year of operation)
Section from Detian to the Tourist Center	3541	4574	6068
The tourist center - X532 section	5737	7824	10632
The section of X532 - North Bridge Head of Shuolong Medium Bridge	5635	7688	10446

(2) Structure of Vehicle Types

See Table 3.2-3 for the vehicle type ratio of the Project according to the Feasibility Study Report of the Project.

Table 3.2-3 Vehicle Type Ratio and All-day to Daytime Ratio of Traffic Flow

Year / Vehicle Type	Year 2023	Year 2029	Year 2038

	(the 1st year after operation)	**(the 7th year after operation)**	**(the 15th year after operation)**
Small freight vehicle	5.32%	6.05%	5.30%
Medium freight vehicle	4.60%	5.53%	4.79%
Large freight vehicle	2.13%	4.04%	7.79%
Extra-large freight vehicle	1.31%	2.64%	4.64%
Small Passenger Vehicle	51.50%	53.33%	58.75%
Large Passenger Vehicle	5.84%	6.44%	7.14%
Tractor	27.22%	20.31%	10.54%
Motorcycle	2.08%	1.66%	1.05%

The traffic flow ratio is 80% in daytime and 20% in nighttime (16h in daytime and 8h in nighttime) according to the actual situation.

3.2.4 Setting of Earthwork Balance and Temporary Land

(1) Balance of earthwork and stonework

The earthwork balance accounting results in the Report of Soil and Water Conservation Scheme for Detian – Shuolong Highway Project (the first draft) show that the Project has a total excavation amount of 433,600m^3 (including 30,500m^3 of stripped topsoil), a total fill amount of 369,400m^3 (including 30,500m^3 of covered topsoil), no borrows, and permanent spoil of 64,300m^3 (transported to the spoil area for stacking). The earthwork is mainly produced in subgrade works area. See table 2.2-3 for the earthwork balance of the Project.

(2) Temporary construction scheme

It is expected to build 1 concrete mixing station, 1 asphalt mixing station, 1 stone rolling yard and 1 spoil area for the main works of the Project according to the construction scheme in the Project feasibility study report. After the communication and coordination between the Project Designer and the local government, the temporary works of the Project are planned to be concentrated in the left plot of K10+200 (opposite to CNOOC), covering an area of about 60 mu. This plot is a resettlement site planned by the local government, and the land is owned by the residents in Shuolong Community. The land is mainly dry land, which has been purchased and requisitioned by the local government. See 6.2-10 for the satellite diagram of this plot.

Figure 3.2-1 Plot Location of Comprehensive Yard/Station for Temporary Facilities Preliminarily Selected by the Employer

① Construction production and living quarters

Asphalt concrete pavement is adopted for the Project, and it is estimated to build 1 concrete mixing station and 1 asphalt mixing station, which will be jointly arranged in the resettlement site of local government for purchasing and storage. The land is located beside the existing highway, which is convenient for material transportation.

The concrete mixing station is provided with concrete mixing station and laboratory. It is estimated to install 2 mixers of 120 type, which are equipped with 8 bins; it is provided with prefabricated house for the operators of the mixing station, concrete truck drivers and some project management personnel. The asphalt mixing station is planned to be equipped with at least 1 automatic metering asphalt concrete mixing station with a capacity of 320t/h and above.

Combined with the comparison and selection of material sources, the stones excavated within the line section and the gravels made of tunnel slags are proposed to be utilized in the

Project, so as to reduce the engineering cost. The stone rolling yard is also preliminarily arranged in the resettlement site purchased and stored by the local government. The block is located near the exit of Longhong Tunnel, which can effectively shorten the transportation distance of tunnel slag. At the same time, the block is located beside the existing highway, which is convenient for stone transportation.

② Spoil area

After the excavation and filling of the Project are balanced, the produced 64,300 m^3 of permanent spoil will be transported to the special spoil area of the Project for stacking. At present, the Employer has initially selected 1 spoil ground, which is located in the resettlement site purchased and stored by the local government and arranged together with the temporary land for construction. The proposed plot is located beside the existing highway, which is convenient for muck transportation.

③ Temporary storage yard

Before the subgrade construction of road sections under reconstruction, expansion and new construction of the Project, the topsoil needs to be stripped and temporarily piled up in a centralized way for later land reclamation or ecological restoration. The environmental impacts of temporary dump are mainly temporary land occupation, construction noise, transportation dust, etc. There is a small amount of topsoil produced in the Project, and the balance between excavation and filling can be achieved. There is no temporary storage yard in the Project, and the topsoil produced during subgrade excavation is temporarily stored in the spoil ground, which can be used for backfilling subgrade and roadside slope after the subgrade works is completed.

④ Construction temporary access

Most sections of the Project are subject to the reconstruction and expansion of existing roads, and the distance between new road sections and existing roads is not far. Temporary works are located near existing roads, and existing highways along the border and existing rural roads can basically meet the transportation requirements of construction materials of the Project, so the construction temporary access will not be provided.

Table 3.2-4 Balance Table of Earthwork for the Project

Project Zoning	Excavation					Filling				Transfer-In		Transfer-Out		Discarded soil	
	Topsoil	Ordinary soil	Earthwork	Pavement of existing road	Subtotal	Topsoil	Ordinary soil	Earthwork	Subtotal	Quantity	Source	Quantity	Destination	Subtotal of Spoil	Destination
Subgrade works area	3.01	15.87	23.82	0.48	43.18	3.01	13.95	19.87	36.83	1.6		1.6		6.35	Spoil ground
Bridge works area		0.04			0.04		0.02		0.03					0.02	Spoil ground
Construction access road zone	0.04	0.06			0.1	0.04			0.04			0		0.06	Spoil ground
Construction production and living quarters		0.04			0.04		0.04		0.04						
	3.05	16.01	23.82	0.48	43.36	3.05	14.01	19.87	36.94	1.6		1.6		6.43	

3.2.5 Summary of Pollution Source Strength

Table 3.2-5 Summary of Main Pollution Sources in Construction Period

Pollution Sources	Pollution Stage	Main Pollution Sources	Source Strength and Influence
Waste gas	Construction dust	TSP	It has a great adverse impact on the atmospheric environment within 150m of the roadside.
	Dust from mixing station	TSP	It has an adverse impact on the ambient air in the downwind direction of 150m
	Asphalt paving	Asphalt fume	It is mainly produced in the paving process; as the asphalt sets, the effect disappears.
Noise	Noise of construction machinery	Leq	76~98dB(A); the instantaneous sound level of sudden blasting can reach 130dB(A)
Wastewater	Domestic sewage produced by construction personnel	SS,COD,BOD	The output is 1314t/a; it is used for forest land fertilization after septic tank treatment.
	Production Wastewater	SS	Short-term increase of SS in receiving water body
Solid waste	16.43t of domestic garbage produced by construction personnel		It is collected by the contractor, and placed in the local sanitary landfill for landfill or other harmless treatment.
	Permanent spoil: 64,300m^3		It is placed in the spoil ground, and then the vegetation is restored or greened.

Table 3.2-6 Summary of Main Pollution Sources in Operation Period

Pollution Sources	Emissions (t/d)	Annual Emissions (t/a)	Disposal Method
Wastewater	There are no service facilities and no domestic sewage is discharged.		
Solid waste	A small quantity	A small quantity	It is discarded at will by passengers of vehicles traveling on the highway and cleaned regularly by maintenance workers
Waste gas	Automobile exhaust and CO emissions: 0.0273 - 0.0875mg/(s·m), NO_2 emissions: 0.0017 - 0.0054 mg/(s·m);		
Noise	Traffic noise: 59.18 - 78.85dB(A)		

3.3 Shuolong Port (Phase II of Shuolong Main Gate)

3.3.1 Basic Information of Phase I Project

Daxin Shuolong Port (upgraded) infrastructure project-Shuolong Port (Shuolong Main Gate) project is located near the boundary pillar No.845, Guiyue West Road at the border of China and Vietnam, with geographical coordinates of 106°49′23.17″ E and 22°48′59.71″ N. The total investment of the project is RMB 274.5 million, with a total land area of 17755.88m^2

and a total building area of 13767.1m^2. It mainly includes the construction of gateway, passenger clearance building, inbound and outbound concourse hall, motor vehicle access inspection hall, port service center, parking lot, public restroom, duty-free shops, customs supervision facilities, and inspection and quarantine facilities. On April 17, 2017, the *Reply on Proposal for Daxin Shuolong Port (Upgrading) Infrastructure Project - Shuolong Port (Shuolong Main Gate) Project* (XFGZ [2017] No. 33) issued by the Development and Reform Bureau of Daxin County was obtained. On May 23, 2017, the *Reply on Environmental Impact Report for Daxin Shuolong Port (Upgrading) Infrastructure Project - Shuolong Port (Shuolong Main Gate) Project* (XHGP [2017] No. 7) issued by Daxin County Environmental Protection Bureau was obtained. The Project (Phase I) was commenced in 2018 and the main structure of Phase I works has been completed now. The completed woks are shown in Table 3.3-1.

The passenger clearance building has been built in the Phase I of the Project and the supporting environmental protection works include three-stage septic tank, sewage pipe network, electrostatic oil fume processor, smoke exhaust pipe, medical waste storage room, garbage collection bins and sound proof, noise elimination and vibration reduction measures.

Table 3.3-1 Main Construction Contents of Passenger Clearance Building

Name	Floor	Construction Content
Passenger clearance building	1F	Hall, souvenir sales area, riverbank support, entry and exit elevator hall, gate business room, fire control room, entry hall, bank, standby room, inspection and control studio, storage room, foreign affairs meeting room, card archive room, emergency treatment room, luggage inspection and monitoring room, quarantine dog captive room, companion animal inspection room, companion animal vaccination room, companion animal temporary storage room, current medical X-ray examination room, and medicine bottle equipment storage room, isolation and check-up room, medical disinfection room, interception storage room, sample room, tax collection room, drug dog standby room, explosion-proof room, search room, business acceptance room, drug inspection room, declaration room for passengers and goods, audio-visual printed matter examination room, case examination room, questioning room, diesel generator room, rest area, entry inspection hall, restroom passage, etc.

	Floor 2	Leisure dining bar, commercial sales area, foreign coffee shop, inspection room, duty-free shop, inspection hall, standby room, inspection and control studio, storage room, foreign affairs meeting room, card archive room, emergency treatment room, luggage inspection and monitoring room, quarantine dog captive room, companion animal inspection room, companion animal vaccination room, companion animal temporary storage room, current medical X-ray examination room, and medicine bottle equipment storage room, isolation and check-up room, medical disinfection room, interception storage room, sample room, tax collection room, drug dog standby room, explosion-proof room, search room, business acceptance room, drug inspection room, declaration room for passengers and goods, audio-visual printed matter examination room, case examination room, exit hall, restroom, etc.
	Floor 3	Activity room, internal dining room, library, duty room, internal leisure activity area, lounge, office, conference room, storage room, computer room, monitoring room, etc.

3.3.2 Construction Content of the Project

The Project is the Shuolong Port (Shuolong Main Gate) (Phase II) under Shuolong Port Infrastructure (Upgrading) Project in Daxin County. It functions as an integrated service area, mainly to provide customs clearance and passenger boarding and alighting services, parking of customs passing vehicles and the development of border port tourism services. The planning land area of Phase II is about 18,533.72 ㎡ (about 27.8 mu), with a total floor area of 11,668.03 ㎡, including the Port Service Center, service station, public restroom, ecological parking lot and ancillary road revegetation project, Guichun River revetment landscape park and basement. The total investment is RMB 107,938,400 only.

See Table 3.3-2 for the main technical and economic indicators and quantities of the Project.

Table 3.3-2 Main Technical and Economic Indicators and Quantities

S/N	Item		Unit	Quantity	Remarks
1	Total planned land area		m^2	18533.72	
2	Building area		m^2	1503.58	
3	Total building area		m^2	11668.03	
3.1	Above-ground gross floor area		m^2	6138.37	
	3.1.1	Port service center	m^2	5664.90	
	3.1.2	Public restroom	m^2	67.32	
	3.1.3	Service station	m^2	60.0	

	3.1.4	Corridor	m^2	326.72	
	3.1.5	1 # staircase	m^2	19.43	
3.2	Underground building area		m^2	5529.66	
4	Building density			21.23	
5	Plot ratio			0.63	
6	Greening rate		%	39.63	
7	Total parking spaces for motor vehicles		Nr.	283	
7.1	Underground motor vehicle parking spaces		Nr.	220	Small-sized vehicle
7.2	Underground motor vehicle parking spaces		Nr.	11	
7.3	Underground motor vehicle charging pile parking spaces		Nr.	26	
7.4	Ground motor vehicle parking spaces		Nr.	26	Bus
8	Parking spaces for non-motor vehicles		Nr.	54	
9	Total investment		10,000 yuan	10793.84	

The land area of Shuolong Port (Shuolong Main Gate) (Phase II) Project is about 18533.72 m^2, with a total floor area of 11668.03m^2, including port service center, service station, public restroom, ecological parking lot and ancillary revegetation works, Guichun River revetment landscape park and basement parking lot. See Table 3.3-3 for the construction contents of the Project.

Table 3.3-3 List of Main Construction Contents of Shuolong Port (Phase II of Shuolong Main Gate)

S/N	Item	Scope of Works	Remarks
1	Port service center	It covers an area of about 1030.11m^2, with six floors and a total floor area of 5664.90m^2. The service center includes the commodity exhibition hall, handling hall, supporting offices, conference rooms, multi-function halls, cafes and dormitories.	
2	Service station	Building Area 60 m^2. The service stations mainly provide convenient charging piles, daily necessities and medical supplies purchase services for passengers.	
3	Public restroom	Building Area 67.32 m^2. Public restrooms are provided with special toilets for the elderly, the weak, the sick, the disabled and the pregnant.	
4	Ecological parking lot	It will set up 26 motor vehicle parking spaces (large vehicle) and 54 non-motor vehicle parking spaces for waiting for inspection of inbound and	

		outbound vehicles, transfer of inbound and outbound tourists and parking of vehicles of staff.	
5	Revetment landscape park	This project is to build an ecological landscape area with transnational characteristics of the Sino-Vietnamese border, and provide new leisure facilities for tourists from home and abroad. Three functional areas will be built along the revetment: the Youyi Park, Gongrong Park, and Hezuo Park, all of which show the landscape with transnational characteristics of the Sino-Vietnamese border to tourists from home and abroad.	
6	Basement	The basement covers a total area of 5529.66 m2, which is used for passenger car parking service. There are 257 car parking spaces, including 220 mechanical parking spaces, 11 parking spaces for ordinary motor vehicles and 26 parking spaces with charging piles	
7	Roads	6469.0m^2	
8	Hardening of the square	4477.0m^2	
9	Landscape works	4735.0m^2	

3.3.3 Summary of Pollution Source Strength for the Project

Table 3.3-4 Summary of Main Pollution Sources in Construction Period

Pollution Sources	Pollution Stage	Main Pollution	Source Intensity and Influence
Waste gas	Construction dust	TSP	It has a great adverse impact on the atmospheric environment within 150m of surrounding area.
	Exhaust gas from construction vehicles	CO,NO_2	It has an adverse impact on the ambient air in the downwind direction of 150m
	Decoration waste gas	Formaldehyde, benzene and toluene	It is mainly produced in the decoration process; as the decoration is completed, the impact disappears.
Noise	Noise of construction machinery	Leq	76~98dB(A); the instantaneous sound level of sudden blasting can reach 130dB(A)
Waste water	Domestic sewage produced by construction personnel	SS,COD,BOD	The output is 4200t; it is discharged into the sewage treatment plant after being treated by septic tank.
	Production wastewater	SS	Short-term increase of SS in receiving water body
Solid waste	11.3t of domestic garbage produced by construction personnel		It is collected by the Contractor, who entrusts the local sanitation department to treat it.

Table 3.3-5 Summary of Main Pollution Sources in Operation Period

Pollution Sources	Emissions (t/d)	Annual Emission t/a	Main Pollutants	Generation Amount t/a	Discharge Amount t/a	Disposal Method
Wastewater	8.8	3212	COD	2.98	1.99	After being treated by septic tank, it is discharged into Shuolong Town Sewage Treatment Works through municipal sewage pipe network
			BOD_5	1.99	0.99	
			SS	1.99	0.99	
			NH_3-N	0.30	0.20	
Solid waste	0.299	109	Mainly domestic waste of service facilities;			
Waste gas	Automobile exhaust, odor of restroom and domestic garbage collection point, and exhaust gas of standby diesel generator					
Noise	Traffic noise: 64.45 - 78.58 dB(A)					

4 Environmental Sensitive Objects

4.1 Wuzhou (Longyanzui)-Shuolong Expressway (Chongzuo–Jingxi Expressway to Shuolong Port Section)

4.1.1 Acoustic Environmental Protection Objects

There are 12 acoustic environmental protection objects within the scope of assessment along the proposed highway, including 8 sensitive points along the main line (2 schools and 6 villages) and 4 sensitive points along Shuolong Connecting Line (villages). Refer to Table 4.1-1 for details.

Table 4.1-1 List of Acoustic Environmental Sensitive Points along the Project

S/N	Center Chainage	Description of Sensitive Points	Location Relation with the Project			Form and height difference relative to subgrade /m	Angle of road-side houses to the road	Number of households/persons within the assessment scope		Characteristics of surrounding environment and Investigation on drinking water sources of villagers	Measures	Photo
			Orientation	Distance from the highway (m)				Cat. 4a zone	Cat. 2 zone			
				Boundary	Center line							
I. Sensitive points along the main line												
1	K4+700~K4+900	Buli	Left side of the road	141.5	148	Bridge - 20	Parallel	/	42/208	The proposed highway passes through the north side of the village in the form of separated bridge. There is a certain elevation difference between the village and the highway. The houses are mainly of brick-concrete structures with 1-3 stories and equipped with aluminum alloy glass windows, part of the houses are of brick-tile structures. Existing environmental noise sources: social activities and traffic. Drinking water source of villagers: mountain spring water.	The noise level and the quality of the spring water are within the allowed standards, so no measures are required.	
2	K5+070~K5+100	Xuanjie teaching school	Left side of the road	82.5	89	Bridge - 20	Vertical	/	13 persons	The proposed highway passes through the north side of the school in the form of a separated bridge. There is a certain elevation difference between the sensitive point and the highway. The school is composed of a two-story building with aluminum alloy glass windows, and both teachers and students do not live in the school. Existing environmental noise sources: social activities and traffic; drinking water source: mountain spring water.	The noise level and the quality of the spring water are within the allowed standards, so no measures are required.	

3	K5+400~K5+460	Buguo	Left side of the road	11	17.5	Bridge - 15	Skew	9/45	15/70	The proposed highway passes through the north side of the village in the form of a separated bridge. There is a certain elevation difference between the sensitive point and the highway. The houses in the village are mainly of brick-concrete structures with 1-3 stories and equipped with aluminum alloy glass windows. Existing environmental noise sources: social activities and traffic; drinking water source of villagers: mountain spring water.	The noise level and the quality of the spring water are within the allowed standards, so no measures are required.	
4	K5+200~K5+450	Datun	Left side of the road	140.5	147	Bridge - 13	Parallel	/	60/284	The proposed highway passes through the north side of the village in the form of bridge. There is certain elevation difference between the sensitive point and the highway. The houses in the village are mainly of brick-concrete structures with 1-3 stories and equipped with aluminum alloy glass windows. Existing environmental noise sources: social activities and traffic; drinking water source of villagers: mountain spring water.	The noise level and the quality of the spring water are within the allowed standards, so no measures are required.	
5	K5+750~K5+900	Dunli	Right side of the road	167	180	Subgrade -10	Slightly skew	/	45/214	The proposed highway passes through the south side of the village in the form of subgrade. There is certain elevation difference between the sensitive point and the highway. The houses in the village are mainly of brick-concrete structures with 1-3 stories and equipped with aluminum alloy glass windows. Existing environmental noise sources: social activities and traffic; drinking water source of villagers: mountain spring water.	The noise level and the quality of the spring water are within the allowed standards, so no measures are required.	

6	Yixian Village Primary School	K11+880~K11+900	Left side of the road	24	60	Subgrade -12	Vertical	/	9 persons	The proposed highway passes through the west side of the school in the form of a subgrade. There is a certain elevation difference between the sensitive point and the highway. The school is composed of a two-story building with aluminum alloy glass windows, and both teachers and students do not live in the school. Existing environmental noise sources: social activities and traffic; drinking water source: mountain spring water.	The noise level and the quality of the spring water are within the allowed standards, so no measures are required.	
7	Guitun	K11+900~K12+050	Left side of the road	79	92	Bridge -13.5	Parallel	/	55/270	The proposed highway passes through the west side of the village in the form of bridge. There is certain elevation difference between the sensitive point and the highway. The houses in the village are mainly of brick-concrete structures with 1-3 stories and equipped with aluminum alloy glass windows. Existing environmental noise sources: social activities and traffic; drinking water source of villagers: mountain spring water.	The noise level and the quality of the spring water are within the allowed standards, so no measures are required.	
8	Bangtun	AK0+100~AK0+250	Right side of the road	13	26	Subgrade -7	Skew	6/30	50/235	The proposed highway passes through the south side of the village in the form of subgrade. There is certain elevation difference between the sensitive point and the highway. The houses in the village are mainly of brick-concrete structures with 1-3 stories and equipped with aluminum alloy glass windows. Existing environmental noise sources: social activities and traffic; drinking water source of villagers: mountain spring water.	Install ventilated sound insulation windows with the installation capacity of 20 m2	
II. Sensitive points along the connecting line												

1	Sanjiadiantun	AK1+780~AK1+820	Left side of the road	82	95	Subgrade -3	Skew	/	3/15	The proposed highway passes through the west side of the village in the form of subgrade. There is certain elevation difference between the sensitive point and the highway. The houses in the village are mainly of brick-concrete structures with 2 stories and equipped with aluminum alloy glass windows. Existing environmental noise sources: social activities and traffic; drinking water source of villagers: mountain spring water.	Aluminum alloy glass windows have been installed at this sensitive point to meet the requirements of noise reduction, so it is not needed to take additional noise prevention measures	
2	Waitun	AK2+600~AK2+700	Right side of the road	113	129	Subgrade -2	Vertical	10/40	11/45	The proposed highway passes through the east side of the village. There is certain elevation difference between the sensitive point and the highway. The houses in the village are mainly of brick-concrete structures with 1-3 stories and equipped with aluminum alloy glass windows. Existing environmental noise sources: social activities and traffic; drinking water source of villagers: mountain spring water.	The noise level and the quality of the spring water are within the allowed standards, so no measures are required.	
3	Longmei	AK2+950~AK3+150	Right side of the road	166	179	Subgrade -5	Parallel	2/8	18/60	The proposed highway passes through the east side of the village. There is certain elevation difference between the sensitive point and the highway. The houses in the village are mainly of brick-concrete structures with 1-3 stories and equipped with aluminum alloy glass windows. Existing environmental noise sources: social activities and traffic; drinking water source of villagers: mountain spring water.	The noise level and the quality of the spring water are within the allowed standards, so no measures are required.	
4	Rentun	AK5+020~AK5+180	Right side of the road	1	7.4	Subgrade	Parallel	3/15	27/137	The proposed highway passes through the east side of the village in the form of subgrade. There is certain elevation difference between the sensitive point and the highway. The houses in the village are mainly of brick-concrete structures with 1-3 stories and equipped with aluminum alloy glass windows. Existing environmental noise sources: social activities; drinking water source of villagers: mountain spring water.	Install ventilated sound insulation windows with the installation capacity of 90 m2	

4.1.2 Water Environmental Protection Objects

(1) Surface water environmental protection objects

The water environmental protection targets within the assessment scope of the Project mainly include: surface water bodies such as Baidou River, Xialei River and Guichun River crossed by the highway; one township-level drinking water source protection area adjacent to the highway (drinking water source protection area in Shuolong Town, Daxin County). See Table 4.1-2 and Table 4.1-3 for the relationship between main surface water environment protection objects and the route.

Table 4.1-2 List of Main Surface Water Environmental Protection Objects of the Project

S/N	Main Surface Water Bodies	Relation with the Route	Investigation on Centralized Drinking Water Source Conservation Area	Measures
1	Baidou River	ZK5+165/YK5+187 Buxuan Major Bridge 20/19×30m prestressed concrete T-girder	There is no drinking water source conservation area at the bridge, and there is no centralized water intake downstream of the bridge.	1. For the construction of river-crossing major bridge, the operation sequence of pile foundation shall be reasonably arranged, and construction in flood periods and the fish spawning peak period shall be avoided; steel cofferdams shall be built in the dry season of rivers; adopt advanced technology to shorten the operation time. 2. Provide warning signs such as speed limit, no overtaking, and no
2		ZK6+960/YK6+950 Dunli Major Bridge 28/19×20m prestressed concrete T-girder		
3		ZK8+795/YK8+815 Longkalang Super Viaduct 31/32×40m prestressed concrete T-girder		
4	Xialei River	ZK12+075/YK12+117 Bangtun Major Bridge 3×40m prestressed concrete T-girder		
5	Guichun River	AZK5+353/AYK5+337 Shuolong Guichun River Major Bridge 3×30m prestressed concrete small box girder		

				dropping. 3. Provide reinforced crash barriers and warning signs.

Table 4.1-3 List of Main Surface Water and Drinking Water Source Protection Areas along the Project

S/N	Water Source Name	Level	Water Intake	Relation with the line	Passing through water source protection areas or not
1	Drinking Water Source Protection Area in Shuolong Town, Daxin County	Centralized in the township (approved)	The water intake is located in Yuejin Canal, providing drinking water for Shuolong Community.	The proposed highway passes through the downstream boundary of the water intake, and the minimum distance is about 95m from AK1+900~AK3+510 to Class II protection area and 690m to the Class I protection area.	The route is adjacent to the water source protection area and does not pass through the protection area. This section is constructed in the form of tunnel.

(2) Groundwater environmental protection objects

The starting point of the project passes through the Bukan Water Source Class I and Class II Protection Areas in Liliang Village, Fuxin Town. Tiandeng People's Government agreed to relocate the entire Bukan water source area (in Liliang Village, Fuxin Town according to the Reply of Tiandeng People's Government on Adjusting the Bukan Water Source in Liliang Village, Fuxin Town, Tiandeng County (TDH [2019] No.134), and the relocation procedure is currently in progress. After relocation, the Project does not involve crossing the scope of Bukan water source protection zone.

4.1.3 Ecological Environmental Protection Objects

Two ecologically sensitive areas are located within the assessment scope, namely Xialei Nature Reserve and Huashan Scenic Area, and the overlapping area of these two areas is located at AK3+600~AK4+600. There are no other ecologically sensitive areas.

Within the assessment scope, there are 3 species of Class II wild plants under national protection, namely, buerretiodendron hsienmu, Cibotium barometz and Zenia insignis; 4 species of plants under protection of Guangxi Autonomous Region, namely, Acampe rigida, Cymbidium bicolor, Cheirostylis chinensis and Spiranthes

sinensis. 7 species of ancient trees such as Radermachera sinica, Dimocarpus longan, Ficus virens Aiton and Litchi chinensis, totaling 10 (Nr.); 14 species of Class II animals under national protection such as Hoplobatrachus rugulosus, Accipiter virgatus and Lophura nycthemera; 58 species of animals under protection of Guangxi Autonomous Region, such as Rana guentheri, Bungarus fasciatus, Pycnonotus jocosus and Callosciurus erythraeus. The Project mainly occupies the activity and foraging areas of protected animal and does not affect the concentrated habitats of protected animal; the Project occupies 15.7hm^2 of key public welfare forests.

Table 4.1.-4 Ecological Environmental Protection Objects

Ecologically sensitive area					
S/N	**Sensitive Objects**	**Level**	**Main Protected Objects**	**Location Relation Between the Route and the Protection Area**	**Management Requirement**
1	Xialei Nature Reserve in Guangxi	Autonomous region level	Northern tropical karst forest ecosystem and rare and endangered species such as François's Langur, Assamese Macaque, Burretiodendron hsienmu, Cycas miquelii and Orchid	The sections at K7+885~K10+715 and AK3+600~AK4+600 pass through the experimental area of the Nature Reserve, with a total length of 3.83km	Special assessment for the Project shall be carried out according to the management requirements of the State and Guangxi Autonomous Region on nature reserves, and it shall be approved by the administrative department.
2	Huashan National Scenic Area in Guangxi	National Level	A large number of cliff mural landscapes of the ancient Zhuang nationality	The sections at K11+500~K12+263 and AK0+000~AK5+416 pass through the Class II protection area of the Scenic Area, with a total length of 6.179km	Other formalities may be handled according to law after the plan is approved by the construction administrative department at or above the county level according to the management authority of construction projects

Protected plants and ancient trees						
S/N	**Sensitive Objects**		**Chainage**	**Relationship with road reserve boundary (m)**	**Total number/area (species/clusters)**	**Content or level of protection**
1	Protected plants	Excentrodendron tonkinese	K4+700	80m RHS of Buli Tunnel	8/0	National Level II
2			K8+900	70m LHS of Longkalang	7/0	

				Super Major Bridge		
3			K9+250	160m LHS of Longkalang Super Major Bridge	1/0	
4			K9+400	210m on the right side of Longkalang Super Major Bridge	1/0	
5			K9+880	180 m to the left side of Longdong No.1 Tunnel	3/0	
6			K9+900	320 m to the right side of Longdong No.1 Tunnel	1/0	
7			K10+375	Upper right of Longdong No.2 Tunnel	7/0	
8		Zenia insignis Chun	K8+700	270m on the right side of Longkalang Super Major Bridge	8/0	
9			K9+400	50m LHS of the route	1/0	
10			K10+330	40 m to the left of Longdong No.2 Tunnel	2/0	
11		Cibotium barometz	AK3+930	10 m to the right of Shuolong Tunnel	6/0	
12			AK4+390	55 m to the right side of Shuolong Tunnel	2/0	
13		Acampe rigida	K9+900	120 m to the right side of Longdong No.1 Tunnel	3/0	Guangxi Zhuang Autonomous Region Level
14		Cymbidium bicolor Lindl	K10+053	90 m to the left side of Longdong No.1 Tunnel	8/0	
15		Cheirostylis chinensis	K9+100	190m LHS of Longkalang Super Major Bridge	2/0	
16		Spiranthes sinensis	AK3+930	10 m to the right of Shuolong Tunnel	5/0	
17	Ancient tree	Radermachera sinica	K4+570	35m LHS of Buli Tunnel	1/0	Class III
18		Dimocarpus longan	K10+050	58m LHS of Longdong Tunnel	3/0	Ancient tree
19		Ficus lacor	AK0+580	In the occupied area	1/1	Class III
20		Dimocarpus longan	AK4+980	6m RHS of the connecting line	1/0	Class III

21		Litchi chinensis	AK5+010	6m RHS of the connecting line	1/0	Class III
22		Litchi chinensis	AK5+010	35m on the right side of the Connecting Line	2/0	Class III
23		Ficus lacor	AK5+000	65m on the right side of the Connecting Line	1/0	Class III
Protected animals						
1	Protected animals		The Project mainly occupies the activity and foraging areas of protected animal and does not affect the concentrated habitats of protected animal		14 species of Class II animals under national protection: Hoplobatrachus rugulosus, Gekko gecko, Lophura nycthemera, Centropus bengalensis, Centropus sinensis, Aviceda leuphotes, Accipiter trivirgatus, Accipiter virgatus, Milvus migrans, Spilornis cheela, Glaucidium brodiei, Glaucidium cuculoides, Falco tinnunculus;58 species of animals under protection of Guangxi Autonomous Region, such as Rana guentheri, Bungarus fasciatus, Pycnonotus jocosus and Callosciurus erythraeus	Class I and II under national protection; animals under protection of Guangxi Autonomous Region
Key public welfare forest						
1	Key public welfare forest		The area of public welfare forest damaged by construction in Tiandeng County is about 4.88hm^2		Water conservation forest	Key public welfare forests under protection of Guangxi Autonomous Region
2			The area of public welfare forest damaged by construction in Daxin County is about 10.82hm^2		Water conservation forest	
Cultivated land						
1	Basic farmland		Affected areas along the whole route		22.67hm^2	Cultivated land

4.2 Detian-Shuolong Highway

4.2.1 Water Environmental Protection Objects

The water environmental protection objectives within the evaluation scope of the Project are mainly: Guichun River crossed by the highway and two township-level drinking water source protection areas adjacent to the highway. See Table 3.2-1 and Table 3.2-2 for the relationship between main surface water environment protection objects and the route.

Table 4.2-1 List of Main Surface Water Environmental Protection Objects of the Project

S/N	Main Surface Water Bodies	Relation with the Route	Investigation on Centralized Drinking Water Source Conservation Area	Main Measures
1	Guichun River	It is located on the south side of the route, where K0+000~K5+500 is adjacent to the river, and no bridge is set to cross the water body.	It is planned to set up the Aitun Drinking Water Source Protection Area in Shuolong Town on the river, and the planned water intake is located at K5+000	Temporary drainage ditches and sedimentation tanks shall be provided for the construction of the section near the river, to prevent that the bare surface is washed by rain and flows into Guichun River, so as to avoid affecting the water quality

Table 4.2-2 List of Main Surface Water Environmental Protection Objects along the Project

S/N	Water Source Name	Level	Water Intake	Relation with the line	Passing through water source protection areas or not	Main Measures
1	Aitun water source in Shuolong Town, Daxin County	Centralized in the township (approved)	The water intake is located near Aitun Dam of Guichun River, which is the planned water	Highway section K0+460~K5+360 passes through the Grade II conservation area of the Aitun Drinking Water Source Conservation Area in Shuolong Town,	The route passes through the water source protection area, of which 1.13km is	Road runoff collection system is set on the river side of K3+900~ K5+300; an oil isolation and sedimentation tank is set outside K5+300 water

S/N	Water Source Name	Level	Water Intake	Relation with the line	Passing through water source protection areas or not	Main Measures
			source.	where section K3+980~K5+110 is adjacent to the Grade-I conservation area of this water source conservation area.	adjacent to the Class I protection area, and this section is planned to be used along the whole line	source protection area to lead to the downstream of Aitun Dam for discharge; signs of speed limit, no overtaking, in and out, and water source are arranged on both sides of K0+200 and K5+300.
2	Community water source area in Shuolong Town, Daxin County	Centralized in the township (approved)	The water intake is located in Yuejin Canal, providing drinking water for Shuolong Community.	Highway K9+400~K10+000 of the Project passes through the Grade-II conservation area of Shuolong Community Water Source Conservation Area in Shuolong Town, and the layout of section K10+000~K11+400 shall be adjacent to the Grade-II conservation area of this water source conservation area.	The route crosses the water source protection area with a crossing length of 600m, of which the tunnel section is about 300m and the subgrade section is about 300m.	Corrugated steel crash barriers are set at the river side of K7+500~K8+100; speed limit traffic signs are set at K7+500~K8+100; water source entry and exit signs are set at both ends of K9+400~K10+000

4.2.2 Acoustic Environmental Protection Objects

There are 12 acoustic environmental protection objects within the assessment scope along the proposed highway, including 1 school and 11 villages. Refer to Table 3.2-3 for details.

Table 4.2-3 List of Acoustic Environmental Sensitive Points along the Project

S/N	Sensitive Point Name	Center Chainage	Location Relation with the Project		Households/ Number	Characteristics of Surrounding Environment and Investigation on Drinking Water of Villagers	Main Measures	Photo
			Orientation	Distance m (centerline/ boundary)				
1	Detian	K0+000	RHS	69/60	63/274	It is located at the foot of the mountain at the entrance of Detian Waterfall Scenic Area; the houses are mainly brick-concrete buildings with 2 - 3 floors, and some 5 - 6 houses near the entrance of the scenic area are used as tourist hotels, all of which are equipped with aluminum alloy glass windows. Drinking water source of villagers: mountain spring water.	The noise level and the quality of the spring water are within the allowed standards, so no measures are required.	
2	Liudeng	K1+900~ K2+060	LHS	8/0	16/65	It is located at the foot of the mountain on the north side of the existing highway along the border; the houses are mainly brick-concrete buildings with 3 floors, and some houses along the road are used as tourist inns, all of which are equipped with aluminum alloy glass windows. Drinking water source of villagers: mountain spring water.	The noise of 4 households exceeds the standard, and 40m^2 of windows are replaced by the ventilation and sound proof windows	

S/N	Sensitive Point Name	Center Chainage	Location Relation with the Project		Households/ Number	Characteristics of Surrounding Environment and Investigation on Drinking Water of Villagers	Main Measures	Photo
			Orientation	Distance m (centerline/ boundary)				
3	Aijiang Wood Farm	K3+000~ K3+500	LHS	15/6	21/120	It is located at the foot of the mountain on the north side of the existing highway along the border; the houses are mainly brick-concrete buildings with 2 - 3 floors, all of which are equipped with aluminum alloy glass windows. Drinking water source of villagers: mountain spring water.	The noise level and the quality of the spring water are within the allowed standards, so no measures are required.	
4	Aitun	K5+500~ K5+700	Both sides	7/0	54/211	It is located in the relatively gentle zone beside the river bank on the south side of the existing highway along the border. Some residents built houses on the roadside to serve as shops, restaurants and hotels. These houses are mainly brick-concrete buildings with 2 - 3 floors, and a few old houses are of brick and tile structure. All buildings are equipped with aluminum alloy glass windows, and most of the old houses are equipped with wooden windows. Drinking water source of villagers: mountain spring water.	The noise of 5 households exceeds the standard, and 50m^2 of windows are replaced by the ventilation and sound proof windows	

S/N	Sensitive Point Name	Center Chainage	Location Relation with the Project		Households/ Number	Characteristics of Surrounding Environment and Investigation on Drinking Water of Villagers	Main Measures	Photo
			Orientation	Distance m (centerline/ boundary)				
5	Bagan	K5+900~ K6+000	LHS	25/18	76/272	It is located at the foot of the mountain on the east side of the existing highway along the border; the houses are mainly brick-concrete buildings with 2 - 3 floors, and a few old houses are of brick and tile structures; all buildings are equipped with aluminum alloy glass windows, and most of the old houses are equipped with wooden windows. Drinking water source of villagers: mountain spring water.	The noise of 3 households exceeds the standard, and 30m2 of windows are replaced by the ventilation and sound proof windows	
6	Aijiang Village Primary School	K6+100	RHS	135/125	/	The school consists of two teaching buildings, each with 2 floors; one building has 4 classrooms for primary school students and another building has 6 classrooms, serving as Detian Kindergarten. There is 1 primary school teacher, 5 kindergarten teachers and 100 students. All buildings are equipped with aluminum alloy glass windows. None of the teachers and students live in school. Their drinking water is the mountain spring water.	The noise level and the quality of the spring water are within the allowed standards, so no measures are required.	

S/N	Sensitive Point Name	Center Chainage	Location Relation with the Project		Households/ Number	Characteristics of Surrounding Environment and Investigation on Drinking Water of Villagers	Main Measures	Photo
			Orientation	Distance m (centerline/ boundary)				
7	Longjian	K6+700~ K6+800	Both sides	7/0	46/161	It is located on both sides of the existing highway along the border. Some residents built 3 - 6 houses on the roadside to serve as shops, restaurants and tourism inns. These houses are mainly brick-concrete buildings with 2 - 3 floors, and a few old houses are of brick and tile structure. All buildings are equipped with aluminum alloy glass windows, and most of the old houses are equipped with wooden windows. Drinking water source of villagers: mountain spring water.	The noise of 7 households exceeds the standard, and 70m^2 of windows are replaced by the ventilation and sound proof windows	
8	Wanlong	K6+900~ K7+100	Both sides	8/0	90/327	It is located on both sides of the existing highway along the border. Some residents built 3 - 6 houses on the roadside to serve as shops, restaurants and tourism inns. These houses are mainly brick-concrete buildings with 2 - 3 floors, and a few old houses are of brick and tile structure. All buildings are equipped with aluminum alloy glass	The noise of 8 households exceeds the standard, and 80m^2 of windows are replaced by the ventilation and sound proof windows	

S/N	Sensitive Point Name	Center Chainage	Location Relation with the Project		Households/ Number	Characteristics of Surrounding Environment and Investigation on Drinking Water of Villagers	Main Measures	Photo
			Orientation	Distance m (centerline/ boundary)				
						windows, and most of the old houses are equipped with wooden windows. Drinking water source of villagers: mountain spring water.		
9	Longhong	K9+700	RHS	36/25	80/313	It is located on both sides of the existing highway along the border. Some residents built 3 - 6 houses on the roadside to serve as shops, restaurants and tourism inns. These houses are mainly brick-concrete buildings with 2 - 3 floors, all of which are equipped with aluminum alloy glass windows. Villagers' drinking water is the tap water supplied by villages and towns.	The noise of 2 households exceeds the standard, and 20m^2 of windows are replaced by the ventilation and sound proof windows	

S/N	Sensitive Point Name	Center Chainage	Location Relation with the Project		Households/ Number	Characteristics of Surrounding Environment and Investigation on Drinking Water of Villagers	Main Measures	Photo
			Orientation	Distance m (centerline/ boundary)				
10	Gutun	K10+400~ K11+200	Both sides	12/2	88/323	It is located on both sides of the existing highway along the border. Some residents built 3 - 6 houses on the roadside to serve as shops, restaurants and tourism inns. These houses are mainly brick-concrete buildings with 2 - 3 floors, all of which are equipped with aluminum alloy glass windows. Villagers' drinking water is the tap water supplied by villages and towns.	The noise of 16 households exceeds the standard, and 160m^2 of windows are replaced by the ventilation and sound proof windows	
11	Shuolong Community	K12+300~ K13+100	LHS	10/0	295/1040	It is located on the north side of the existing highway along the border, in the center of Shuolong Town. There are many shops, restaurants and hotels near the main streets of the town, and one middle school and one primary school in the center of the town. The residential houses in the town are mainly brick-concrete buildings with 2 - 3 floors, and the teaching buildings in schools are with 4 - 5 floors, all of which are equipped with aluminum alloy glass windows. Their drinking water is the tap water supplied	The noise of 13 households exceeds the standard, and 130m^2 of windows are replaced by the ventilation and sound proof windows	

S/N	Sensitive Point Name	Center Chainage	Location Relation with the Project		Households/ Number	Characteristics of Surrounding Environment and Investigation on Drinking Water of Villagers	Main Measures	Photo
			Orientation	Distance m (centerline/ boundary)				
						by villages and towns.		
12	Rentun	K13+200~ K13+400	LHS	65/55	36/118	It is located at the foot of the mountain about 200m east of the edge of Shuolong Town; the houses are mainly brick-concrete buildings with 2 - 3 floors, all of which are equipped with aluminum alloy glass windows. Villagers' drinking water is the tap water supplied by villages and towns.	The noise of 5 households exceeds the standard, and 50m^2 of windows are replaced by the ventilation and sound proof windows	

4.2.3 Ecological Environmental Protection Objects

There are only two ecologically sensitive areas within the evaluation scope, namely Xialei Autonomous Region Nature Reserve and Huashan Scenic Area in Guangxi.

The results of the field survey within the evaluation scope are as follows: there are 3 species of national Class II protected plants, including 4 species of excentrodendron tonkinese, 7 clusters of cymbidium bicolor lindl, and 9 clusters of cibotium barometz; there are 2 ancient trees (banyan tree and litchi tree); there are 3 species of national Class II protected animals (hoplobatrachus rugulosus, glaucidium cuculoides and centropus sinensis) and 21 species autonomous region-level protected animals, such as bufo melanostictus, naja atra, pycnonotusjocosus and callosciurus erythraeus. The project mainly occupies the activity and foraging habitats of protected animals, which do not involve their concentrated habitats; it occupies 1.08hm^2 of key non-commercial forest.

Table 4.2.-4 Ecological Environmental Protection Objects

Ecologically sensitive area						**Measures**
S/N	**Sensitive Objects**	**Level**	**Main Protected Objects**	**Location Relation Between the Route and the Protection Area**	**Management Requirement**	
1	Xialei Nature Reserve in Guangxi	Autonomous region level	Northern tropical karst forest ecosystem and rare and endangered species such as François's Langur, Assamese Macaque, Burretiodendron hsienmu, Cycas miquelii and Orchid	Crossing is not involved, and the nearest distance is about 700m.	The experimental area can be used for scientific experiments, teaching practice, visit and domestication, cultivate rare animals and plants and other activities	Crossing is not involved; it is prohibited to arrange the temporary sites in protected areas
2	Huashan National Scenic Area in Guangxi	National Level	A large number of cliff mural landscapes of the ancient Zhuang nationality	The whole project is located in the scenic area (Class II Reserve).	Other formalities may be handled according to law after the plan is approved by the construction administrative department at or above the county level according to the management authority of construction projects	Coordinate landscape greening with scenic area; strengthen the management of construction; accept the supervision of scenic area management office

Protected animals, plants and ancient trees							
S/N	**Sensitive Objects**		**Chainage**	**Relationship with road reserve boundary (m)**	**Total number/area (species/clusters)**	**Content or level of protection**	**Main Measures**
1	Protected plants	Excentrodendron tonkinese	K13+050	15 m on the right	2/0	National Level II	In-situ conservation
2		Excentrodendron tonkinese	K13+600	50m on the left	2/0	National Level II	In-situ conservation
3		Cymbidium bicolor Lindl	K13+050	15 m on the right	2/0	National Level II	In-situ conservation

4		Cymbidium bicolor Lindl	K11+150	2m on the left	5/5	National Level II	Optimize the design as far as possible to avoid them; if it is impossible to avoid them, report it to the forestry departmen t for the approval of transplant
5		Cibotium barometz	K9+400	290m on the right	2/0	National Level II	In-situ conservati on
6		Cibotium barometz	K5+360	45m on the left	2/0	National Level II	In-situ conservati on
7	Anci ent tree	Ficus microcarpa Linn. f.	K11+150	Adjacent to the left side	1/1	Class III	Optimize the design as far as possible to avoid them; if it is impossible to avoid them, report it to the forestry departmen t for the approval of transplant
8		Litchi chinensis	K12+560	20m on the right	1/0	Class III	In-situ conservati

							on
Protected animals							
1	Protected animals		The Project mainly occupies the activity and foraging areas of protected animal and does not affect the concentrated habitats of protected animal		There are 3 species of national Class II protected animals (hoplobatrachus rugulosus, glaucidium cuculoides and centropus sinensis) and 21 species autonomous region-level protected animals, such as bufo melanostictus, naja atra, pycnonotusjocosus and callosciurus erythraeus.	National Class II and autonomous region-level protected animals	Strengthen the management of construction personnel; ban on hunting; set up bridges and culverts
Key public welfare forest							
1	Key public welfare forest		The crossing length of subgrade in Daxin County is about 3700m, covering an area of about 1.08hm^2		Water conservation forest	Key public welfare forest	Optimize the design to reduce the occupation, take measures of "compensating every piece of land occupied" in case of occupation

4.3 Shuolong Port (Phase II of Shuolong Main Gate)

4.3.1 Atmospheric and Acoustic Environment Protection Objects

There is 1 acoustic environment within the evaluation scope of the proposed project. See Table 4.3-1 for details.

Table 4.3-1 List of Acoustic and Atmospheric Environmental Sensitive Points along the Project

S/N	Sensitive Point Name	Location Relation with the Project		Households/ Number	Characteristics of Surrounding Environment and Investigation on Drinking Water of Villagers	Photo
		Orientation	Distance (m)			
1	Shuolong town residential area	East	5	5/20	The houses are mainly brick-concrete buildings with 2 floors, all of which are equipped with aluminum alloy glass windows. Villagers' drinking water is the tap water.	

4.3.2 Water Environmental Protection Objects

The water environmental protection objects within the assessment scope of the Project mainly include: Guichun River on the north side of the Project and 1 township-level drinking water source protection area near the Project. See Table 4.3-2 and Table 4.3-3 for the relationship between main surface water environment protection objects and the route.

Table 4.3-2 List of Main Surface Water Environmental Protection Objects of the Project

S/N	Main Surface Water Bodies	Location Relation with the Project	Investigation on Centralized Drinking Water Source Conservation Area	Main Measures
1	Guichun River	30m north of plant boundary	It is planned to set up Aitun drinking water source protection zone in Shuolong Town at 6.5km upstream of the	Temporary drainage ditches and sedimentation tanks shall be provided for the construction, to

			river	prevent that the bare surface is washed by rain and flows into Guichun River, so as to avoid affecting the water quality.

Table 4.3-3 List of Main Surface Water Environmental Protection Objects along the Project

S/N	Protection Objects	Orientation Opposite to Plant Boundary	Distance from the Project	Type
1	Community water source area in Shuolong Town, Daxin County	Northwest	The project is about 1000m away from the land area of the Class II protection zone	Drinking water source conservation area

4.3.3 Ecological Environmental Protection Objects

There are only two ecologically sensitive areas within the evaluation scope, namely Xialei Autonomous Region Nature Reserve and Huashan Scenic Area in Guangxi.

The results of the field survey within the evaluation scope are as follows: there are 3 species of national Class II protected plants, including 4 species of excentrodendron tonkinese, 7 clusters of cymbidium bicolor lindl, and 9 clusters of cibotium barometz; there are 2 ancient trees (banyan tree and litchi tree); there are 3 species of national Class II protected animals (hoplobatrachus rugulosus, glaucidium cuculoides and centropus sinensis) and 21 species autonomous region-level protected animals, such as bufo melanostictus, naja atra, pycnonotusjocosus and callosciurus erythraeus. The project mainly occupies the activity and foraging habitats of protected animals, which do not involve their concentrated habitats.

Table 4.3.-4 Ecological Environmental Protection Objects

Ecologically Sensitive Area						**Measures**
S/N	**Sensitive Objects**	**Grade**	**Main Protected Objects**	**Location Relation Between the Route and the Protection Area**	**Management Requirement**	
1	Xialei Nature Reserve in Guangxi	Autonomous region level	Northern tropical karst forest ecosystem and rare and endangered species such as François's Langur, Assamese Macaque,	Crossing is not involved, and the nearest distance is about 1000m.	The experimental area can be used for scientific experiments, teaching practice, visit and domestication, cultivate rare	Crossing is not involved; it is prohibited to arrange the temporary sites in protected areas

			Burretiodendron hsienmu, Cycas miquelii and Orchid		animals and plants and other activities	
2	Huashan National Scenic Area in Guangxi	National Level	A large number of cliff mural landscapes of the ancient Zhuang nationality	The project is located in the scenic area	Other formalities may be handled according to law after the plan is approved by the construction administrative department at or above the county level according to the management authority of construction projects	Coordinate landscape greening with scenic area; strengthen the management of construction; accept the supervision of scenic area management office

5 Environment Impact Analysis and Mitigation Measures

5.1 Wuzhou (Longyanzui)-Shuolong Expressway (Chongzuo–Jingxi Expressway to Shuolong Port Section)

5.1.1 Ecological Impact Analysis and Mitigation Measures

5.1.1.1 Analysis of Ecological Impact

(1) In the recommended scheme, the main line of the project (Route K) (chainage K7+885~K10+715) and the connecting line (chainage AK3+600~AK4+600) cross the experimental area of Xialei Nature Reserve, with a total crossing length of about 3.83km. According to the Assessment Report on Environmental Impact of Wuzhou (Longyanzui)– Shuolong Highway (Chongzuo–Jingxi Expressway to Shuolong Port Section) on Xialei Region-Level Nature Reserve in Guangxi prepared by Guangxi Forest Inventory & Planning Institute, the quantitative results show that the impact of the proposed highway on the ecological system and landscape, biological community and habitat, and main protected objects of Xialei Nature Reserve are relatively small, and the impact on the species and populations of Xialei Nature Reserve and the biosafety of the nature reserve is moderate impact. The proposed highway construction has some negative impacts on Xialei Nature Reserve, which are mainly as follows: the connectivity of habitat is affected to some extent, thereby leading to the impact on the migration, dispersion and reproduction of important species; invasive plants spread further, and the accessibility of the nature reserve is improved, which leads to an increase in the management cost and difficulty of the nature reserve. On the premise of actively taking protection and restoration measures, properly coordinating the relationship with relevant interest groups can alleviate the impact of the proposed highway on the nature reserve.

(2) K11+500~K12+263 and AK0+000~AK5+416 pass through Huashan Scenic Area, the national Class II protection area, with a total crossing length of 6.179km, which does not involve special and Class I scenic areas. The scenic areas along the line are mainly the Class III scenic spots of Duxiu Peak and Yuejin Channel, with the nearest distances of 500m and 1100m respectively. There are few scenic spots on both sides of the proposed highway. The terrain along the line is featured by small topography changes. In spite of the inevitable vegetation destruction along the line during

construction, the interference to the vegetation will be minimized through planning, design and compensation restoration. The line has little impact on the landform and vegetation primitiveness of the Huashan Scenic Area. The line passing through the periphery of the scenic spot intensive area has little impact on the integrity of scenic spots and improves the accessibility of the scenic area.

(3) The biomass loss caused by the project construction is about 2036.4 t, and the lost species are mainly common species and artificial species.

(4) The protected plants distributed within the evaluation scope, such as excentrodendron tonkinese, zenia insignis Chun, cibotium barometz and ancient trees, are all outside the road reserve boundary, and are less affected by the engineering construction.

(5) For cultivated land and villages in sections with protected amphibians such as hoplobatrachus rugulosus and fejervarya limnocharis, the road sections are basically along the foot of the mountain, involving no large-scale crossing of irrigated land. The project has 10 bridges and 5 tunnels in the above-mentioned sections. The ecological connectivity on both sides of the highway is maintained to a certain extent through these facilities, and the barrier effect of the highway on amphibian protected animals is reduced.

(6) The sections for Rana guentheri, Bungarus fasciatus, Pycnonotusjocosus, Callosciurus erythraeus and other protected animals at the autonomous region level, are mainly habitats such as shrubs and wood land near water, and the affected species can find suitable alternative habitats in the region by actively moving. In the Project, the bridge-tunnel ratio of the mainline is 71.4%, and the bridge-tunnel ratio of the connecting line is 28.22%, which plays a certain role as an animal corridor and has an acceptable impact on the habitat, migration, distribution and reproduction of Bungarus fasciatus.

(7) The area of key public welfare forests occupied by the project is about 15.7 hm^2, which are all key public welfare forests at the autonomous region level. The vegetation types of key public welfare forests are monsoon forest and warm shrubs, and the main ecological function is water conservation forest. On the whole, the Project occupies a relatively small proportion of the area of key public welfare forests compared with that in counties along the line, would not impair the continued performance of its dominant ecological function, and has no great impact on its overall

ecological service capacity. In addition, a site survey on ecological public welfare forests through which the Project goes shows distribution of the same vegetation type similar or superior to that on the structure of key public welfare forests to be occupied near the forests. With "occupation and supplementation", the ecological service capacity of regional key public welfare forests would not change greatly.

(8) Bush is mainly occupied at the tunnel entrance and exit at the construction area of tunnel works in the Project, a portion of economic forests and scrub-grassland also occupied. The affected species are mainly local common or widely distributed species, such as Pterolobium punctatum, Cipadessa cinerascens, Sageretia omeiensis, and Cratoxylum cochinchinense. The number of lost plant individuals is limited, which basically has no effect on the population quantity in relative regions. All tunnel works along the project have good geological conditions and stable bedrock, and the tunnel construction has no direct disturbance to the vegetation on the tops.

(9) The project has three spoil areas and three temporary stock yards. Among the two production and living areas, except that the construction and living area is close to residents (the nearest residential area (Dunli) is 120 m away from No.1 on the east side and the nearest residential area (Bangtun) is 25 m away from No.2 on the north side), the asphalt mixing plant and concrete mixing plant in the construction and living area should be reasonably arranged and kept as far away as possible from residential areas; selection of other temporary sites meet the requirements basically.

From the perspective of environmental protection, spoil grounds and temporary stockyards of the Project shall follow the site selection principle and requirement below:

① Borrow areas shall be located at low hills whenever possible; spoil grounds and temporary pile yards shall be in the valley or gentle slope type as possible. The spoil ground with a small upstream catchment area is not a big gully and easy to be protected. The surrounding of spoil grounds and temporary stock yards is free of collapse, landslide, and other natural disasters.

② Spoil grounds and temporary stock yards shall get rid of centrally distributed habitats of protected flora and fauna or well developed natural vegetation, and areas with special social concern (such as, concentrated villages and towns, hospitals and schools). There is no village or important utility within the impact area of spoil grounds, especially downstream areas.

③ Without the consent of the competent authority, spoil areas, borrow areas and

temporary stock yards shall not be in areas prohibited by laws and regulations, such as nature reserves, geological parks, famous scenic sites, culture relic protection site, drinking water source protection area, danger areas of collapse and landslide and susceptible areas of debris flow.

④ Spoil areas, borrow areas and temporary stock yards shall not be in urban and township planning areas or visible range of famous scenic sites. Spoil areas and borrow areas shall not be within the visible range of the highway as possible.

⑤ Spoil grounds and temporary stock yards are not allowed to be located at rivers and reservoirs along the line or below the highest flood line of the river.

⑥ Spoil grounds, borrow areas and temporary stockyards shall not be set up in basic cultivated land, high-yield cultivated land, specialty cultivated land and mineral resources distribution areas and other important resource areas; occupation of woodland and irrigated land shall be avoided as far as possible, and occupation of non-irrigated land shall be minimized as far as possible; priority shall be given to hillside land, wasteland, abandoned land or unavailable land.

⑦ The haul distance of borrows and spoils shall be minimized and existing access roads shall be used for transportation as possible; transport passage do not go through sensitive areas, such as urban areas, concentrated residential areas, schools and hospitals.

The construction, production and living area shall meet the following site selection requirements:

① Rent local houses or use houses acquired and demolished for the highway as construction camps and management rooms during the construction period of the Project as possible;

② It shall not be located within the range of the catchment area of the water body with the function of drinking water. Sewage cannot be discharged to the vicinity of the water intake of the surface water body or groundwater with the function of domestic drinking water.

③ Without the consent of the competent authority, it shall not be in areas prohibited by laws and regulations such as nature reserves, geological parks, famous scenic sites, basic cultivated land protection areas, culture relic protection sites and drinking water source protection areas.

④ It shall not be set up in basic cultivated land, high-yield cultivated land, specialty cultivated land and mineral resources distribution areas, and other important resource areas; occupation of wood land and irrigated land shall be avoided as far as possible, and occupation of non-irrigated land shall be minimized as far as possible, priority shall be given to hillside land, wasteland, abandoned land or unavailable land;

⑤ The domestic sewage generated shall be treated by sewage treatment facilities before discharged. The effluent quality shall meet the requirements of the Grade I standard limit in the Integrated Wastewater Discharge Standard. Feces in the centralized living area can be used as cultivated land fertilizer through composting. It is strictly prohibited to allow them to overflow or discharge them into rivers without treatment.

⑥ According to the Design Specifications of Highway Environmental Protection (JTG B04-2010), the asphalt mixing station should not be less than 300m to the environmental sensitive point, and shall be located on the windward side of the protected object in the wind direction of the least frequency in local construction seasons.

⑦ According to the Design Specifications of Highway Environmental Protection (JTG B04-2010), the aggregate and other mixture mixing station should not be less than 200m to the environmental sensitive point, and shall be located on the windward side of the protected object in the wind direction of the least frequency in local construction seasons.

(10) Common fish are mainly distributed in the bridge site assessment area. The impact of major bridge construction on the water environment is mainly manifested by the increase of suspended substance concentration in the water body, and the concentration of petroleum substances in the water body will also increase under the condition of improper treatment or management. The primary productivity is reduced mainly by affecting photosynthesis such as algae in the water body, which leads to a decrease of bait, which has a certain impact on fish. The impact of the project on fish is limited to the construction area, so it does not affect the protection of fish species resources. The increase of suspended solids concentration in water will lead to a decrease of plankton biomass in the construction area. After the construction, with the dilution and self-purification of water, the water quality will gradually improve, and the plankton can basically return to the level before construction. The aquatic benthonic animal is also distributed in similar environments in other nearby areas. From the

perspective of species protection, the construction of the project has little impact on these species. Cofferdam construction technology is adopted in the construction of bridge foundation, so as to minimize the disturbance to rivers, and the impact on aquatic organisms is small and temporary, which can be basically restored upon the operation of the project.

5.1.1.2 **Ecological Impact Mitigation Measures**

(1) The main line chainage K7+885~K10+715 and the connecting line chainage AK3+600~AK4+600 of the project cross the experimental area of the Xialei Nature Reserve. It is forbidden to set up temporary sites such as construction camps, construction, production and living areas, spoil areas, temporary stock yards and construction building materials stacking points in the drinking nature reserve, and it is forbidden to dredge sand and borrow soil within the scope of the reserve. The construction range shall be strictly delimited, and the number of temporary land occupation and construction temporary access shall be controlled. It is not allowed to expand the land range into the nature reserve without authorization, or pile up domestic garbage and discharge wastewater in the nature reserve. The construction and production domestic sewage outside the nature reserve shall not be discharged into the nature reserve. The design of Longkalang Tunnel, Longdong Tunnel and Shuolong Tunnel shall be improved, and special landscape shall be designed for the tunnel portals and exits. The design form, color and shape should be coordinated with the surrounding natural landscape, and covering and greening shall be provided. Preventive animal barriers shall be provided to prevent wild animals from entering the tunnel and nearby roads. Ecological slope protection should be adopted as far as possible in the road section crossing the nature reserve, and green plants should be planted with little artificial trace where the mortar rubble protection slope must be used. Warning signs and speed limit and no-horn signs shall be provided 1km before entering the Xialei Nature Reserve on the road. The signs 1km before entering the reserve says "It's close to Xialei Nature Reserve, please drive carefully, and do not turn on high beam lights", and the warning sign for leaving the section between the two reserves says "you have left Xialei Nature Reserve, thank you for your support".

(2) The main line K11+500~K12+263 and the connecting line AK0+000~AK5+416 of the project cross the Huashan Scenic Area (Class II Reserve). Special greening should be designed for crossing sections, and local species should be

organized to imitate local ecological communities and integrate highway landscape with the natural landscape. Ecological slope protection should be adopted as far as possible in the visible area, and green plants should be planted with little artificial trace where the mortar rubble protection slope must be used. The site selection of construction, production and living areas shall be further optimized. The distance between asphalt mixing plant and the nearest environmental sensitive point should not be less than 300m, and the distance between mixture mixing plant and the nearest environmental sensitive point should not be less than 200m, and the mixing plants should be on the windward side of the protected object with the minimum frequency wind direction in the local construction season. It is forbidden to set up temporary sites such as construction, production and living areas, spoil area, temporary stock yards and construction building materials stacking points in Huashan Scenic Area and its adjacent areas, and it is forbidden to dredge sand and borrow soil within the Huashan Scenic Area. It is necessary to mark out the construction range strictly, control the number of temporary sites and construction temporary access, and prohibit anyone from expanding the range at will or entering the Huashan Scenic Area. It is forbidden to pile up domestic garbage and discharge wastewater in Huashan Scenic Area. Set up warning signs and speed limit no-sounding signs 1km before the road section near Huashan Scenic Area. Warning signs, speed limit signs and no-horn signs shall be provided 1km before entering Huashan Scenic Area. The signs 1km before entering Huashan Scenic Area says "It's close to Huashan Scenic Area, please drive carefully, and do not turn on high beam lights", and the warning sign for leaving the section between the two reserves says "you have left Huashan Scenic Area, thank you for your support".

(3) The construction shall be carried out in strict accordance with the construction boundary, and the construction plan range shall not be expanded at will.

(4) During the construction period, the contractor should strengthen the protection of the stock yards and spoil areas, strengthen the sanitary management of the construction personnel, avoid the direct discharge of domestic sewage, reduce water pollution, and maximize the protection of animal habitats.

(5) Sections K4+200~K9+200 and K11+500~AK5+300 involve irrigated land sections and Sections K12+0~K12+100 and AK5+300~ line ending point involve river section, and amphibian protected animals such as Hoplobatrachus rugulosus and Fejervarya limnocharis may appear. Highway construction should be routed along the

foot of the mountain, avoiding the direct crossing of irrigated land sections. In addition, culverts should be further added to the above sections to alleviate the impact, and gentle slopes should be designed at both ends of the culverts to facilitate amphibian migration.

(6) For the sections K4+200~K9+200 and K11+500~AK5+300 where there is a high probability of poor flying birds such as Centropus bengalensis, Centropus sinensis and Phasianus colchicus, it is suggested to plant shrubs such as low arbor + Paliurus ramosissimus on both sides of the subgrade section to form a arborous layer and dense hedgerow under the forest, so as to improve the flying height of birds such as Centropus sinensis crossing the highway.

(7) Raptors such as aviceda leuphotes and elanus caeruleus, and mammals such as scandentia and prionailurus bengalensis are mainly distributed in the K1+700~K4+200, K9+200~K11+500 forests in the road sections with well-developed vegetation and little human interference, as well as the road sections crossing the Xialei Nature Reserve, which are close to the core area of the protection area and on one side of the buffer zone. During the blasting operations, the amount of detonation is decreased and the operations are prevented in the morning, at night, and at the noon to eliminate the impact on the animals.

(8) After the completion of the project, the ecological environment of the construction site should be restored as soon as possible to minimize the adverse impact of habitat destruction on animals. After the construction of each section of highway is completed, the temporary land occupation and its vicinity shall be greened reasonably, and the native evergreen trees shall be mainly planted, with some shrubs and herbs to restore the animal habitat and landscape as soon as possible.

(9) The project construction plans to use 15.7 hectares of public welfare forests at the autonomous region level, which are located in the wood land areas of Tiandeng County and Daxin County respectively. The line Designer is suggested to avoid the areas involving public welfare forests in the first place. If it is impossible to avoid them, the passage form shall be of bridges or tunnels. If it is required to adopt subgrade for the route, the Route Designer needs to go through the relevant wood land formalities as per the law, accept the supervision of the forestry authority, adopt the non-local compensation mode of "compensating every piece of land occupied", and pay a full amount of forest and vegetation recovery fees for the construction, cultivation, protection and management of public welfare forests.

5.1.2 Water Impact Analysis and Mitigation Measures

5.1.2.1 Analysis of Wastewater Impact

(1) The project bridges across Baidou River, Xialei River and Guichun River have pier construction in water, and it is planned to use the technology of "steel cofferdam + bored pile", which will have produce certain suspended solids that affect the water within 100m downstream of the bridge site during the construction period.

(2) The construction and production wastewater is treated by oil separation and precipitation, and then used for sprinkling water on the construction site to reduce dust. Domestic sewage from construction camps is treated by temporary septic tanks and used for surrounding agricultural irrigation, which has little impact on the environment.

(3) MBR sewage treatment facilities are adopted for the treatment of the sewage from toll stations during the operation period, and the wastewater can be reused for greening, road cleaning, toilet flushing, etc. without external discharge, which has little impact on the water environment after being treated to meet the standards of the *Reuse of Recycling Water for Urban - Water Quality Standard for Non-portable Urban Use* (GB_T18920-2002) and the *Wastewater Reuse of Highway Service Area - Water Quality* (JT/T645.1-2016), and toilet flushing, road cleaning, urban greening standards.

5.1.2.2 Analysis of Impact on Water Environmental and Mitigation Measures

(1) It is forbidden to set up temporary facilities such as spoil area, temporary stock yards, borrow areas and construction camps in Xialei Nature Reserve, Huashan Scenic Area and Water Source Protection Area.

(2) Reasonably arrange the operation sequence of the pile foundation of the river-crossing bridge to avoid the flood period of the river; steel cofferdams should be provided in the dry season, and advanced technology should be adopted to shorten the operation time. All cofferdams should be completed and the working face should be cleaned up before the flood season comes.

(3) After the construction and production wastewater is treated by oil separation and precipitation, the supernatant is used for sprinkling water on the construction site to reduce dust, and the precipitated mud and muck are dried in the drying tank and then transported to the spoil area for disposal. Domestic sewage from the construction camp will be treated by temporary septic tanks and used for surrounding agricultural

irrigation.

(4) MBR sewage treatment facilities are adopted for toll stations and maintenance work areas, and the wastewater can be reused for greening, road cleaning, toilet flushing, etc. without external discharge, which has little impact on the surrounding surface water after being treated to meet the standards of the *Reuse of Recycling Water for Urban - Water Quality Standard for Non-portable Urban Use* (GB_T18920-2002) and the *Wastewater Reuse of Highway Service Area - Water Quality* (JT/T645.1-2016), and toilet flushing, road cleaning, urban greening standards.

5.1.3 Noise Impact Analysis and Mitigation Measures

5.1.3.1 Environmental Impact Analysis of Noise

(1) The noise generated by loaders in the process of demolition & relocation and subgrade excavation has the greatest impact, and the daytime noise level at the construction site boundary is about 21.0dB(A) higher than the daytime noise limit specified in the Emission Standard of Environment Noise for Boundry of Construction Site (GB12523-2011), and the nighttime noise level is about 36.0dB(A) higher than the nighttime noise limit; the daytime noise level at the construction site boundary in the process of subgrade filling is about 19.0dB(A) higher than the daytime noise limit specified in the Emission Standard of Environment Noise for Boundry of Construction Site (GB12523-2011), and the nighttime noise level is about 34.0dB(A) higher than the nighttime noise limit; the daytime noise level at the construction site boundary in the process of construction of bridge pile foundation is about 19.0dB(A) higher than the daytime noise limit specified in the Emission Standard of Environment Noise for Boundry of Construction Site (GB12523-2011), and the nighttime noise level is about 34.0dB(A) higher than the nighttime noise limit; the daytime noise level at the construction site boundary in the process of road paving is about 19.5dB(A) higher than the daytime noise limit specified in the Emission Standard of Environment Noise for Boundary of Construction Site (GB12523-2011), and the nighttime noise level is about 34.5dB(A) higher than the nighttime noise limit.

(2) Impact analysis on sensitive points during the construction period: For sensitive points close to the highway construction site boundary for which Class 4a standards are implemented, the daytime noise during construction is 2.9 dB(A) higher than standard, and the nighttime noise is 17.9 dB(A) higher than standard. At the

sensitive points for which Class 2 standards are implemented, where there is shelter from a row of buildings in front of them, the daytime and nighttime noise is 6.0dB(A) and 11.0dB(A) higher than standard respectively; where there is no shelter from buildings in front of them, the daytime and nighttime noise at a distance of 100m from the centerline of the highway is 5.0dB(A) (max.) and 15.0dB(A) (max.) higher than standard respectively; and, the daytime noise at a distance of 150m from the centerline of the highway is 1.5 dB(A) (max.) higher than standard, and the nighttime noise is 11.5dB (A) (max.) higher than standard.

(3) The Project includes 6 tunnels, which may require blasting. According to the relevant data, the sudden instantaneous sound level in the blasting can reach 130dB(A), which can greatly changes the surrounding acoustic environment and frighten the nearby people. The blasting impact range is a radius of 500m from the blasting hole. The investigation finds that there are three sensitive targets (Buli Village, Longrun Village and Rentun Village) within a 500m radius of the tunnel. The Project may bring a great instantaneous impact to them, but the impact is temporary. The adverse impact will disappear when the blasting ends up.

(2) By the mid-term operation of the project, among the 12 sensitive points, the daytime noise of all the sensitive points meets the requirements of the corresponding standards in the Environmental Quality Standards for Noise. The nighttime noise of three sensitive points in Bangtun, Sanjiatun and Rentun exceeded the requirements of the corresponding standards of the Environmental Quality Standards for Noise, and the excess of Dunli is 1.0-7.9dB(A), which affects about 197 residents in total.

5.1.3.2 Noise Impact Mitigation Measures

(1) During the construction period, it is necessary to focus on the acoustic environmental impact and protective measures of villages close to the highway. It is strictly forbidden to carry out construction at noontime (12: 00 ~ 14: 30) and 22: 00 ~ 6:00 the next morning. If continuous operation is required, it shall be announced in advance.

(2) Take measures such as replacing aluminum alloy windows for buildings with excessive noise prediction in the mid-term operation.

(3) Within the scope of noise exceeding the standard during the operation period of the Project, it is not advisable to build new noise-sensitive buildings such as schools, hospitals, nursing homes, etc. If the construction of these buildings is required,

necessary noise reduction measures shall be taken.

5.1.4 Vibration Impact Analysis and Mitigation Measures

5.1.4.1 Analysis of Vibration Impact

According to the prediction results of the *Environmental and Social Impact Assessment Report* of the Project, the vibration speed of Longruntun is lower than the safe allowable vibration speed of general civil buildings, and the vibration speed is within the safe allowable vibration speed range of roughcast houses. The blasting operation of the Longdong Tunnel has little impact on the safety of nearby sensitive points (houses) in Longruntun. The vibration speed of sensitive points in Rentun is slightly higher than the safe allowable vibration speed of general civil buildings, and higher than the safe allowable vibration speed range of roughcast houses. The blasting operation of Shuolong Tunnel has a certain influence on nearby sensitive points in Rentun. The Assessment suggests using the current mature millisecond blasting technology, reducing the blasting charge in one blasting, selecting reasonable blasting parameters, millisecond delay intervals and other measures to reduce the vibration influence caused by the blasting.

5.1.4.2 Vibration Impact Mitigation Measures

According to the vibration impact analysis, the vibration speed of Longruntun is lower than the safe allowable vibration speed of general civil buildings, and the vibration speed is within the safe allowable vibration speed range of roughcast houses. The blasting operation of the Longdong Tunnel has little impact on the safety of nearby sensitive points (houses) in Longruntun. The vibration speed of sensitive points in Rentun is slightly higher than the safe allowable vibration speed of general civil buildings, and higher than the safe allowable vibration speed range of roughcast houses. The blasting operation of Shuolong Tunnel has a certain influence on nearby sensitive points in Rentun. However, the blasting vibration speed is affected by factors such as primary charge and geological conditions. When the engineering geological conditions are determined, the blasting charge directly affects the vibration strength and the safety distance. Therefore, the Assessment suggests using the current mature millisecond blasting, reducing the blasting charge in one blasting, selecting reasonable blasting parameters, millisecond delay intervals and other measures to reduce the vibration

influence caused by the blasting.

5.1.5 Atmospheric Impact Analysis and Mitigation Measures

5.1.5.1 Atmospheric Impact Analysis

(1) During the construction period, the main air pollution sources are dust caused by material transportation, loading and unloading, earthwork filling and excavation, and concrete mixing. In the absence of dust control measures, the area within 150 meters of the downwind of the construction site is seriously affected by dust.

(2) Clean energy such as electricity and liquefied gas are used for all the toll stations in the project, and the main air pollution source during the operation period is automobile exhaust. According to the analogy analysis, the 24-hour average value and the 1-hour average value of nitrogen dioxide and carbon monoxide within the highway assessment range meet the requirements of Class II Standard of the *Ambient Air Quality Standard* (GB3095-2012) in the long-term operation.

(3) By analogy analysis, the concentration distribution of exhaust pollutants at the tunnel portal attenuates with the increase of plane distance from the portal center which has the highest concentration, and the attenuation is significant without terrain obstruction. Atmospheric stability has a great impact on the concentration distribution of pollutants outside the tunnel portal. When the atmosphere is stable, the diffusion ability of pollutants is inhibited, and when the atmosphere is unstable, the turbulent motion is strengthened, the pollutants discharged from the portal diffuse rapidly, and the concentration of pollutants around the portal is low. The maximum CO concentration at 60m and 90m outside the tunnel portal does not exceed 10.00mg/m^3 and 8.5mg/m^3 respectively. Therefore, the tunnel pollutants in the Project have little impact on the ambient air at sensitive points 60 m away.

5.1.5.2 Atmospheric Impact Mitigation Measures

(1) Dust prevention measures such as enclosing metal baffles should be taken on the construction site, sprinkling water should be carried out regularly to reduce dust on the construction site and construction temporary access, and water-sprinkling times should be increased on sections close to sensitive targets such as residential areas.

(2) For the construction camp with concrete (asphalt) mixing plant and storage yard, there should be no sensitive points within 300m in the downwind direction, and the mixing plants should be equipped with dust removal device, and water shall be sprinkled around the mixing plant to reduce dust.

5.1.6 Impact Analysis of Solid Waste and Mitigation Measures

5.1.6.1 Impact Analysis of Solid Waste

(1) Environmental impact analysis of solid waste during the construction period

An amount of 473,000m^3 permanent slag will be discarded in the project. Due to the quantity of waste earthwork & stonework is relatively large, if the spoil ground is not arranged reasonably or the contractor piles up the slag at will, it is easy to cause the unplanned distribution of waste earthwork & stonework and spoils along both sides of the work area, crowding out a considerable amount of agricultural and forestry land, making it difficult to control water and soil loss, causing great adverse effects on the ecosystem around the spoil grounds and bringing great difficulties to the recovery and utilization of temporary land at the spoil ground. It will also bring great adverse effects on the landscape environment along the route.

The total amount of domestic waste in the construction camps during the construction period is 72t. The domestic waste in the construction camps generally contains many organic matters, which is easy to cause a large number of bacteria and mosquitoes to multiply. If it cannot be collected and disposed of centrally, it will easily lead to an increase in the incidence of infectious diseases in the camp and easy to spread. Villages are distributed around some construction camps, and the stench generated by randomly dumped domestic waste will have certain adverse effects on the health of residents in surrounding villages and the surrounding landscape environment. Therefore, regular collection and disposal are necessary.

(2) Environmental impact analysis of solid waste during the operation period

The annual output of solid domestic garbage of service and management facilities along the project is 10.95 t/a. If it is not properly collected and treated, it will have a considerable adverse impact on the sanitation and landscape environment around the service facilities. During the operation stage of the Project, the maintenance workers will maintain the whole route of the highway, clear, collect and centrally dispose of the garbage dropped by the running vehicles or passengers along the route. Therefore, this

category of solid waste generally does not have a big adverse impact on the environment along the route.

The micro amount of oily sludge produced by the oily sewage treatment facilities in the toll station of the Project is hazardous waste, which is collected by the toll station operation entity and then regularly disposed of by an entrusted qualified entity.

The general solid waste and hazardous waste generated by the project are properly disposed of and the environmental management is strengthened. The hazardous waste generated during the operation period of the project has little impact on the surrounding environment.

5.1.6.2 Mitigation Measures for Solid Waste

(1) Mitigation measures of solid waste during the construction period

① Abandoned earthwork of subgrade shall be transported to the spoil ground and temporary spoil yard determined in the project design in time. It is strictly prohibited to pile up along the construction area at will, and corresponding protective measures shall be taken according to the Soil and Water Conservation Scheme of the project.

② The contractor shall provide management personnel to carry out on-site management on the transportation and disposal of the muck, so as to avoid rough loading and transportation and improper dumping.

③Strengthen the production management, and regularly inspect and maintain asphalt pipelines and storage tanks. Asphalt mixing residue shall be collected in a special container to be recycled. The asphalt waste that cannot be reused shall be sent to a qualified company for recycling, and shall not be landfilled or burned directly.

④ The muck generated from bridge construction shall be transported to the spoil ground for disposal.

⑤Small garbage bins are provided in the construction camp for centralized collection and then the local environmental sanitation department is entrusted to transport and dispose of the garbage. It is not allowed to throw the garbage everywhere or mix them with construction waste, which will affect environmental sanitation.

(2) Mitigation measures of solid waste during the operation period

① Garbage cans will be provided in toll stations of the project to collect solid waste, and the garbage will be regularly transported and removed by the environmental sanitation department;

② The micro amount of oily sludge produced by the oily sewage treatment facilities in the toll station is hazardous waste, which should be stored separately and regularly handed over to local dangerous goods disposal entity for proper disposal.

③ Build a temporary storage room that meets the requirements, and entrust an entity with corresponding hazardous waste disposal qualification to properly dispose of hazardous wastes such as waste oil sludge and oil residue generated after oil separation during the operation period.

5.1.7 Environmental Risk Impact Analysis and Mitigation Measures

5.1.7.1 Environment Risk Impact Analysis

1. Environmental Risk

In the long term of operation, the probability of dangerous goods transportation accidents on the project bridges crossing water is 0.000014~0.006222 times/year, with the largest probability of dangerous goods transportation accidents of 0.006222 times/year in Longkalang Bridge. The probability of dangerous goods accidents in the long tunnels is 0.000188~0.011523 times/year, with the largest probability of dangerous goods transportation accidents of 0.011523 times/year in Longdong Tunnel.

In the Project, vehicles transporting dangerous goods and harmful substances such as chemicals on sections of important water areas are less likely to have traffic accidents. But according to the principle of probability theory, this kind of small probability event is possible. Once dangerous goods transportation accident happens, if no effective preventive measures are taken, the water environment of Baidou River, Xialei River and Guichun River will be greatly polluted.

2. Impact on Sensitive Areas

(1) Prediction and Analysis of Buxuan Bridge

According to the prediction results in the table, after the oil spill occurs in Buxuan Bridge, the oil can spread to Baidou River-Xialei Nature Reserve 5km downstream after about 4 hours.

(2) Prediction and Analysis of Dunli Bridge

According to the prediction results in the table, after the oil spill occurs in Dunli Bridge, the oil can spread to Baidou River-Xialei Nature Reserve 1.7km downstream after about 1.36h.

(3) Impact Analysis of Other River Sections

Bangtun Bridge across Xialei River and Shuolong Guichun River Bridge across Guichun River are located in Huashan Scenic Area. In case of an oil spill, it will directly pollute the sensitive target in Xialei River-Huashan Scenic Area Section and Guichun River-Huashan Scenic Area Section. Therefore, emergency plans should be started in time to reduce the impact on sensitive areas.

(4) Emergency measures

Since there are great uncertainties of oil spill quantity and oil spill timing in oil spill accidents, in case of an oil spill, the emergency plan should be started in time, the downstream sensitive area shall be notified, and oil slick shall be controlled without drifting downstream to minimize the pollution impact on the downstream sensitive areas.

5.1.7.2 Risk Prevention Measures

(1) Enhance the monitoring and management of road sections (chainages K7+885~K12+263, AK0+000~AK5+416) crossing Huashan Scenic Area and Xialei Nature Reserve. It is suggested to set a speed limit sign on this section to reduce the possibility of accident risk and set up one warning board at K6+885, K10+715, AK3+600, AK4+600, K11+500 and AK5+416 sections respectively, with emergency contact persons and telephone numbers of the relevant risk accident handling authorities marked on the warning board (the management agency during the highway operation period and the environmental risk emergency rescue personnel of this section).

(2) Enhance the anti-collision design of water-crossing bridges, especially the sections crossing Xialei Nature Reserve and Huashan Scenic Area, such as Longkalang Super Major Bridge (K8+181~K9+208), Bangtun Major Bridge (K11+697~K12+243) and Shuolong Guichun River Major Bridge (AK5+227~AK5+383). Make sure that the strength of the bridge can meet the strength requirements for avoiding the accident vehicles falling into the river.

(3) The Employer shall prepare an emergency plan and set up an emergency office for handling accidents, so as to communicate, contact and coordinate with competent authorities and other relevant departments in case of risks and accidents, and carry out the treatment at accident scenes.

(4) Enhance the management of dangerous goods transport vehicles, and strictly implement the Specifications for Highway Transportation of Dangerous Goods and Regulations on Safety Management of Dangerous Chemicals; strictly control

dangerous goods transport vehicles without “three certificates" to drive on the road; Vehicles transporting dangerous goods shall be registered in public security organs for filling before driving on the road and shall transport goods following the designated routes and time;

(5) Set up a material warehouse in the toll station of the Project, provide a certain number of accident emergency devices (each place equipped with several hand-held and hand-pushed fire extinguishers, 0.5t oil absorption felt, 5 sets of gas masks, etc.) as emergency materials to control the occurrence of major pollution accidents.

5.2 Detian-Shuolong Highway

5.2.1 Ecological Impact Analysis and Mitigation Measures

5.2.1.1 Analysis of Ecological Impact

(1) The biomass loss caused by the project construction is about 1,112.51 t, and the lost species are mainly common species and artificial species.

(2) The protected plants distributed within the assessment scope include Excentrodendron tonkinese, Cymbidium bicolor Lindl, Cibotium barometz and ancient trees. Among them, except one Ficus microcarpa and five clusters of Cymbidium bicolor Lindl, the rest are all located beside the existing road, which are within the project area and are affected by the project construction if the construction is expanded to both sides by the centerline of the existing road. Other protected plants and ancient trees are at a certain distance from the current highway, so they are less affected with proper construction protection measures.

(3) Amphibious animals mainly inhabit rivers, canals and irrigated lands along the highway. The Project is a reconstruction and expansion project, and most of the road sections are to widen the existing roads, mostly located on both sides of the existing roads. Affected by the current highway occupation and operation, most amphibious animals in the assessment area have moved to undisturbed areas far away from the highway except for a small number of amphibious animals living in roadside cultivated lands under the human settlement environment. Therefore, the construction of the Project has little impact on the individual number and population of amphibious animals in the assessment area.

(4) The sections of autonomous region-level protected animals, such as C. versicolor, E. radiata, P. mucosus, Naja atra, etc., are mainly shrubs, woodlands near

water and other habitats. Affected by the current highway occupation and operation, the naturally sensitive reptiles in the assessment area have moved to undisturbed areas far away from the highway, and the construction activities such as subgrade excavation for reconstruction and expansion of the project have relatively little impact on reptiles.

(5) At present, the Employer initially selects the spoil ground and the construction, production and living area, which are located on the north side plot of the existing border highway at the exit of Longhongtun Tunnel (the north side of CNOOC). This plot is the resettlement land reserved by Shuolong Town, and there are two restrictive factors for the site location, one is that it is in Huashan Scenic Area, and the other is that it is in the water source protection area (Class II Reserve) of Shuolong Community in Shuolong Town. Affected by the route direction, it is inevitable that the spoil area and the construction, production and living area will be located in Huashan Scenic Area. Through the demonstration and analysis of the crossing subject, the project has little impact on Huashan Scenic Area after the compensation and restoration measures are taken, and the crossing subject has been approved by the competent authorities. The site selection of temporary buildings is located in the water source area, but it is not in the catchment area of the water source area. There is no water conservancy connection with the water source area, which has little impact on the water quality of the water source area, and the local government is adjusting the location of the water source area. After adjustment, the site does not involve the water source area, and the site selection is basically reasonable.

5.2.1.2 Ecological Impact Mitigation Measures

(1) Optimize the construction design, and avoid the roadside Ficus microcarpa and adnascent Cymbidium bicolor Lindl in the road section near K11+150; for 3 spots of protected plants and ancient trees which are close to the project area, it is suggested to enclose them and provide signboards for in situ protection to avoid the impact of construction activities; for 3 spots of protected plants far away from the project areas, it is suggested to provide warning signs for in situ protection.

(2) Greening design of the Project shall be combined with the landscape greening design of scenic areas. Vegetation for greening shall be the common species in the assessed area.

(3) It is forbidden to set up stockyards, temporary stock yards, spoil ground, and other activities that may cause damages to landscape resources and natural vegetation

in the core tourist attraction of scenic spots, to reduce the landscape impact of scenic spots caused by construction activities;

(4) The construction red line is strictly controlled, especially construction enclosures and scenic spot reminders at road sections near the Huashan Scenic Area, to avoid affecting nearby scenic spots.

(5) The construction temporary access and temporary land occupation of sections K2+000 ~ K3+600 and K7+300~K9+800 should be reduced as a minimum to reduce the occupation and damage of public welfare forest. Warning signs shall be provided to prohibit land occupation beyond the boundary or cutting down trees, so as to minimize the loss of vegetation caused by the land occupation.

(6) Construction supervision and management of existing forests are strengthened. Contact the management department of Huashan Scenic Area and report the construction section, technology and time period, and accept the supervision and inspection of the management department.

(7) Strengthen the publicity and education of construction personnel, and prohibit hunting wild animals; provide covering and greening at the entrance and exit of the tunnel, and provide preventive animal barriers; investigate whether bird breeding grounds are involved, and if so, construction is not allowed in the breeding period.

(8) Track and monitor the distribution dynamics of invasive alien species and expel them in time.

(9) Choose another site for the spoil ground. It is suggested to relocate the site on the south side of the existing highway to avoid the water source area of Shuolong Community. The construction of the mixing plant can effectively reduce the damage to the original natural environment by using the existing cement plant plot, and the land can be restored to a certain extent after the road is completed and the mixing plant is dismantled and the plot is reclaimed and greened.

5.2.2 Water Impact Analysis and Mitigation Measures

5.2.2.1 Analysis of Wastewater Impact

(1) The construction and production wastewater is treated by oil separation and precipitation, and then used for sprinkling water on the construction site to reduce dust;

(2) Domestic sewage from construction camps is treated by temporary septic tanks and used for surrounding agricultural irrigation, which has little impact on the

environment.

(3) There are no service facilities in the project, and no domestic sewage is discharged during the operation period, which has little impact on the surrounding water quality.

5.2.2.2 Wastewater Impact Mitigation Measures

(1) It is prohibited to set up the spoil area in the water source protection area, and construction machinery washing shall not be carried out in the water source protection area.

(2) After the construction and production wastewater is treated by oil separation and precipitation, the supernatant is used for sprinkling water on the construction site to reduce dust, and the precipitated mud and muck are dried in the drying tank and then transported to the spoil area for disposal;

(3) Domestic sewage from the construction camp will be treated by temporary septic tanks and used for surrounding agricultural irrigation.

(4) There are no service areas, rest areas and toll stations in the whole project, and no domestic sewage is discharged.

5.2.3 Noise Impact Analysis and Mitigation Measures

5.2.3.1 Analysis of Noise Impact

(1) During the construction period, when a single machine works, the daytime noise at a distance of 50m from the construction machinery reaches the standard (70dB(A)) specified in the Emission Standard of Environment Noise for Boundry of Construction Site, and the nighttime noise at a distance of 284m from the construction machinery reaches the standard (55dB(A)).

(2) The noise generated by loaders in the process of demolition & relocation and subgrade excavation construction has the greatest impact, and the daytime noise level at the construction site boundary is about 8.9dB(A) higher than the daytime noise limit specified in the Emission Standard of Environment Noise for Boundry of Construction Site (GB12523-2011), and the nighttime noise level is about 23.9dB(A) higher than the nighttime noise limit; in the process of subgrade filling construction, the daytime noise level at the construction site boundary is about 6.9dB(A) higher than the daytime noise limit specified in the Emission Standard of Environment Noise for Boundry of Construction Site (GB12523-2011), and the nighttime noise level is about 21.9dB(A)

higher than the nighttime noise limit; in the process of bridge pile foundation construction, the daytime noise level at the construction site boundary is about 3.2dB(A) higher than the daytime noise limit specified in the Emission Standard of Environment Noise for Boundry of Construction Site (GB12523-2011), and the nighttime noise level is about 18.2dB(A) higher than the nighttime noise limit; in the process of road paving construction, the daytime noise level at the construction site boundary is about 7.5dB(A) higher than the daytime noise limit specified in the Emission Standard of Environment Noise for Boundry of Construction Site (GB12523-2011), and the nighttime noise level is about 22.5dB(A) higher than the nighttime noise limit.

(3) Impact analysis on sensitive points during the construction period: For sensitive points close to the highway construction site boundary for which Class 4a standards are implemented, the daytime noise during construction is 1.9 dB(A) higher than standard, and the nighttime noise is 16.9dB(A) higher than standard. At the sensitive points for which the Class 2 standard is implemented, where the points are shielded by front buildings, the daytime and nighttime noise is 5.4dB(A) and 15.4dB(A) higher than the standard respectively; where there is no front buildings, the daytime and nighttime noise at a distance of 100m from the centerline of the highway is 0.9dB(A) (max.) and 10.9dB(A) (max.) higher than the standard respectively; the daytime noise at a distance of 150m from the centerline of the highway is up to standard, and the nighttime noise is 4.9dB(A) (max.) higher than the standard.

(4) The sudden instantaneous sound level in blasting can reach 130dB(A), which can greatly change the surrounding acoustic environment and frighten the nearby people. The blasting impact range is of a radius of 500m from the entrance. The investigation finds that there is a sensitive target (Longhongtun) within a 500m radius of the Longhong Tunnel, which may be subjected to a great instantaneous but temporary impact that will disappear when the blasting construction ends.

(5) In the mid-term of project operation, six sensitive points of acoustic environment meets the standard in the daytime, and six sensitive points exceeds the standard in different degrees in the nighttime. 195 residents in 53 households are affected (exceeding the standard), and the nighttime noise of the sensitive points exceeding the standard is 0.6~6.7dB(A) higher than standard in the mid-term operation. It is proposed to replace 530m² ventilation and sound proof windows to achieve the noise reduction effect.

5.2.3.2 Mitigation Measures for Noise Impact

(1) During the construction period, it is necessary to focus on the acoustic environmental impact and protective measures of villages close to the highway. It is strictly forbidden to carry out construction at noontime (12: 00 ~ 14: 30) and 22: 00 ~ 6:00 the next morning. If continuous operation is required, it shall be announced in advance.

(2) Take a measure of mounting sound insulation windows for buildings predicted to have excessive noise in the medium term of operation.

(3) Within the scope of noise exceeding the standard during the operation period of the Project, it is not advisable to build new noise-sensitive buildings such as schools, hospitals, nursing homes, etc. If the construction of these buildings is required, necessary noise reduction measures shall be taken.

5.2.4 Vibration Impact Analysis and Mitigation Measures

5.2.4.1 Analysis of Vibration Impact

According to the prediction results of the Environmental and Social Impact Assessment Report of the Project, the vibration speed of Longhongtun is higher than the safe allowable vibration speed of general civil buildings, and the blasting of Longhong Tunnel has certain impact on the nearby sensitive points of Longhongtun. The Assessment suggests using the current mature millisecond blasting technology, reducing the blasting charge in one blasting, selecting reasonable blasting parameters, millisecond delay intervals and other measures to reduce the vibration influence caused by the blasting.

5.2.4.2 **Vibration Impact Mitigation Measures**

According to the vibration impact analysis, the blasting of Longhong Tunnel has certain impact on the nearby sensitive points of Longhongtun. However, the blasting vibration velocity is affected by factors such as one-time charge and geological conditions. When the engineering geological conditions are determined, the charge for blasting directly affects the vibration intensity and the safety distance. Therefore, the Assessment suggests using the current mature millisecond blasting, reducing the blasting charge in one blasting, selecting reasonable blasting parameters, millisecond delay intervals and other measures to reduce the vibration influence caused by the

blasting.

5.2.5 Atmospheric Impact Analysis and Mitigation Measures

5.2.5.1 Atmospheric Impact Analysis

(1) During the construction period, the main air pollution sources are dust caused by material transportation, loading and unloading, earthwork filling and excavation, and concrete mixing. In the absence of dust control measures, the area within 150 meters of the downwind of the construction site is seriously affected by dust.

(2) According to the analogy analysis, the 24-hour average value and the 1-hour average value of nitrogen dioxide and carbon monoxide within the highway assessment range meet the requirements of Class I Standard of the Ambient Air Quality Standard (GB3095-2012) in the long-term operation.

(3) By analogy analysis, the concentration distribution of exhaust pollutants at the tunnel portal attenuates with the increase of plane distance from the portal center which has the highest concentration, and the attenuation is significant without terrain obstruction. Atmospheric stability has a great impact on the concentration distribution of pollutants outside the tunnel portal. When the atmosphere is stable, the diffusion ability of pollutants is inhibited, and when the atmosphere is unstable, the turbulent motion is strengthened, the pollutants discharged from the portal diffuse rapidly, and the concentration of pollutants around the portal is low. The maximum CO concentration at 60m and 90m outside the tunnel portal does not exceed 10.00mg/m^3 and 8.5mg/m^3 respectively. Therefore, the pollutants in Longhong Tunnel of the Project have little impact on the ambient air of the surrounding sensitive points.

5.2.5.2 Atmospheric Impact Mitigation Measures

(1) Dust prevention measures such as enclosing metal baffles should be taken on the construction site, sprinkling water should be carried out regularly to reduce dust on the construction site and construction temporary access, and water-sprinkling times should be increased on sections close to sensitive targets such as residential areas.

(2) The proposed mixing plant shall be surrounded by enclosures, and a sprinkler system shall be provided around the enclosures. The mixing equipment shall be equipped with dust removal devices.

(3) The Project is an old road reconstruction and expansion project. The existing road is a border highway, and the project is located on the road from Shuolong to Detian scenic area with heavy traffic. Therefore, it is necessary to ensure the smooth traffic of

tourist avenues and tourist vehicles during the construction process, and at the same time ensure civilized construction and meeting of environmental requirements. Subgrade construction of the widened road section should be carried out in the way of half opening to traffic and half closing. The construction area should be cleaned in time and watered regularly, the construction waste slag should be transported to the designated abandoned slag yard in time, safety warning signs should be set up at all major traffic intersections and construction sites, and protective fences should be set up within the protection scope of existing lines, and special personnel should be assigned to guard to ensure the construction safety.

5.2.6 Impact Analysis of Solid Waste and Mitigation Measures

5.2.6.1 Impact Analysis of Solid Waste

There are no traffic service facilities such as service areas and rest areas in the project. During the operation period, the solid waste mainly including the loads scattered by transport vehicles and articles discarded by bus passengers, is linearly distributed along the highway.

During the operation stage of the Project, the maintenance workers will maintain the whole route of the highway, clear, collect and centrally dispose of the garbage dropped by the running vehicles or passengers along the route. Therefore, this category of solid waste generally does not have a big adverse impact on the environment along the route.

5.2.6.2 Mitigation Measures for Solid Waste

(1) Garbage cans are provided at scenic areas and parking islands along the route, and sanitation personnel are arranged to clean and collect domestic garbage which shall be cleaned and transported by the sanitation department on a regular basis;

(2) Publicity is enhanced along the route, and signs of "No littering and protect the tourist attraction environment" are set up.

5.2.7 Environmental Risk Impact Analysis and Mitigation Measures

5.2.7.1 Environment Risk Impact Analysis

According to the investigation, most sections of Guichun River are located near the route of the Project, and 1 water intake for the township water source is set up at

the Guichun River. Also, the water source for Shuolong Community comes from Guichun River. In the case of traffic accident occurred on the project highway, vehicles may rush into Guichun River and cause fuel leakage directly into the surface water, or the leaked fuel on the pavement may enter the Guichun River along with the surface runoffs, which may pollute the water quality of Aitun Water Source in Shuolong Town and the water quality of Shuolong Community Water Source taken from Guichun River.

Once the pollutants directly enter the above-mentioned water sources, the content of petroleum pollutants in the water sources will exceed the standard, resulting in deterioration of water quality, and in severe cases, the water supply of the water sources will be interrupted directly.

5.2.7.2 Environmental Risk Impact and Mitigation Measures

In order to reduce the impact of project environmental risks on water quality of water sources, it is proposed to put forward risk prevention measures from several aspects such as risk sources, influencing ways and sensitive objects, etc. The details are as shown below:

(1) Risk source control measures

The project does not involve sewage discharge, and the occurrence of water pollution risk accidents is mainly caused by fuel leakage led by traffic accidents of vehicles on the highway. Therefore, by limiting the vehicle type entering the section and controlling the probability of traffic accidents, the occurrence of water pollution risks can be controlled from the source. According to the statistics of transportation departments, traffic accidents mainly occur in the process of drivers' bad driving behaviors such as fatigue driving, inattention in the driving process, speeding and illegal overtaking. The traffic accidents caused by locomotive faults are relatively few. Therefore, in order to effectively control the occurrence of traffic accidents, it is necessary to correct the bad driving behavior of drivers, and measures such as limiting the speed of vehicles, limiting the number of vehicles and setting up warning traffic signs can be taken.

Speed control: as the section of K0+000~K5+500 is close to the national border, the designed speed of this section is 40km/h, which alleviates the occurrence probability of accidents to a certain extent, and speed limit signs are set at both ends of the section. The water intake of Yuejin Canal is located at the sightseeing spots along the river in the K7+800 Detian Old Kapok Scenic Area. It is not convenient for tourists to pass

through the anti-collision guardrail. It is suggested to set speed reduction belts and speed limit signs at both ends of the Section of K7+500~K8+100 to control the speed.

Limiting traffic flow: this section is located in Detian Grand Scenic Spot. Huashan Scenic Area. According to the special opinions of scenic spots on the highway crossing scenic spots, it is suggested that the highway shall be included in the scenic highway planning. The EIA suggests that the project construction department should further strengthen communication with the scenic area management department, incorporate the section into the internal roads of the scenic area, and control the passenger flow, so as to avoid excessive traffic flow on the section increasing the probability of risk accidents.

Set warning signs: the overtaking prohibited signs shall be set up at K3+900~K5+300 near the primary land conservation area of Aitun water source in Shuolong Town and K7+600~K8+000 near the water inlet of Yuejin Canal; and the signs such "You have entered the secondary conservation area for Aitun water source in Shuolong Town, please drive with cautions" shall be set up at both ends of the section of K0+460~K5+360; and the signs such as "You have entered the secondary conservation area for Shuolong Community water source in Shuolong Town, please drive with cautions" shall be set up at both ends of the section of K9+400~K10+000.

(2) Control Measures of Environmental Impact Paths

As the section of K0+000~K5+500 is close to the national border, a national defense border guardrail has been set in this section, which can effectively prevent vehicles in an accident from rushing into Guichun River. However, the existing highway is not provided with drainage ditches, and the surface runoff directly flows into Guichun River. In order to reduce the impact of accident wastewater on the water source area, this assessment suggests that the project shall build intercepting drainage ditch about 1.4km away from the section of K3+900~K5+300, which is close to the primary land conservation area for Aitun water source in Shuolong Town, and build a sedimentation tank on the mountainside of K5+300 to collect the surface runoff. After sedimentation treatment, it will be discharged into the downstream section of Aitun Dam in Guichun River to reduce the impact of surface runoff on the water quality of Aitun water source in Shuolong Town.

(3) Alternative Measures for Environmental Sensitive Objects

The Shuolong Community Water Source Plant is located in the market town of

Shuolong Town, which is connected to Guichun River through Yuejin Canal. The water from the river will be supplied to water users in the market town after purification treatment. At the end of Yuejin Canal, there is the Shuolong Town Power Plant, whose water quantity and flow rate are affected by the opening and discharging of the power station. Therefore, it is suggested to strengthen monitoring at the water intake of the water plant. Once the water quality in the canal is found to be affected by leakage pollution, the water supply shall be stopped immediately, and the government shall be reported to start the emergency plan at the same time, and the water supply shall be resumed after the pollution treatment finished and the water samples are tested to be qualified.

Aitun Water Source in Shuolong Town is a planned water source, and no water intake project has been carried out yet. It is suggested that the water intake video surveillance system and rapid water quality analyzer should be set up during the construction of the water intake project in this water source area to monitor the water quality. Once pollution occurs, water intake and water supply shall be stopped immediately, and the government shall be reported to start the emergency plan. The water supply shall be resumed after the pollution treatment finished and the water samples are tested to be qualified.

(4) Emergency plans and measures

When the project is put into trial operation, the Project Owner shall strictly follow the relevant provisions of the Measures for the Record Management of Emergency Response Plans for Environmental Emergencies in Enterprises and Institutions (Trial) to carry out emergency plan preparation, evaluation and documentation.

5.3 Shuolong Port (Phase II of Shuolong Main Gate)

5.3.1 Ecological Impact Analysis and Mitigation Measures

5.3.1.1 Analysis of Ecological Impact

As the project route does not cross Xialei Nature Reserve, it has little impact on the reserve. The Project is located in the landscape coordination area of Huashan Scenic Area. The construction of the Project coordinates with the landscape of Huashan Scenic Area, and does not damage the scenic area landscape. The construction is helpful to improve the supporting infrastructure of the scenic area, and the construction during the construction period will cause certain damage to the site in the scenic area. After the

project is completed, the project landscape will enhance the beauty of Huashan Scenic Area.

With the excavation of the construction site, the existing vegetation will be lost due to the construction, most of the biological individuals will be removed, and a few individuals will be transplanted, which will cause the destruction of the original landform, reduce or lose the water and soil conservation function of the original landform, and increase water and soil loss. The current project land occupation includes wood land and a small amount of non-irrigated land. The land occupation of the Project is planned as port construction land. After the construction project occupies, the current land occupation changes from non-irrigated land and wood land to port construction land, which changes the regional ecosystem.

The land occupied by the project mainly consists of wood land and non-irrigated land ecosystems. Ecologically, they are "producers", and when the port is established, the vegetation in the permanently occupied area of the Project will disappear completely. However, as the Project occupies a small area, the original vegetation form in this area is single, the natural vegetation is common in the local area, and the artificial vegetation is wood land and crops, the loss of biomass reduced by the construction can be compensated by greening. The construction will not reduce the ecological diversity of regional species, and has little impact on regional natural vegetation and no obvious impact on regional ecology. The permanent land occupation of the proposed project needs to occupy the original vegetation, resulting in the loss of vegetation biomass. The Project will occupy permanent land and lose a certain amount of biomass. After the project is completed, greening will be carried out with an area of 4,735 m^2, which will maximize the biomass of the nature strip and make up for some of the biomass loss caused by the construction. Generally speaking, the land occupation of the Project loses a certain amount of biomass, but the amount is small, which has a slight impact on the regional ecosystem.

Most of the land occupied by the Project is developed non-irrigated land, wood land, etc. Human production and living activities are frequent, and the common animals are rodents such as voles. In addition, there are some common reptiles, amphibians, birds and other species, which are rarely seen in this land. In general, terrestrial animals will gradually move to the surrounding areas with the construction of the Project, so the construction has little impact on them.

The Project does not occupy basic cultivated land, and the agricultural production land within the occupied area is small. According to the field investigation, most of the agricultural farming areas occupied by the Project are non-irrigated land, and there is basically no commercial crops. Changing the original land use mode of the land after the construction has a certain impact on agricultural production, but the impact is limited.

In summary, under the condition of strictly implementing the above ecological environment protection measures, the construction has no obvious disturbance to the regional ecological system and has little impact on the surrounding ecological environment.

5.3.1.2 Ecological Impact Mitigation Measures

(1) It is forbidden to set up stockyards, temporary stock yards, spoil ground, and other activities that may cause damages to landscape resources and natural vegetation in the core tourist attraction of Huashan Scenic Area, so as to reduce the landscape impact of scenic spots caused by construction activities;

(2) The construction red line is strictly controlled, and the construction enclosures shall be provided to avoid affecting the scenic spot.

(3) Construction supervision and management of existing forests are strengthened. Contact the management department of Huashan Scenic Area and report the construction section, technology and time period, and accept the supervision and inspection of the management department.

(4) Construction vehicles should not be parked without authorization or scattered as much as possible. The domestic garbage of construction workers should be unified treated and transported out of the construction area in a centralized manner to prevent random littering and crushing of the wood land vegetation and crops.

(5) Set up warning signs. The warning sign indicates the scope of the construction area of the project. It is forbidden to occupy lands by construction crossing the border or cut down trees. Vegetation loss caused by the land occupation should be minimized.

(6) Propaganda and education of constructors shall be improved. It is forbidden to hunt wild animals.

(7) Field survey is required before construction in the bird breeding season to observe whether there any birds near the construction area, such as places where the heron is concentrated. If any, the construction of the route section near the heron

breeding site should be temporarily suspended, and should be continued after the breeding ends and baby birds leave the nest.

5.3.2 Water Impact Analysis and Mitigation Measures

5.3.2.1 Analysis of Wastewater Impact

(1) The construction and production wastewater is treated by oil separation and precipitation, and then used for sprinkling water on the construction site to reduce dust;

(2) The construction domestic sewage will be discharged into Shuolong Sewage Treatment Works after being treated by the three-stage septic tank.

(3) The domestic sewage (8.8m³/d) of the Project is discharged into Shuolong Sewage Treatment Works for centralized treatment through municipal sewage pipe network after being treated by septic tanks to reach the Class III standard of the Integrated Wastewater Discharge Standard (GB8978-1996), and then discharged into Guichun River after being treated to reach the Class I B standard of the Discharge Standard of Pollutants for Municipal Wastewater Treatment Works (GB18918-2002)

5.3.2.2 Mitigation Measures for Wastewater Impact

(1) It is prohibited to set up the spoil area in the water source protection area, and construction machinery washing shall not be carried out in the water source protection area.

(2) After the construction and production wastewater is treated by oil separation and precipitation, the supernatant is used for sprinkling water on the construction site to reduce dust, and the precipitated mud and muck are dried in the drying tank and then transported to the spoil area for disposal;

(3) Domestic sewage from the construction camp will be discharged into Shuolong Sewage Treatment Works after being treated by the temporary septic tank.

(4) Shuolong Sewage Treatment Works was put into use in October 2015. The Sewage Treatment Works uses a multi-stage composite moving bed bio-membrane reactor treatment process, which treats 1,000 tons of sewage every day. The water discharge of the Project is 8.8 t/d, accounting for 0.9% of the sewage treatment capacity of Shuolong Town. The current water supply in Shuolong Town is 600t/d, and the water

discharge is calculated as 80% of its water supply, so the water discharge of the residents in Shuolong Town is 480t/d. Therefore, Shuolong Sewage Treatment Works can still receive the domestic sewage produced by the Project. The project is located within the pollutant receiving scope of Shuolong Town Sewage Treatment Works. After field survey, the municipal sewage pipe network has been built, so it is feasible to introduce domestic wastewater into Shuolong Town Sewage Treatment Works for treatment.

5.3.3 Noise Impact Analysis and Mitigation Measures

5.3.3.1 Analysis of Noise Impact

(5) During the construction period, when a single machine works, the daytime noise at a distance of 50m from the construction machinery reaches the standard (70dB(A)) specified in the Emission Standard of Environment Noise for Boundry of Construction Site, and the nighttime noise at a distance of 284m from the construction machinery reaches the standard (55dB(A)).

(6) During demolition and excavation, the noise generated by loaders has the greatest impact, and the daytime noise level at the construction site boundary is about 8.9dB(A) higher than the daytime noise limit specified in the Emission Standard of Environment Noise for Boundry of Construction Site (GB12523-2011), and the nighttime noise level is about 23.9dB(A) higher than the nighttime noise limit.

(7) Impact analysis on sensitive points during the construction period: during the construction period, the impact on the residential area of Shuolong Community in the east is obvious, so construction enclosure shall be provided properly.

(8) During the operation period, the automobile noise in the parking lot and the ventilation fan in the basement have obvious impacts on the residential area of Shuolong Community in the east, but after noise reduction measures are taken, the impact is reduced.

5.3.3.2 Mitigation Measures for Noise Impact

(1) During the construction period, it is necessary to focus on the acoustic environmental impact and protective measures of villages close to the highway. It is strictly forbidden to carry out construction at noontime (12: 00 ~ 14: 30) and 22: 00 ~ 6:00 the next morning. If continuous operation is required, it shall be announced in

advance.

(2) The noise generated by motor vehicles can be greatly reduced and has little impact on the surroundings after such measures are taken as low-speed driving, no honking and enhanced greening. The noise generated by the passengers and business activities is characterized by low intensity, discontinuity and irregularity. In general, the social activity noise has little impact on the surroundings. The anti-vibration and vibration reduction measures shall be improved during installation of fans, and silencers shall be installed at openings. All kinds of pumps shall be installed in their own machine rooms, and sound-absorbing materials shall be used indoors. During installation, the equipment shall be balanced and vibration reduction measures shall be taken, and noise reduction shall be realized by obstruction from surrounding buildings.

5.3.4 Atmospheric Impact Analysis and Mitigation Measures

5.3.4.1 Atmospheric Impact Analysis

(1) During the construction period, the main air pollution sources are dust caused by material transportation, loading and unloading, earthwork filling and excavation, and concrete mixing. In the absence of dust control measures, the area within 150 meters of the downwind of the construction site is seriously affected by dust.

(2) Due to the open area where the project is located, good ventilation, and low motor vehicle exhaust emission, the small amount of exhaust gas emitted has little impact on the surroundings after being diluted by air. In addition, it is required to flame out for temporary parking, so as to reduce the working hours of the engine and exhaust emission. Therefore, the automobile exhaust in ground and underground parking lots has little impact on sensitive points and air environment.

(3) The amount of waste gas produced by public toilets can be reduced by daily cleaning, and the waste gas pollutants are led to the outside for unorganized emission through the exhaust fans, which has little impact on the environment. The domestic garbage shall be classified and stored in garbage bins, and delivered to the environmental sanitation department for concentrated treatment every day; After the above measures are taken, the garbage stench produced during the project construction has little impact on the surrounding environment.

5.3.4.2 Mitigation Measures for Ecological Impact

(1) Dust prevention measures such as enclosing metal baffles should be taken on the construction site, sprinkling water should be carried out regularly to reduce dust on

the construction site and construction temporary access, and water-sprinkling times should be increased on sections close to sensitive targets such as residential areas.

(2) A variety of grass and trees shall be planted for greening near the ground parking spaces, and green belts shall be provided accordingly. Meanwhile, ventilation of underground garages shall be improved to reduce the impact of automobile exhaust on the surrounding environment. In addition, it is required to flame out for temporary parking, so as to reduce the working hours of the engine and exhaust emission. Therefore, the automobile exhaust in the ground parking lot has little impact on the sensitive points and air environment. The amount of waste gas produced by toilets can be reduced through daily cleaning, and the waste gas pollutants are led to the outside for unorganized emission through the exhaust fans. The domestic garbage shall be classified and stored in garbage bins and delivered to the environmental sanitation department for concentrated treatment every day.

5.3.5 Impact Analysis of Solid Waste and Mitigation Measures

5.3.5.1 Impact Analysis of Solid Waste

The solid waste during the operation period mainly comes from items discarded by tourists and passengers, and the garbage dropped by tourists along the highway shall be cleaned, collected and treated in a concentrated way. Therefore, this kind of solid waste generally does not have a great adverse impact on the environment.

5.3.5.2 Mitigation Measures for Solid Waste

(1) Garbage cans are provided at sightseeing and rest areas for passengers, and sanitation personnel are arranged to clean and collect domestic garbage which shall be cleaned and transported by the sanitation department on a regular basis;

(2) Publicity is enhanced along the route, and signs of "No littering and protect the tourist attraction environment" are set up.

6 Environmental Management and Environmental Monitoring Plan

6.1 Environment Management Plan

6.1.1 Environmental Protection Management Plan

See Table 6.1-1~3 for the environmental protection management plan of each component.

Table 6.1-1 Schedule of Environmental Management Plan for Wuzhou (Longyanzui)-Shuolong Expressway (Chongzuo-Jingxi Expressway to Shuolong Port Section)

S/N	Environmental Factors	Environmental Impact or Risk	Mitigation Measures	Implementing Agency	Management Departments
I	**Design Stage**				
1	Ecological environment	Impacts on sensitive areas passing through Xialei Natural Reserve	The construction design of K7+885~K10+715 and AK3+600~AK4+600 sections shall be optimized to avoid Xialei Nature Reserve in Guangxi as far as possible. During the engineering design, the number of culverts and passages shall be increased as appropriate to meet the needs of animal activities such as amphibians, reptiles and small mammals. For greening design, local species shall be organized to imitate local ecological communities and integrate highway landscape with the natural landscape, so as to reduce the impact on the landform.	Designer	Guangxi Chongzuo City Construction Investment Development Group Co., Ltd.
		Impacts on sensitive areas passing through Huashan	The construction design of K11+500~K12+263 and		

S/N	Environmental Factors	Environmental Impact or Risk	Mitigation Measures	Implementing Agency	Management Departments
		Scenic Area	AK0+000~AK5+416 sections shall be optimized to avoid Huashan National Scenic Area in Guangxi as far as possible. During the engineering design, the number of culverts and passages shall be increased as appropriate to meet the needs of animal activities such as amphibians, reptiles and small mammals. For greening design, local species shall be organized to imitate local ecological communities and integrate highway landscape with the natural landscape, so as to reduce the impact on the landform.		
		Impacts of temporary land use on sensitive areas	According to preliminary decision, Dunli will be 120 m to the east of 1# construction living area, and Bangtun will be 25 m to the north of 2# construction living area, which will be greatly affected by noise, dust and asphalt fume, so it is suggested to optimize the site selection of the construction living areas at the design stage. Site selection of the construction living areas and other temporary land shall follow the following site selection requirements: ① It shall not be set within the catchment area of a water body with the drinking water function, and the discharged sewage shall not enter areas close to the water intake of the surface water body or underground water		

S/N	Environmental Factors	Environmental Impact or Risk	Mitigation Measures	Implementing Agency	Management Departments
			with the living drinking water function; ② It shall not be set in areas prohibited by laws and regulations such as nature reserves, geological parks, basic farmland preservation areas, cultural relics protection units and drinking water source protection areas, and shall not be set in scenic spots without the consent of the competent authorities; ③ It shall not be set in important resource areas such as basic farmland, high-yield farmland, specialty farmland and areas with mineral resources, forest land and paddy field shall not be occupied as much as possible, less dry land shall be occupied, and sloping land, wasteland, abandoned land or difficult to use land shall be considered first; ④ The distance between the concrete mixing station and environmental sensitive points should not be less than 200 m, and the distance between the asphalt mixing station and environmental sensitive points should not be less than 300 m, and the concrete mixing station and the asphalt mixing station should be set on the windward side of the protected object in the minimum frequency wind direction in the local construction season;		
2	Noise	Noise impacts of highway	·In the trial operation stage, the		

S/N	Environmental Factors	Environmental Impact or Risk	Mitigation Measures	Implementing Agency	Management Departments
		operation on acoustic environment protection objects along the route	Contractor shall track and monitor the predicted sensitive points (in Bangtun and Buguo) exceeding the standard in the midterm, investigate the wishes of the affected residents before acceptance of the actual sensitive points exceeding the standard, and take compensation measures such as replacement of sound proof windows or economic compensation according to the wishes of the affected residents.		
3	Water environment	Impacts of highway operation on water environment along the route	·Sewage treatment devices shall be set up in toll stations (jointly built with maintenance work areas), and corresponding anti-seepage measures shall be taken. ·Construction management of cross-river bridges shall be strengthened, construction organization shall be properly conduced and construction technologies shall be optimized. ·Reinforced anti-collision guardrails and warning signs shall be set up for cross-river bridges, especially Longkalang Super Major Bridge located in Xialei Nature Reserve, and Bangtun Bridge and Shuolong Guichun River Bridge located in Huashan Scenic Area, to prevent motor vehicles, especially vehicles transporting dangerous goods, from falling directly into the river when accidents occur on the bridges, causing		

S/N	Environmental Factors	Environmental Impact or Risk	Mitigation Measures	Implementing Agency	Management Departments
			major pollution incidents.		
II	**Construction Period**				
1	Ecological environment	Impacts on Xialei Nature Reserve	·It is forbidden to set up stockyards, temporary stock yards, spoil areas, construction living area and other activities that may cause damages to landscape resources and natural vegetation in Xialei Nature Reserve, so as to reduce the impacts of construction activities on vegetation and landscape in Xialei Nature Reserve; · For crossing the Xialei Nature Reserve, it is suggested that measures such as "shortening excavation footage, reducing blasting charge and increasing excavation benches" should be taken for Longkalang Tunnel and Shuolong Tunnel construction to reduce single blasting charge, reduce blasting impact and further reduce blasting vibration velocity. Blasting shall be prevented in the morning, at night and in the noon to eliminate the scare of wild animals. · When crossing the sections of Xialei Nature Reserve (K7+885~K10+715, AK3+600~AK4+600), 2.5m high baffles or dustproof nets shall be set on both sides of the construction area, and the water shall be sprayed for dust reduction. Before the construction of the project, the environmental awareness education	Construction Contractor	Employer Supervisor Supervision company for water and soil conservation

S/N	Environmental Factors	Environmental Impact or Risk	Mitigation Measures	Implementing Agency	Management Departments
			and legal publicity shall be strengthened for the construction personnel, so that the construction personnel can understand the scope, protected objects, relevant management regulations of the reserve, environmental protection laws and regulations and environmental pollution control. It is prohibited for the construction personnel to poach wild animals, cut down trees and dig plants at will. The use of fire in the field shall be strictly controlled to prevent fire. Billboards and warning signs shall be made and placed in eye-catching positions in the construction area to protect the environment and wildlife. ·Strengthen construction supervision and management of existing forests. Contact the management department of the Xialei Nature Reserve and report the construction section, technology and time period, and accept the supervision and inspection of the management department.	Construction Contractor	Employer Supervisor
		Impacts on Xialei Nature Reserve and Huashan Scenic Area	It is forbidden to set up temporary sites in the core scenic area of scenic spots. Without the consent of the competent authorities, temporary sites shall not be set up in other areas of the scenic spots to reduce the impact of construction activities on landscape of the scenic spots;		

S/N	Environmental Factors	Environmental Impact or Risk	Mitigation Measures	Implementing Agency	Management Departments
			·The construction red line shall be strictly controlled; especially, construction enclosures and scenic spot reminders at road sections (K11+500~K12+263 and AK0+000~AK5+416) passing through the Huashan Scenic Area shall be made, so as to avoid affecting the scenic spots near the Huashan Scenic Area. ·For K11+500~K12+263 and AK0+000~AK5+416,2.5m high baffles or dust-proof nets shall be provided on both sides of the construction area, and spray water on the sections to reduce dust; ·Strengthen construction supervision and management of existing forests. Contact the management department of Huashan Scenic Area and report the construction section, technology and time period, and accept the supervision and inspection of the management department.		Supervision company for water and soil conservation
		Impact on the protected plants and old trees	For Ficus lacor in the AK0+580 occupied area, design should be optimized to avoid it as much as possible, and if it cannot be avoided, it should be reported to the forestry department for approval to transplant; For the old trees (one Radermachera sinica, one longan and one lychee) close to the project area (K4+570, AK4+980		

S/N	Environmental Factors	Environmental Impact or Risk	Mitigation Measures	Implementing Agency	Management Departments
			and AK5+010), in order to avoid the impact of construction activities on them, it is recommended to block them around and hang with signs for in-situ protection; •For places where protected plants are far away from the project area, it is recommended to provide signboards for in-situ protection.		
		Impact on public welfare forest and forest land	·Construction access roads and temporary land occupation shall be minimized to reduce the occupation and damage of public welfare forests; ·Provide warning signs to prohibit cross-border construction and land occupation or felling of trees, and minimize vegetation loss caused by land occupation.		
		Impact on wild animals and birds	·Strengthen publicity and education for construction workers. Catching and killing wild animals are prohibited; ·Cover up and afforest the tunnel portals, and provide signboard with "barrier to prevent animals from entering"; ·Investigate whether there are bird breeding grounds, and if so, avoid construction during breeding period.		
2	Water environment	Impacts of construction of underwater piers of river-crossing bridges on water environment	For bridges with piers in water, the pile foundation operation sequence of the river-crossing bridge should be arranged reasonably to avoid flood period and peak period of fish spawning (March ~		

S/N	Environmental Factors	Environmental Impact or Risk	Mitigation Measures	Implementing Agency	Management Departments
			July); steel cofferdams should be set up in the dry season of the river; advanced technology shall be adopted to shorten the operation time; ·During the construction of steel cofferdam of bridge pile foundation in water, anti-pollution barrier shall be set in the working waters; · During the pile foundation drilling and pouring construction of the river-crossing major bridge, the slurry for the retaining wall is circulated and not discharged. The waste slurry produced is transported to the waste slurry drying pool in the construction camp on the shore and the settled muck is transported to the waste spoil ground for landfilling. · Temporary interception and drainage ditches shall be set around the bridge construction area and the construction area for the road section near the river, and temporary sedimentation tanks shall be set at the water outlet so that the drainage can be connected to the surrounding drainage system after sedimentation. ·Construction material stack yards shall not be located near the river; ·Strengthen management and prevent construction solid waste, domestic garbage and domestic sewage from being discharged into any water body;		

S/N	Environmental Factors	Environmental Impact or Risk	Mitigation Measures	Implementing Agency	Management Departments
			·After treatment, the wastewater from construction shall be reused as far as possible, and shall not be discharged at will.		
		Pollution of production and domestic wastewater in construction camp	·The production and living quarters shall not be set within the drinking water source conservation area, and the production and living wastewater shall not be discharged into the water body within the drinking water source protection area. ·The wastewater from construction and production after oil trap and desilting treatment shall be reused as much as possible. The oil substances trapped shall be collected in closed tanks and then delivered to the institutions designated by the local environmental protection department for treatment on a regular basis. ·Domestic wastewater after being treated by three-stage septic tank is used for fertilizing the forest land around the construction living area, and the septic tank is periodically cleaned and used for fertilizing the forest land.		
		Pollution of wastewater from tunnel construction	· Conduct a detailed investigation on Longhong tunnel before construction, and use environment-friendly water-plugging materials for plugging after comprehensive water leakage and gushing prevention schemes are		

S/N	Environmental Factors	Environmental Impact or Risk	Mitigation Measures	Implementing Agency	Management Departments
			formulated. ·Oil trap and desilting basin shall be provided at the portals of tunnels to treat the production wastewater. The supernatant after sedimentation shall be recycled, and the waste slag from the sedimentation tank shall be stored in a centralized way; oil substances trapped shall be collected in closed tanks and delivered to the institutions designated by the local environmental protection department for treatment on a regular basis.		
		Impacts of construction of sections nearby Bukan Water Source in Liliang Village, Fuxin Town	·The proposed highway section K0+000~K1+410 crosses the protected area of Bukan Water Source in Liliang Village, Fuxin Town, yet, K0+955~K1+023 crosses the primary land conservation area of Bukan Water Source in Liliang Village, Fuxin Town, and there are legal obstacles. The Project involves the section (K0+000~K1+410) in water source conservation area, to ensure the safety of drinking water for Bukan village residents, the construction shall not start until the water source adjustment is completed and the new water supply project is put into use; ·It is forbidden to discharge construction wastewater and domestic sewage to the conservation area of Bukan Water Source in Liliang Village, Fuxin Town;		

S/N	Environmental Factors	Environmental Impact or Risk	Mitigation Measures	Implementing Agency	Management Departments
			·The water intake section shall be provided with a warning sign "construction in sections near water sources"; ·Carry out publicity and education activities in water source protection areas. It is prohibited to damage the water quality in water source protection areas.		
3	Ambient air	Impact of exhaust gas on environment during construction period	·When transporting bulk materials, transportation vehicles shall be covered with tarpaulin and the materials on the surface shall be wet; ·In the construction area near sensitive points and farmland, the construction access road shall be sprinkled with water to reduce dust; ·Clean up sprinkled materials in a timely manner, and provide a pool for cleaning the tires of transportation vehicles in the temporary work area; ·The site selection for large-scale mixing plant (precast yard) shall meet the requirements of specifications and shall be equipped with dust removal device. ·It is suggested to purchase commercial asphalt directly, and asphalt shall not be mixed on the construction site; asphalt paving should be done in weather with good diffusion conditions, and advanced paving technology shall be adopted to reduce the generation of asphalt smoke.		

S/N	Environmental Factors	Environmental Impact or Risk	Mitigation Measures	Implementing Agency	Management Departments
4	Acoustic environment	Impact of construction noise on environment	·Before the construction of the Project, the cases about noise and pollution discharge shall be reported to the local Ecological Environment Bureau; ·Reasonably arrange the construction sequence. In the construction area near the sensitive points, avoid construction operations and transportation of construction materials at night (22: 00 ~ 6: 00 the next day); ·Provide baffles in the construction area near the sensitive points and strengthen maintenance for machinery and equipment; ·Notice shall be issued before blasting operation. Night operation is prohibited.		
5	Solid wastes	Impact of solid wastes on environment	·Spoils of the subgrade shall be transported to the waste spoil yard and temporary stock yard in time determined in the project design, and corresponding preventive measures shall be taken; ·Asphalt residue shall be recycled and not be discarded or disposed of at will; ·Domestic garbage in construction camps shall be collected centrally and regularly delivered to the sanitation department for removal and disposal.		
6	Cultural relics	Impacts of construction on cultural relics	The Employer and Contractor shall stop immediately when cultural relics are found during construction, report to the local government and cultural relics management department promptly, and	Employer and Contractors	Tiandeng County Cultural Relics Bureau, Daxin County Cultural Relics Bureau

S/N	Environmental Factors	Environmental Impact or Risk	Mitigation Measures	Implementing Agency	Management Departments
			take appropriate measures to protect them. The construction cannot continue until the cultural relics management department has given its opinions and determined the cultural relics will not be affected. During the construction, the regulations and policies of the state on cultural relics protection shall be observed to prevent damage to the cultural relics.		
III	**Operation Period**				
1	Ecological environment	Alien species invasion	·Track and monitor the distribution dynamics of invasive alien species and expel them in time.	Highway Administration Bureau	Daxin Ecological Environment Bureau, Tiandeng Ecological Environment Bureau
		Water ecological environment	·When water pollution is caused by traffic accidents on bridges across Baidou River, Xialei River and Guichun River, the local fishery administrative department shall be notified in a timely manner.		
2	Water environment	Impact of road surface runoff on surrounding water bodies	•Regularly carry out desilting, inspection and cleaning of oil trap in tunnel sections. •According to the monitoring plan for the operation period, monitor the water quality in sensitive sections regularly.		
3	Air pollution	Impact of vehicle exhaust on environment during operation period	•Regular monitoring and establishment of monitoring files.		
4	Noise pollution	Impact of traffic noise	•Implement the noise monitoring plan during the operation period, improve the noise reduction measures taken for the sensitive points of the acoustic environment along the route		
5	Solid wastes	Impact of domestic waste on	•Provide garbage cans at scenic areas and parking		

S/N	Environmental Factors	Environmental Impact or Risk	Mitigation Measures	Implementing Agency	Management Departments
		landscape	islands along the route, arrange sanitation personnel to clean and collect domestic garbage, which shall be cleaned and transported by the sanitation department on a regular basis; •Strengthen publicity along the route to remind tourists that it is prohibited to drop litter carelessly.		
6	Environmental risks	Impacts on water environment risks of Xialei Nature Reserve and Huashan Scenic Area	·The Operator shall establish an emergency leading team to deal with accidental spillage of dangerous goods; ·Transportation of dangerous goods shall be subject to three certificates issued by the public security department, i.e. transportation permit, driver's license and security officer's certificate, and dangerous goods transportation vehicles shall be marked with dangerous goods signs; ·The preparation of emergency plan, management and maintenance of emergency equipment and regular exercise system shall be improved; ·The daily inspection and maintenance of bridge deck runoff collection system and emergency pool set up in Xialei Nature Reserve and Huashan Scenic Area shall be strengthened to ensure their normal use, and the dangerous goods shall be cleaned up and disposed in time after the occurrence of dangerous accidents. •In case of accidental spillage of dangerous goods, notify relevant departments immediately and take emergency actions according to the emergency plan.		Public Security Bureau of Tiandeng County, Public Security Bureau of Daxin County

Table 6.1-2 Schedule of Environmental Management Plan for Detian-Shuolong Highway

S/N	Environmental Factors	Environmental Impact or Risk	Mitigation Measures	Implementing Agency	Management Departments
I	**Design Stage**				
1	Ecological environment	Impact on old and well-known trees	·Optimize the construction design, the section near K11+080 shall bypass the banyan tree on the roadside.	Designer	Employer
		The Project will occupy the forest land and destroys the original ecosystem	·The occupation of forest land shall be reported to relevant departments according to relevant procedures; attention must be paid to reduce the land occupation of the slope, especially the slope passing through the public welfare forest section; Complete the design of water and soil conservation plan according to regulations and implement ecological compensation measures according to the plan;		
		Impact on ecological landscape	·Greening design of the Project shall be combined with landscape greening design of scenic areas. Vegetation for greening shall be the common species in the assessed area.		
		Temporary land use destroys the original ecosystem in sensitive areas	·The spoil ground is preliminarily located on the north side of the existing border highway on the east side of Longhongtun, covering an area of about 5070m^2 (about 7.6 mu) and mainly occupying the non-irrigated land and wasteland. It is located within the water source area, so it is required to optimize the site selection of the spoil ground. It is recommended to locate it on the south side of the existing border highway and avoid the water source conservation area of Shuolong Community. ·The mixing plant is preliminarily located on the north side of the existing border highway on the west side of Shuolong Community, covering an area of about 1600m^2 (about 2.4 mu) . It is now a cement plant, and during site selection, the nature reserves, water		

S/N	Environmental Factors	Environmental Impact or Risk	Mitigation Measures	Implementing Agency	Management Departments
			sources, special and Class I conservation areas of scenic spots and scenic spots at all levels are avoided; ·If the spoil ground and mixing plant are inevitably located in Huashan Scenic Area, the special and Class I conservation areas and scenic spots shall be avoided, and the relevant vegetation restoration measures in the crossing subject and water and soil conservation plan shall be implemented; · Costs for greening or reclamation of temporary land shall be included in the project investment.		
2	Land resources	The land occupation caused by the Project changes the land type	•The occupation of cultivated land shall be reported to relevant departments according to relevant procedures. •The construction camp shall be preferentially located in flat wasteland to avoid occupying fertile farmland and forest land.		
3	Water environment	Impacts of environmental risks on water quality of water source	The road surface runoff collection and treatment system of the class I land protection area section near Aitun Water Source in Shuolong Town and the water inlet section of Yuejin Canal shall be incorporated into the construction design.		
4	Noise	Noise impacts of highway operation on acoustic environment protection objects along the route	·In the trial operation stage, the Contractor shall track and monitor the predicted sensitive points exceeding the standard in the midterm, investigate the wishes of the affected residents before acceptance of the actual sensitive points exceeding the standard, and take compensation measures such as replacement of sound proof windows or economic compensation according to the wishes of the affected residents.		
II	**Construction Period**				
1	Ecological environment	Impacts on Huashan Scenic Area	· It is forbidden to set up stockyards, temporary stock yards, spoil ground, and other activities that may cause damages to landscape		

S/N	Environmental Factors	Environmental Impact or Risk	Mitigation Measures	Implementing Agency	Management Departments
			resources and natural vegetation in the core tourist attraction of scenic spots, to reduce the landscape impact of scenic spots caused by construction activities; ·Strictly control the right of way; provide construction enclosure and signboards in the sections especially near the Huashan Scenic Area to avoid affecting the nearby scenic spots. ·Strengthen construction supervision and management of existing forests. Contact the management department of Huashan Scenic Area and report the construction section, technology and time period, and accept the supervision and inspection of the management department.	Construction Contractor	Employer Supervisor Supervision company for water and soil conservation
		Impacts of temporary land use on Huashan Scenic Area	·Before the completion of the Project, strictly implement the vegetation restoration measures in the crossing subject, water and soil conservation plan and land reclamation plan, and carry out reclamation and greening of temporary land to reduce the impacts on vegetation and landscape resources in Huashan Scenic Area		
		Impact on the protected plants and old trees	·For the 3 places where protected plants and old trees are located close to the project area, in order to avoid the impact of construction activities on them, it is recommended to provide enclosures and signboards in the surrounding areas for in-situ protection; ·For the 3 places where protected plants are far away from the project area, it is recommended to provide signboards for in-situ protection.		
		Impact on public welfare forest and forest land	·Construction access roads and temporary land occupation in K2+000 ~ K3+600 and K7+300~K9+800 sections shall be minimized to reduce the occupation and damage of public welfare		

S/N	Environmental Factors	Environmental Impact or Risk	Mitigation Measures	Implementing Agency	Management Departments
			forests. ·Provide warning signs to prohibit cross-border construction and land occupation or felling of trees, and minimize vegetation loss caused by land occupation.	Construction Contractor	Employer Supervisor Supervision company for water and soil conservation
		Impact on wild animals and birds	·Strengthen publicity and education for construction workers. Catching and killing wild animals are prohibited; ·Cover up and afforest the tunnel portals, and provide signboard with "barrier to prevent animals from entering"; ·Investigate whether there are bird breeding grounds, and if so, avoid construction during breeding period.		
2	Water environment	Impacts of construction of the section near the river on water environment	·Reasonably arrange the construction period and try to avoid the rainy season; ·Construction material stack yards shall not be located on the section near the river; ·Before construction, build temporary drainage trenches and settling tanks; ·Strictly implement water and soil conservation plan to reduce water and soil loss; ·Strengthen management and prevent construction solid waste, domestic garbage and domestic sewage from being discharged into any water body; ·After treatment, the wastewater from construction shall be reused as far as possible, and shall not be discharged at will.		
		Pollution of production and domestic wastewater in construction camp	·The production and living quarters shall not be set within the drinking water source conservation area, and the production and living wastewater shall not be discharged into the water body within the drinking water source protection area.		

S/N	Environmental Factors	Environmental Impact or Risk	Mitigation Measures	Implementing Agency	Management Departments
			·The wastewater from construction and production after oil trap and desilting treatment shall be reused as much as possible. The oil substances trapped shall be collected in closed tanks and then delivered to the institutions designated by the local environmental protection department for treatment on a regular basis. ·Domestic wastewater after being treated by three-stage septic tank is used for fertilizing the forest land around the construction living area, and the septic tank is periodically cleaned and used for fertilizing the forest land.		
		Pollution of wastewater from tunnel construction	·Conduct detailed investigation on Longhong tunnel before construction, and use environment-friendly water-plugging materials for plugging after comprehensive water leakage and gushing prevention schemes are formulated. ·Oil trap and desilting basin shall be provided at the portals of tunnels to treat the production wastewater. The supernatant after sedimentation shall be recycled, and the waste slag from the sedimentation tank shall be stored in a centralized way; oil substances trapped shall be collected in closed tanks and delivered to the institutions designated by the local environmental protection department for treatment on a regular basis.		
		Impact of construction in sections near water sources	·During the construction of K0+200~K5+300 and K7+500~K8+100 sections, the material storage yard shall be arranged far away from the water body, and cover measures shall be taken to prevent the water quality in the water intake section from being polluted by materials caused by rainwater scouring; ·The water intake section shall be provided with a warning sign "construction in sections near water sources";		

S/N	Environmental Factors	Environmental Impact or Risk	Mitigation Measures	Implementing Agency	Management Departments
			·Carry out publicity and education activities in water source protection areas. It is prohibited to damage the water quality in water source protection areas.		
3	Ambient air	Impact of exhaust gas on environment during construction period	·When transporting bulk materials, transportation vehicles shall be covered with tarpaulin and the materials on the surface shall be wet; ·In the construction area near sensitive points and farmland, the construction access road shall be sprinkled with water to reduce dust; ·Clean up sprinkled materials in a timely manner, and provide a pool for cleaning the tires of transportation vehicles in the temporary work area; ·The site selection for large-scale mixing plant (precast yard) shall meet the requirements of specifications and shall be equipped with dust removal device. ·It is suggested to purchase commercial asphalt directly, and asphalt shall not be mixed on the construction site; asphalt paving should be done in weather with good diffusion conditions, and advanced paving technology shall be adopted to reduce the generation of asphalt smoke. During subgrade construction of the widened road sections, half-open and half-closed construction should be adopted. The construction area should be cleaned in time and watered regularly. The construction waste slag should be transported to the designated abandoned slag yard in time. Safety warning signs and protective fences should be set up, and personnel should be assigned specially to guard them.		

S/N	Environmental Factors	Environmental Impact or Risk	Mitigation Measures	Implementing Agency	Management Departments
4	Acoustic environment	Impact of construction noise on environment	·Before the construction of the Project, the cases about noise and pollution discharge shall be reported to the local Ecological Environment Bureau; ·Reasonably arrange the construction sequence. In the construction area near the sensitive points, avoid construction operations and transportation of construction materials at night (22: 00 ~ 6: 00 the next day); ·Provide baffles in the construction area near the sensitive points and strengthen maintenance for machinery and equipment; ·Notice shall be issued before blasting operation. Night operation is prohibited.		
5	Vibration Impact	Vibration impact of the tunnel blasting	With the current mature millisecond blasting technology, reduce the blasting charge in one blasting, select reasonable blasting parameters, millisecond delay intervals and other measures to reduce the vibration impact of the blasting.		
6	Solid wastes	Impact of solid wastes on environment	·Spoils of the subgrade shall be transported to the waste spoil yard and temporary stock yard in time determined in the project design, and corresponding preventive measures shall be taken; ·Asphalt residue shall be recycled and not be discarded or disposed of at will; ·Domestic garbage in construction camps shall be collected centrally and regularly delivered to the sanitation department for removal and disposal.		
III	**Operation Period**				
1	Ecological environment	Alien species invasion	·Track and monitor the distribution dynamics of invasive alien species and expel them in time.	Highway Administration Bureau	Daxin Ecological Environment
		Water ecological	•When water pollution is caused by traffic accidents near the		

S/N	Environmental Factors	Environmental Impact or Risk	Mitigation Measures	Implementing Agency	Management Departments
		environment	Guichun River, notify the local fishery administrative department in a timely manner.	Detian Scenic Area Management Office	Bureau
2	Water environment	Impact of road surface runoff on surrounding water bodies	•Regularly carry out desilting, inspection and cleaning of oil trap in tunnel sections. •According to the monitoring plan for the operation period, monitor the water quality in sensitive sections regularly.		
3	Air pollution	Impact of vehicle exhaust on environment during operation period	•Regular monitoring and establishment of monitoring files.		
4	Noise pollution	Impact of traffic noise	•Implement the noise monitoring plan during the operation period, improve the noise reduction measures taken for the sensitive points of the acoustic environment along the route		
5	Solid wastes	Impact of domestic waste on landscape	•Provide garbage cans at scenic areas and parking islands along the route, arrange sanitation personnel to clean and collect domestic garbage, which shall be cleaned and transported by the sanitation department on a regular basis; •Strengthen publicity along the route to remind tourists that it is prohibited to drop litter carelessly.		
6	Environmental risks	Impact of environmental risks and accidents in water source sections	•Prepare emergency plans and establish emergency offices; •Cooperate with the traffic police inspection post at the level of the scenic area management department to limit the traffic flow in sensitive road sections; ·Perfect the preparation of emergency plan, management and maintenance of emergency equipment and regular exercise system; •Regularly check the operation status of environmental protection		Public Security Bureau of Daxin County

S/N	Environmental Factors	Environmental Impact or Risk	Mitigation Measures	Implementing Agency	Management Departments
			facilities in water source protection areas.		

Table 6.1-3 Schedule of Environmental Management Plan for Shuolong Port (Phase II of Shuolong Main Gate)

S/N	Environmental Factors	Environmental Impact or Risk	Mitigation Measures	Implementing Agency	Management Departments
I	**Design Stage**				
1	Ecological environment	The Project will occupy the forest land and destroys the original ecosystem	·The occupation of forest land shall be reported to relevant departments according to relevant procedures; attention must be paid to reduce the land occupation of the slope, especially the slope passing through the public welfare forest section; Complete the design of water and soil conservation plan according to regulations and implement ecological compensation measures according to the plan;	Designer	Employer
		Impact on ecological landscape	·Greening design of the Project shall be combined with landscape greening design of scenic areas. Vegetation for greening shall be the common species in the assessed area.		
2	Land resources	The land occupation caused by the Project changes the land type	•The occupation of cultivated land shall be reported to relevant departments according to relevant procedures. •The construction camp shall be preferentially located in flat wasteland to avoid occupying fertile farmland and forest land.		
3	Water environment	Impacts on water quality of	Water pollution of Guichun River shall be avoided during construction period		

S/N	Environmental Factors	Environmental Impact or Risk	Mitigation Measures	Implementing Agency	Management Departments
		Guichun River			
4	Noise	Noise impacts on acoustic environment protection objects	·The Contractor shall reduce the impacts on nearby sensitive points.		
II	**Construction Period**				
1	Ecological environment	Impacts on Huashan Scenic Area	· It is forbidden to set up stockyards, temporary stock yards, spoil ground, and other activities that may cause damages to landscape resources and natural vegetation in the core tourist attraction of scenic spots, to reduce the landscape impact of scenic spots caused by construction activities; ·Strictly control the right of way; provide construction enclosure and signboards in the sections especially near the Huashan Scenic Area to avoid affecting the nearby scenic spots. ·Strengthen construction supervision and management of existing forests. Contact the management department of Huashan Scenic Area and report the construction section, technology and time period, and accept the supervision and inspection of the management department.	Construction Contractor	Employer Supervisor Supervision company for water and soil conservation
		Impacts of temporary land use on Huashan Scenic Area	·Before the completion of the Project, strictly implement the vegetation restoration measures in the crossing subject, water and soil conservation plan and land reclamation plan, and carry out reclamation and greening of temporary land to reduce the impacts on vegetation and landscape resources in Huashan Scenic Area		
		Impact on wild animals and birds	·Strengthen publicity and education for construction workers. Catching and killing wild animals are prohibited; ·Cover up and afforest the tunnel portals, and provide signboard with "barrier to prevent animals from entering"; ·Investigate whether there are bird breeding grounds, and if so, avoid construction		

S/N	Environmental Factors	Environmental Impact or Risk	Mitigation Measures	Implementing Agency	Management Departments
			during breeding period.		
2	Water environment	Impacts of construction on water environment	·Reasonably arrange the construction period and try to avoid the rainy season; ·Construction material stack yards shall not be located on the section near the river; ·Before construction, build temporary drainage trenches and settling tanks; ·Strictly implement water and soil conservation plan to reduce water and soil loss; ·Strengthen management and prevent construction solid waste, domestic garbage and domestic sewage from being discharged into any water body; ·After treatment, the wastewater from construction shall be reused as far as possible, and shall not be discharged at will.		
		Pollution of production and domestic wastewater in construction camp	·The wastewater from construction and production after oil trap and desilting treatment shall be reused as much as possible. The oil substances trapped shall be collected in closed tanks and then delivered to the institutions designated by the local environmental protection department for treatment on a regular basis. ·The construction domestic sewage shall be discharged into Shuolong Sewage Treatment Works after being treated by the three-stage septic tank.		
3	Ambient air	Impact of exhaust gas on environment during construction period	·When transporting bulk materials, transportation vehicles shall be covered with tarpaulin and the materials on the surface shall be wet; ·In the construction area near sensitive points and farmland, the construction access road shall be sprinkled with water to reduce dust; ·Clean up sprinkled materials in a timely manner, and provide a pool for cleaning the tires of transportation vehicles in the temporary work area; · · It is suggested to purchase commercial asphalt directly, and asphalt shall not be mixed on the construction site; asphalt paving should be done in weather with good	Construction Contractor	Employer Supervisor Supervision company for

S/N	Environmental Factors	Environmental Impact or Risk	Mitigation Measures	Implementing Agency	Management Departments
			diffusion conditions, and advanced paving technology shall be adopted to reduce the generation of asphalt smoke.		water and soil conservation
4	Acoustic environment	Impact of construction noise on environment	·Before the construction of the Project, the cases about noise and pollution discharge shall be reported to the local Ecological Environment Bureau; ·Reasonably arrange the construction sequence. In the construction area near the sensitive points, avoid construction operations and transportation of construction materials at night (22: 00 ~ 6: 00 the next day); ·Provide baffles in the construction area near the sensitive points and strengthen maintenance for machinery and equipment; ·Notice shall be issued before blasting operation. Night operation is prohibited.		
6	Solid wastes	Impact of solid wastes on environment	·Spoils of the subgrade shall be transported to the waste spoil yard and temporary stock yard in time determined in the project design, and corresponding preventive measures shall be taken; ·Asphalt residue shall be recycled and not be discarded or disposed of at will; ·Domestic garbage in construction camps shall be collected centrally and regularly delivered to the sanitation department for removal and disposal.		
III	**Operation Period**				
1	Ecological environment	Alien species invasion	·Track and monitor the distribution dynamics of invasive alien species and expel them in time.	Highway Administration Bureau Detian Scenic Area Management Office	Daxin Ecological Environment Bureau
2	Water environment	Impact of road surface runoff on surrounding water bodies	•Regularly carry out desilting, inspection and cleaning of oil trap in tunnel sections. •According to the monitoring plan for the operation period, monitor the effluent quality of septic tanks.		
3	Air pollution	Impact of vehicle exhaust on environment during	•Regular monitoring and establishment of monitoring files.		

S/N	Environmental Factors	Environmental Impact or Risk	Mitigation Measures	Implementing Agency	Management Departments
		operation period			
4	Noise pollution	Impact of traffic noise	•Implement the noise monitoring plan during the operation period, improve the noise reduction measures taken for the nearby sensitive points of the acoustic environment.		
5	Solid wastes	Impact of domestic waste on landscape	•Provide garbage cans at scenic areas and parking islands along the route, arrange sanitation personnel to clean and collect domestic garbage, which shall be cleaned and transported by the sanitation department on a regular basis; •Strengthen publicity along the route to remind tourists that it is prohibited to drop litter carelessly.		

6.1.2 Environment Monitoring Plan

Considering the characteristics of the Project, the implementation of environmental protection during the project construction shall be supervised not only by the local environmental protection bureau, but also by relevant departments of the Asian Infrastructure Investment Bank. See table 6.1-4 for the monitoring plan for environmental protection of the project.

Table 6.1-4 Schedule of Environmental Management and Monitoring Plans for the Project

Stage	Supervision department	Supervision Contents	Purpose
At feasibility study stage	Chongzuo Ecological Environment Bureau, Ecological Environment Bureau of Daxin County and AIIB	Review the Environmental Impact Report Environmental and Social Impact Assessment Report	·Ensure that the EIA contents are complete, the topics are proper and the key points are outstanding. ·Ensure that major and potential problems that may arise in the Project have been reflected. ·Ensure that specific and reliable implementation plans for measures to mitigate environmental impacts have been

Stage	Supervision department	Supervision Contents	Purpose
			proposed.
Design and construction stage	Tiandeng Ecological Environment Bureau, Daxin Ecological Environment Bureau	Review the preliminary design and construction scheme for environmental protection	•Strictly implement “Three simultaneities” system.
		Check whether environmental protection investment is implemented	·Ensure investment in environmental protection.
		Check whether the temporary construction area is suitable	·Ensure that these sites meet environmental requirements
		Check the management and preventive measures for material storage yard and temporary stock yard	
		Check the control measures for noise pollution	·Reduce the impact of construction on the surrounding environment and implement relevant environmental protection laws and standards
		Check the discharge and treatment of construction wastewater, domestic sewage and waste engine oil	·Ensure that surface water will not be contaminated
		Check the provision of intercepting and drainage ditch, sedimentation tank and disposal of mud from bridge boring	
		Vegetation restoration in construction production area, spoil area and bare ground	·Ensure that landscape and land resources will not be severely damaged
		Check the construction of environmental protection facilities	·Ensure implementation of "three simultaneities” policy regarding environmental protection
		Monitoring during construction period	· Implement the monitoring plan during the construction period
		Check whether the environmental protection facilities meet the standard requirements	·Acceptance of environmental protection facilities
Operational stage	Chongzuo Ecological Environment Bureau, Tiandeng Ecological Environment Bureau,	Check the implementation of environmental protection measures and vegetation restoration during the operation period	· Implement the environmental protection and soil and water conservation measures
		Check the implementation of the monitoring plan	· Implement the monitoring plan

Stage	Supervision department	Supervision Contents	Purpose
	Daxin Ecological Environment Bureau, Public Security Department and Fire Department	Check the sensitive points where further environmental protection measures are required (environmental problems that were not originally estimated may occur)	·Strengthen environmental management and effectively protect people's health
		Check whether the environmental quality of environmentally sensitive areas meets the requirements of their corresponding quality standards	
		Strengthen supervision, prevent accidents, eliminate hidden dangers of accidents, formulate emergency response plans in advance to facilitate the elimination of the leakage of dangerous and toxic materials in time in case of accidents	Eliminate hidden dangers of accidents and avoid severe environmental pollution incidents

6.1.3 List of Pollutant Emission and Management Requirements

According to the requirements of the Technical Guideline for Environmental Impact Assessment of Construction Project – General Program (HJ 2.1-2016), the list of major pollutant emissions and management requirements during the construction and operation of the Project are shown in Table 6.1-5~7.

Table 6.1-5 List of Pollutant Emission and Management Requirements for Wuzhou (Longyanzui)-Shuolong Expressway (Chongzuo-Jingxi Expressway to Shuolong Port Section)

S/N	Environment Elements	Period	Pollution factor	Generation Amount	Emission Concentration	Discharge Amount	Implemented Standard
1	Domestic sewage	Construction Period	BOD_5,COD,N-NH_3	8640m^3/a	Wastewater from dining room is discharged into septic tank together with toilet flushing water and washing water after oil trap treatment for collection and treatment, and then is used for fertilizing the forest land around the construction living area, and the septic tank is periodically cleaned and used for fertilizing the forest land		
		Operation Period	COD	0.44t/a	100 mg/L	0.07 t/a	The effluent from service facilities shall be reused or discharged after reaching the class I standard of Integrated Wastewater Discharge Standard
			BOD_5	0.37t/a	20 mg/L	0.01 t/a	
			SS	0.44 t/a	70 mg/L	0.1 t/a	

S/N	Environment Elements	Period	Pollution factor	Generation Amount	Emission Concentration	Discharge Amount	Implemented Standard
			NH_3-N	0.007 t/a	5 mg/L	0.007t/a	
			Petroleums	0.003 t/a	2 mg/L	0.001t/a	
2	Ambient air	Construction Period	TSP, asphalt fume, SO2, CO, NOX, THC, etc.	--	A small quantity	A small quantity	Emission standard in Integrated Emission Standard of Air Pollutants (GB16297-1996)
		Operation Period	CO	0.024~0.143 mg/m·s	A small quantity	A small quantity	Level II standard in Ambient Air Quality Standard (GB3095-2012)
			NO_2	0.001~0.009 mg/m·s	A small quantity	A small quantity	
3	Noise	Construction Period	Leq	76~98dB(A)	Out of limits by 3.2~23.9dB(A)		Class 2 of Cat. 4a standard in Environmental Quality Standards for Noise (GB3096-2008)
		Operation Period	Leq	75.9~86.9dB(A)	Out of limits by 1.0~7.9dB(A) for sensitive points in the medium period		
4	Solid wastes	Construction Period	Waste earthwork	473,000m^3	473,000m3		Uniform dumping in the designated waste spoil site
			Domestic wastes	36t/a	36t/a		Domestic wastes shall be cleared and transported by the environmental sanitation department on a periodical basis.
		Operation Period	Domestic wastes	10.95t/a	10.95t/a		Cleared and transported by the environmental sanitation department regularly

Table 6.1-6 List of Pollutant Emission and Management Requirements for Detian-Shuolong Highway

S/N	Environment Elements	Period	Pollution factor	Generation Amount	Emission Concentration	Discharge Amount	Implemented Standard
1	Domestic sewage	Construction Period	BOD_5,COD,N-NH_3	1314m^3/a	Wastewater from the dining room is discharged into the septic tank together with toilet flushing water and washing water after oil trap treatment for collection and treatment, and then is used for fertilizing the forest land around the construction living area, and the septic tank is periodically cleaned and used for fertilizing the forest land		
2	Ambient air	Construction Period	TSP, asphalt fume, SO2, CO, NOX, THC, etc.	--	A small quantity	A small quantity	Emission standard in Integrated Emission Standard of Air Pollutants (GB16297-1996)

S/N	Environment Elements	Period	Pollution factor	Generation Amount	Emission Concentration	Discharge Amount	Implemented Standard
		Operation Period	CO	0.0273~0.0875mg/m·s	A small quantity	A small quantity	Level II standard in Ambient Air Quality Standard (GB3095-2012)
			NO_2	0.0017~0.0054mg/m·s	A small quantity	A small quantity	
3	Noise	Construction Period	Leq	76~98dB(A)	Out of limits by 0.9~20.4dB(A)		Class 2 of Cat. 4a standard in Environmental Quality Standards for Noise (GB3096-2008)
		Operation Period	Leq	59.18~78.85dB(A)	Out of limits by 0.6~6.7dB(A) for sensitive points in the medium period		
4	Solid wastes	Construction Period	Waste earthwork	64,300 m^3	64,300 m3		Uniform dumping in the designated waste spoil site
			Domestic wastes	10.95t/a	10.95t/a		Domestic wastes shall be cleared and transported by the environmental sanitation department on a periodical basis.
		Operation Period	Domestic wastes	A small quantity	A small quantity		Cleaned by maintenance workers regularly

Table 6.1-7 List of Pollutant Emission and Management Requirements for Shuolong Port (Phase II of Shuolong Main Gate)

S/N	Environment Elements	Period	Pollution factor	Generation Amount	Emission Concentration	Discharge Amount	Implemented Standard
1	Domestic sewage	Construction Period	BOD_5,COD,N-NH_3	4200m^3/a	Wastewater from the dining room is discharged into the septic tank together with toilet flushing water and washing water after oil trap treatment for collection and treatment, and then is used for fertilizing the forest land around the construction living area, and the septic tank is periodically cleaned and used for fertilizing the forest land		
2	Ambient air	Construction Period	TSP, asphalt fume, SO2, CO, NOX, THC, etc.	--	A small quantity	A small quantity	Emission standard in Integrated Emission Standard of Air Pollutants (GB16297-1996)

S/N	Environment Elements	Period	Pollution factor	Generation Amount	Emission Concentration	Discharge Amount	Implemented Standard
		Operation Period	CO	A small quantity	A small quantity	A small quantity	Level I standard in Ambient Air Quality Standard (GB3095-2012)
			NO_2	A small quantity	A small quantity	A small quantity	
3	Noise	Construction Period	Leq	76~98dB(A)	Out of limits by 0.9~20.4dB(A)		Class 2 of Cat. 4a standard in Environmental Quality Standards for Noise (GB3096-2008)
		Operation Period	Leq	64.33~78.73dB(A)	Out of limits by 2.4~9.8dB(A) for sensitive points in the medium period		
4	Solid wastes	Construction Period	Waste earthwork	1,600m^3	1,600m3		Uniform dumping in the designated waste spoil site
			Domestic wastes	11.3t/a	11.3t/a		Domestic wastes shall be cleared and transported by the environmental sanitation department on a periodical basis.
		Operation Period	Domestic wastes	109t/a	109t/a		Cleaned by maintenance workers regularly

6.2 Environmental Monitoring and Budget

6.2.1 Purpose of Environmental Monitoring

The purpose of monitoring is to control the pollution trends of the proposed project comprehensively, timely, know the degree of environmental changes, influence coverage of project construction in the project construction area and trends of environmental quality during the operation period to give feedback to the competent authorities in time and to offer scientific evidence to the environmental management of the Project.

6.2.2 Environmental Monitoring Organization

The environmental monitoring during construction period and operation period shall be undertaken by qualified monitoring units entrusted by project contractors or operators, all of which shall be national certification units for environmental quality monitoring, with complete equipment and strong technical force, and can complete the undertaken environment monitoring tasks well.

According to the prediction results of environmental impact, the sensitive concerns with obvious pollution will be taken as the monitoring points, and the pollution during the project construction and operation will be tracked and monitored, mainly including monitoring of noise, air environment and surface water which have great impact on the environment. The monitoring factors will be determined based on the characteristic factors of the pollution during the Project. The monitoring analysis methods of the corresponding items in the Technical Specification for Environmental Monitoring issued by the former State Environmental Protection Bureau are adopted. The evaluation standard shall be in accordance with the national standard for confirmation of EIA of each component.

6.2.3 Environmental Monitoring Plan and Budget

6.2.3.1 Environmental Monitoring Plan of Ambient Air, Noise and Water

The project Employer is responsible for organizing and implementing the environmental monitoring plan during the construction period of the Project, proposes

the environmental monitoring points, monitoring items, monitoring factors, monitoring frequency and responsible for organization of implementation according to the Technical Specifications for Environmental Monitoring during Construction Period Part 1: Environmental Quality Monitoring during Highway Construction (JT/T1016.1-2015). See Table 6.2-1 for the Environmental Monitoring Plan during Construction Period. See table 6.2-2 for the Environmental Monitoring Plan during the Operation Period.

Table 6.2-1 Schedule of Environmental Monitoring Plan during Construction Period

Component Name	Monitored Items	Spot	Factors	Frequency	Expenses Estimate
Component A – Wuzhou (Longyanzui)-Shuolong Expressway (Chongzuo–Jingxi Expressway to Shuolong Port Section)	Noise at the construction site boundary	Sampling for inspection shall be carried out in the construction site of the existing sensitive points within 50m of the construction site, and the sampling rate shall be not less than 50%. Especially, the sensitive points around the construction, production and living areas with mixing stations should be sampled and monitored; the road sections passing through Xialei Nature Reserve and Huashan Scenic Area should be monitored.	**$L_{eq}A$**	Monitoring once every quarter, 2 days for each time; once in the daytime and once at night.	RMB 200,000/year
	Ambient air		TSP	The monitoring shall be conducted once every quarter for 3 days, and the sampling time shall meet the minimum requirements for the validity of pollutant concentration data in GB3095. The daily average concentration of TSP shall be monitored and sampled continuously for 24 hours, and the daily average sampling of PM10 shall be more than 20 hours continuously.	
	Surface Water	Longkalang Super Major Bridge, Bangtun Bridge, Shuolong Guichun River Bridge	Chemical oxygen demand, BOD5, SS, petroleum, ammonia nitrogen, etc.	Monitoring shall be performed quarterly for 2 days each time and once every day.	
Component B - Detian-Shuolong Highway	Noise at the construction site boundary	Sampling for inspection shall be carried out in the construction site of the existing sensitive points within 50m of the construction site, and the sampling rate shall be 50%. Especially, the sensitive points around the mixing stations should be sampled and monitored; the road sections passing through Huashan Scenic Area shall be monitored.	**$L_{eq}A$**	Monitoring once every quarter, 2 days for each time; once in the daytime and once at night.	RMB160,000/year
	Ambient air		TSP	The monitoring shall be conducted once every quarter for 3 days, and the sampling time shall meet the minimum requirements for the validity of pollutant concentration data in GB3095. The daily average concentration of TSP shall be monitored and sampled continuously for 24 hours, and the daily average sampling of PM10 shall be more than 20 hours continuously.	
	Surface Water	Water intake of Guichun River in Aitun Water Source, Shuolong Town and the Yuejin Canal water intake of Guichun River	Chemical oxygen demand, BOD5, SS, petroleum, ammonia nitrogen, etc.	Monitoring shall be performed quarterly for 2 days each time and once every day.	
Component C - Shuolong Port (Phase II of Shuolong Main	Noise at the construction site boundary	Existing sensitive points within 50m of the construction site	**$L_{eq}A$**	Monitoring once every quarter, 2 days for each time; once in the daytime and once at night.	RMB 20,000/year
	Ambient air		TSP	Monitoring shall be conducted	

Gate)				once a quarter for 3 days, and the sampling time should meet the minimum requirement of validity of pollutant concentration data in GB3095. The daily average concentration of TSP should be monitored and sampled continuously for 24 hours, and the daily average sampling of PM10 should be more than 20 hours continuously.	
Total					RMB 380,000/year

Table 6.2-2 Environmental Monitoring Plan during the Operation Period

Component Name	Monitored Items	Spot	Factors	Frequency	Expenses Estimate
Component A – Wuzhou (Longyanzui)-Shuolong Expressway (Chongzuo–Jingxi Expressway to Shuolong Port Section)	Noise	The environmental sensitive points within the scope of project assessment shall be sampled and monitored on site, and the sampling rate shall reach 30%	$L_{eq}A$	Monitoring for each characteristic year during the operation period: twice a year, 2 days for each time. 4 times a day, with twice in the daytime and twice at night. Monitor at the average time of traffic flow and the peak period respectively for 20min each time.	RMB 350,000/year
	Ambient air		TSP,NO_2,CO	Monitoring for each characteristic year during the operation period: twice a year, 7 days for each time; 24 hours for TSP, NO_2 and CO monitoring, respectively.	
	Surface Water	Longkalang Super Major Bridge, Bangtun Bridge, Shuolong Guichun River Bridge	SS, chemical oxygen demand, petroleum, etc.	Once a year in dry season, 2 days for each time	
	Waste water	Main discharge ports of sewage treatment facilities in toll stations, maintenance work areas, etc.	Chemical oxygen demand, BOD5, SS, oil, ammonia nitrogen, etc.	Once a year, 3 days for each time	
Component B - Detian-Shuolong Highway	Noise	The environmental sensitive points within the scope of project assessment shall be sampled and monitored on site, and the sampling rate shall reach 30%	$L_{eq}A$	Monitoring for each characteristic year during the operation period: twice a year, 2 days for each time. 4 times a day, with twice in the daytime and twice at night. Monitor at the average time of traffic flow and the peak period respectively for 20min each time.	RMB 210,000/year
	Ambient air		TSP,NO_2,CO	Monitoring for each characteristic year during the operation period: twice a year, 7 days for each time; 24 hours for TSP, NO2 and CO monitoring, respectively.	
	Surface Water	Water intake of Guichun River in Aitun Water Source, Shuolong Town and the Yuejin Canal water intake of Guichun River	SS, chemical oxygen demand, petroleum, etc.	Once a year in dry season, 2 days for each time	
Component C - Shuolong Port (Phase II of Shuolong Main Gate)	Noise	Evaluate sensitive points within the scope	$L_{eq}A$	Twice a year, 2 days for each time. 4 times a day, twice in the daytime and twice at night.	RMB 60,000/year
	Ambient air		TSP	Twice a year, 7 days for each time; 24 hours for TSP, NO_2 and CO monitoring, respectively.	
Total					RMB 620,000/year

6.2.3.2 Ecological Monitoring Plan

The Employer and Operator are responsible for the organization and implementation of ecological monitoring. See Table 6.2-3 and Table 6.2-4 for the ecological monitoring plan.

Table 6.2-3 Ecological Monitoring Plan during Construction Period

Component Name	Monitoring Point	Monitoring Items, Frequency and Requirements			Expenses Estimate
		Vegetation and Natural Landscape	Protected plants	Protected animals	
Component A – Wuzhou (Longyanzui)-Shuolong Expressway (Chongzuo–Jingxi Expressway to Shuolong Port Section)	Sections passing through Xialei Natural Reserve	Once every quarter	Once every quarter	Once every quarter	RMB 200,000/year
	Sections passing through Huashan Scenic Area	Once every quarter	Once every quarter	/	
	Main sections with wild animals	Once every quarter	/	Once every quarter	
	Distribution points of in situ conservation and transplanting of protected plants	/	Once every quarter	/	
Component B - Detian-Shuolong Highway	Sections passing through Huashan Scenic Area	Once every quarter	Once every quarter	/	RMB 100,000/year
	Main sections with wild animals	Once every quarter	/	Once every quarter	
	Distribution points of in situ conservation and transplanting of protected plants	/	Once every quarter	/	
Total					RMB 300,000/year

Table 6.2-4 Ecological Monitoring Plan during Operation Period

Component Name	Scope and Content of Monitoring		Monitoring Items, Frequency and Requirements					Expenses Estimate
	Type of Monitoring	Main Points and Content of Monitoring	Vegetation	Protected plants Material	Protection animals Material	Invasive alien species	Habitat change	
Wuzhou (Longyanzui)-Shuolong Expressway (Chongzuo–Jingxi Expressway to Shuolong Port Section)	Sections passing through Xialei Nature Reserve (K7+885~K10+715 and AK3+600~AK4+600)	Monitoring location: sections passing through reserve area Monitoring contents: change in ecological environment (Equivalent Continuous Level A); effects of ecological restoration and soil and water	Initial operation stage (within 5 years), once a year	Initial operation stage (within 3 years), once a year	Initial operation stage (within 3 years), once a year; once for medium term operation stage and once for long term operation stage	Initial operation stage (within 3 years), once a year; once every 3 years in the future	—	RMB 150,000/year

Component Name	Scope and Content of Monitoring		Monitoring Items, Frequency and Requirements					Expenses Estimate
	Type of Monitoring	Main Points and Content of Monitoring	Vegetation	Protected plants Material	Protection animals Material	Invasive alien species	Habitat change	
		conservation; ecological invasion in the affected area of the project; monitoring on the impact of traffic noise and light at night on protected animals						
	Protected plants	Monitoring location: protected plants within the scope of assessment, with the focus on protected plants within the occupied land and 50m outside the boundary line. Monitoring contents: the growth of protected plants transplanted within the scope of assessment.	—	Initial operation stage (within 3 years), once a year	—	—	—	
	Protected animals	Monitoring location: road sections with centralized distribution of protected animals. Monitoring contents: plant tall trees in the sections with birds concentrated to prevent birds from colliding with	—	—	Initial operation stage (within 3 years), once a year; once a year for medium term and long term operation stages, respectively	—	—	

Component Name	Scope and Content of Monitoring		Monitoring Items, Frequency and Requirements					Expenses Estimate
	Type of Monitoring	Main Points and Content of Monitoring	Vegetation	Protected plants Material	Protection animals Material	Invasive alien species	Habitat change	
		viaducts; cover up and green the portals of Longkalang Tunnel and Shuolong Tunnel; make the culverts, bridges and tunnels available as animal passages.						
	Ecological invasion	Whole route	—	—	—	Initial operation stage (within 3 years), once a year; once every 3 years thereafter	—	
Detian-Shuolong Highway	Ecological invasion	Whole route	—	—	—	Initial operation stage (within 3 years), once a year; once every 3 years in the future	—	5
Shuolong Port (Phase II of Shuolong Main Gate)	Ecological invasion	—	—	—	—	—	—	--
Total								RMB 200,000/year

Main contents of ecological monitoring:

1. Protected plants

Main monitoring contents during construction period: implementation of protection measures proposed in the report; the growth of protected plants; impacts of construction activities on the protected plants and their habitats. Main monitoring contents during operation period: the growth of protected plants.

2. Road sections with centralized distribution of protected animals

Main monitoring contents during construction period: whether the construction of road sections with mammal and key protected birds disturbs the main activities of protected animals; the implementation of environment report and protection measures for wild animals.

Main monitoring contents during operation period: the blocking effect of roads on wild animals along the route and the effectiveness of animal passages (culverts and viaducts); influence of traffic noise and light on wild animals along the route.

3. Alien species

It mainly monitors the distribution and diffusion of alien species within the range of land occupation for highway.

4. Sections passing through Xialei Natural Reserve

Change in ecological environment (Equivalent Continuous Level A); effects of ecological restoration and soil and water conservation; ecological invasion in the affected area of the project; monitoring on the impact of traffic noise and light at night on protected animals.

6.3 Completion Acceptance for Environmental Protection

According to the requirements of the Law on the Management of the Environmental Inspection of Completed Construction Projects (Decree No.13 of the State Environmental Protection Administration) and the Measures for Environmental Protection Management of Transport Construction Projects (Decree No.5 of the Ministry of Transport in 2003), the "three simultaneities" system for environmental protection shall be strictly implemented in project construction, and the acceptance of environmental protection facilities shall be applied within 3 months after delivery. See Table 6.3-1~3 for the summary of completion acceptance for environmental protection of each component.

S/N	Subitem	Main Content of Acceptance	Remarks
I	Organization	The regulatory department set up according to the management requirements of project environmental protection	Provided by the Project Owner when submitting the acceptance application report
II	Bidding and bid documents	Environmental protection clauses shall be included in project construction and equipment procurement and installation contracts	
III	Dynamic monitoring data	Environmental Monitoring Report and Supervision Summary Report during Construction Period	
IV	Inspection on	Inspection Report on Effect of Environmental	

	effects of environmental protection facilities	Protection Facilities during Trial Operation	
V	Schedule of environmental protection facilities determined in the period of engineering design and EIA		

Environment Elements	**Content of Measures**	**Investment / RMB 10,000**	**Remarks**
Pollution control of acoustic environment	Provision of 2.5m high iron sheet baffle during construction period	20	Temporary provision by contractors
	Strengthen the maintenance of construction machinery and equipment to maintain a low noise level	5	Additional equipment maintenance costs for contractors
	Noise control measures during operation period	63	Ventilated soundproof window with an area of 20 m^2 is installed in Bangtun and that with an area of 90 m^2 is installed in Rentun, totaling 450 m. RMB 500,000 are reserved for the actual construction of noise protection measures.
Prevention and Control of Ambient Air Pollution	Water sprinkling for dust control during the construction period	30	Water sprinkling for dust control during the construction period
	Prevention and control measures of transportation dust pollution	15	Costs for covered transportation or closed transportation
	Prevention and control measures for dust pollution in construction, production and living quarters	25	Covering of stacked materials in construction camp and dust removal devices for concrete mixing equipment
	Dust control measures during tunnel construction	—	Tunnel ventilation (included in the project cost, not included in the direct investment in environmental protection)
Pollution control of water environment	Treatment of construction production wastewater and domestic sewage	50	Sedimentation tank construction and manual cleaning costs (tentative estimation), septic tanks
	Prevention and control of wastewater during bridge construction	30	Temporary drainage ditches and temporary sedimentation tanks provided along the bank side of the whole bridge. (Tentative estimation)
	Wastewater treatment during tunnel construction	18	Setting up of oil separation tank and grit chamber at the entrance and exit of the tunnel, and cyclic utilization of supernatant after precipitation; Arrangement of six tunnels, with each tunnel estimated to be RMB 30,000.
	Sewage treatment facilities in toll stations, etc.	100	One toll station (jointly built with the maintenance work area): one MBR sewage treatment reclaimed water reuse system; a total of RMB 1 million
Investment in ecological protection	Plant protection measures	6	Costs for transplanting of protective plants, protection signs for ancient trees, fence protection, etc.
Solid waste disposal	Garbage collection and disposal in construction camp during construction period	10	Garbage collection and disposal in construction camp during construction period
	Treatment of pier excavation mud and wall	20	Treatment of pier excavation mud and wall protection mud

	protection mud		
Preventive Measures for Accident Risks	Water quality protection measures in nature reserves and scenic spots	60	SS-class reinforced RC anti-collision guardrails for the bridge, warning signs of road sections, etc.
	Risk control measures for river-crossing bridges	30	Collision barriers for the bridge across water bodies
	Water environment risk prevention measures and emergency rescue	50	Emergency plan preparation, emergency rescue equipment and appliances for dangerous goods transportation accidents
Total		532	

Table 6.3-1 Schedule of Environmental Protection Acceptance upon Completion of Wuzhou (Longyanzui)-Shuolong Expressway (Chongzuo-Jingxi Expressway to Shuolong Port Section)

Table 6.3-2 Summary of Environmental Protection Acceptance upon Completion of Detian-Shuolong Highway

S/N	Subitem	Main Content of Acceptance	Remarks
I	Organization	The Project Owner shall organize the acceptance	Provided by the Project Owner when submitting the acceptance application report
II	Bidding and bid documents	Environmental protection clauses shall be included in project construction and equipment procurement and installation contracts	
III	Dynamic monitoring data	Environmental Monitoring Report and Supervision Summary Report during Construction Period	
IV	Inspection on effects of environmental protection facilities	Inspection Report on Effect of Environmental Protection Facilities during Trial Operation	
V	Schedule of environmental protection facilities determined in the period of engineering design and EIA		

Environment Elements	Content of Measures	Investment / RMB 10,000	Remarks
Pollution control of acoustic environment	Provide 2m high iron sheet baffle during construction period and strengthen maintenance for construction machinery and equipment	8	Additional equipment maintenance costs for contractors
	Noise control measures during operation period	106	Installation of ventilation and sound proof windows for sensitive buildings (with an area of 530m^2)
Pollution control for ambient air	Water sprinkling for dust control during the construction period	10	Water sprinkling for dust control during the construction period
	Prevention and control measures of transportation dust pollution	6	Cost for covered transportation or closed transportation
	Prevention measures for dust pollution in construction area	15	Covering measures for stocked materials in the construction camp; dust removal devices for concrete mixing equipment

Pollution control of water environment	Treatment of construction production wastewater and domestic sewage	2	Sedimentation tank construction and manual cleaning costs (tentative estimation), septic tanks
	Prevention and control of construction wastewater for the road section near the river	4	Temporary drainage ditches and sedimentation tanks shall be provided in the section near the river. (Tentative estimation)
	Wastewater treatment during tunnel construction	4	Oil trap and desilting basin shall be provided at the portals of Longhong tunnel. The supernatant after sedimentation shall be recycled; RMB 40,000 proposed for such cost
Investment in ecological protection	Plant protection measures	10	Costs for transplanting of protective plants, protection signs for ancient trees, fence protection, etc.
Disposal of solid waste	Garbage collection and disposal in construction camp during construction period	2	Garbage collection and disposal in construction camp during construction period
	Treatment of pier excavation mud and wall protection mud	3	Treatment of pier excavation mud and wall protection mud
Preventive Measures for Accident Risks	Protection measures for water quality in sections of water source conservation area for drinking water	55	Costs for road surface runoff collection and drainage system, sedimentation tank and warning signs for road sections in water source protection areas
	Water environment risk prevention measures and emergency rescue	5	Emergency plan preparation, emergency drills and training
Total		230	

Table 6.3-3 Schedule of Environmental Protection Acceptance upon Completion of Shuolong Port (Phase II of Shuolong Main Gate)

S/N	Subitem	Main Content of Acceptance	Remarks
I	Organization	The Project Owner shall organize the acceptance	Provided by the Project Owner when submitting the acceptance application report
II	Bidding and bid documents	Environmental protection clauses shall be included in project construction and equipment procurement and installation contracts	
III	Dynamic monitoring data	Environmental Monitoring Report and Supervision Summary Report during Construction Period	
IV	Inspection on effects of environmental protection facilities	Inspection Report on Effect of Environmental Protection Facilities during Trial Operation	
V	Schedule of environmental protection facilities determined in the period of engineering design and EIA		
S/N	Item	Treatment measure	Investment amount (Unit: RMB 10,000)
1	Wastewater	Construction period: sedimentation tanks and	5

S/N	Subitem	Main Content of Acceptance	Remarks
	treatment	drainage ditches	
		Operating period: three-stage septic tank and supporting sewage pipe network	8
2	Off-gas treatment	Construction period: control of dust pollution at the site	5
		Operating period: ventilation equipment of the underground garage	5
3	Solid waste treatment	Construction period: disposal of construction waste, spoil and domestic garbage	8
		Operating period: garbage collection buckets	2
4	Noise treatment	Construction period: barriers, etc	5
		Operating period: anti-vibration and vibration reduction measures, sound absorption materials, etc.	3
5	Landscaping	Greening in the plant area	10
6	Environmental management	Monitoring, supervision, acceptance and other expenses	15
7	Total		66

6.4 Budget

The environmental monitoring cost of Chongzuo Border Connectivity Improvement Project in Guangxi is about RMB 680,000 per year during construction and RMB 820,000 per year during operation, and the investment in environmental protection measures during construction and operation is about RMB 8.28 million.

7 Social Impact and Management Plan

The Project is located in Tiandeng County and Daxin County, Chongzuo City, in the southwest of Guangxi Zhuang Autonomous Region, China. The construction of the Project will improve the transportation infrastructure in the project area, promote foreign exchange and cooperation among Chongzuo, Daxin and Tiandeng counties, directly promote the development of foreign trade, tourism and transportation industry, drive the rise and prosperity of business and catering service industries along the route, promote the employment of local labor force, especially poor people and women, improve the income level of the masses, provide convenience for the resident travel, shorten travel time and improve the travel comfort. However, when the Project is under construction and after it is put into operation, it will have certain adverse effects on some relevant interest groups. Due to the construction of the Project, more land resources will be occupied, and some residents' houses will be demolished, posing risks to the affected people, including losing their sources of livelihood, income decline, losing employment opportunities, and losing residential houses. During the construction period of the Project, due to the need of road construction, the existing traffic on the relevant roads in the region will be temporarily organized by detouring and half-width passage, which will reduce the vehicle operation speed and affect the normal traffic.

In view of the potential social benefits and adverse impacts of the project construction, the Project Owner and all relevant institutions shall take measures to promote and enhance the social benefits of the project and eliminate or alleviate the negative impacts of the project. Therefore, the following management plans are developed. See Table 7.1-1 for details.

Table 7.1-1 Social Impact Management Plan

Specific Matters	Social Impact	Enhancement/Promotion Measures	Time Arrangement	Budget	Implemented by	Monitored by	Monitoring Indexes	Frequency
1- Positive Benefits								
Project construction	Promotion of exchanges and cooperation with ASEAN countries, especially Vietnam	Vigorously publicize the contents and significance of the Project	Before project construction		Project Office ① and Project Executive Office ②			
Project construction	Promotion of the development of tourism, transportation, trade and catering industries	Vigorously publicize the contents and significance of the Project	Before project construction		Project Office and Project Executive Office			
Project Construction	Increase of temporary employment opportunities; the temporary labor force during the construction period of the three components is about 3,204,765 man-days	Give priority to the employment of local labor force in the project affected areas and project areas, especially the employment of poor families and women	Construction period		County Labor and Social Security Bureaus, Township Governments and Village Committee	Project Office, Project Executive Office and External Monitoring Agency	Temporary employment during the project implementation	Twice/year

Project operation	Increase of 110 fixed jobs	Give priority to the employment of local young laborers in the project affected areas and project areas, especially the employment of young laborers and women from poor families	After operation		County Transportation Bureaus, Human Resources and Social Security Bureaus	Project Office and External Monitoring Agency	Number of employed persons in fixed positions after the Project is put into operation	
After completion of Component A	Shortening of travel time and improvement of living quality	The transportation department will open or increase the number of public passenger vehicles	After operation		Municipal and county transportation bureaus	Project Office and External Monitoring Agency	Passenger bus frequency	
After completion of Component B	Elimination of damage of the existing road which will be safer and smoother	The designer shall fully consider public service facilities such as parking lots and bus transfers in the design	After operation		Employer of the Project	Project Office and External Monitoring Agency	Public transport service facilities	

Table 7.1-2- Negative Impacts

Specific Matters	**Social Impact**	**Mitigation/Preventive Measures**	**Time Arrangement**	**Budget**	**Implemented by**	**Supervisor**	**Monitoring Indexes**	**Frequency**

Permanent land acquisition	A total of 1,597.87 mu of permanent LA, affecting 7 villages/communities in 2 counties and 2 townships, and affecting 844 households with 3,635 people	Further optimize the route, minimize the occupation of fertile land, and avoid schools and villages	Throughout the project period	Included in the resettlement expenses	Designer, Project Executive Office	Project Office and External Monitoring Agency	See Resettlement Monitoring Indicators	Twice/year
House demolition	The construction of the Project requires 3,528.96 m^2 of houses to be demolished in Shuolong Community, Shuolong Town, Daxin County, which will affect 18 households with 78 people, and it requires 329.2m^2 of houses to be demolished in Liliang Village and Xuanjie Village, Fuxin Town, Tiandeng County, which will affect 8 households with 32 people	Avoid concentrated residential areas and minimize house demolition	Throughout the project period	Included in the resettlement expenses	Designer, Project Executive Office	Project Office and External Monitoring Agency	See Resettlement Monitoring Indicators	Twice/year
Temporary land occupation	The Project requires a temporary land occupation area of 677	For construction living quarters, spoil grounds, temporary soil dump areas and other temporary occupation areas, the	Throughout the project period	Included in the	Designer,	Project Office and External	See Resettlement	Twice/year

	mu, which affects 816 people in 186 households from 2 towns, 7 villages/communities.	amount of land occupied can be reduced by renting local houses or arranging them in permanent occupation areas. When new land must be occupied, the site should be reasonably selected to avoid occupying basic cultivated land, commercial crop areas, wood land, and other areas, and to occupy wasteland, abandoned land, or land hard to utilize as much as possible to reduce the adverse impact on local residents.		resettlement expenses	Project Executive Office	Monitoring Agency	Monitoring Indicators	
Traffic control for construction	The existing traffic on the relevant roads in the region will be temporarily organized by detouring and half-width passage, which will reduce the vehicle operation speed and affect the normal traffic.	Improve and supplement relevant traffic signs according to the actual conditions, provide guidance signs at the intersection with local roads and make use of variable message signs, cable broadcasts and other methods to guide traffic to prevent traffic congestion in the operation section. The temporary access road built by the Employer shall be incorporated into the local highway system, and shall be constructed and maintained in accordance with relevant standards for rural roads. These roads can be used by the masses during construction to improve public travel conditions.	Throughout the project period		Project Executive Office	Project Office and External Monitoring Agency		Twice/year

Note: ① Project Office refers to the Office of Leading Team for Resettlement of Guangxi Chongzuo Border Connectivity Improvement Project; ② Project Executive Office refers to the Executive Office for Guangxi Chongzuo Border Connectivity Improvement Project.

7.1 Situation of Vulnerable Groups and Implementation of Government Support Policies

A total of 844 households with 3,635 people are affected by the permanent expropriation of farmland and the demolition of houses and ancillary facilities in the Project, among which 194 households with 760 people are identified as vulnerable groups by the government (households enjoying the minimum living guarantee and five guarantees and poverty-stricken households registered in 2015, the same below), accounting for 20.91% of the total affected population. Among them, there are 11 households with 48 people enjoying five-guarantees, 71 households with 274 people enjoying the minimum living guarantee and 112 poverty-stricken households with 438 people. The vulnerable groups are all from households affected by permanent LA.

For the vulnerable groups affected by the Project, they not only enjoy the same compensation and resettlement as other families affected by land acquisition, but also enjoy various government support policies. The government also provides subsistence allowance to inhabitants of a border area within 0-3 km of the land border to ensure that their livelihoods are sustainable and their incomes are restored and increased.

In view of the potential adverse effects of the project construction on vulnerable groups, the Project Owner and relevant institutions shall focus on their resettlement, monitor the availability of various government subsidies, take measures to give priority to temporary employment opportunities for these families as much as possible, eliminate or mitigate the adverse effects of the project on them, and restore their livelihood and income level as soon as possible. Therefore, the following management plans are developed. See Table 7.1-3 for details.

Table 7.1-3 Management Plan for Affected Vulnerable Groups

Types and numbers of affected vulnerable groups	Compensation and resettlement measures for this project	Government support policy	Enhance promotion measures	Time Arrangement	Monitoring Indexes	Implemented by	Monitored by	Frequency
Households enjoying five-guarantees: 11 households with 48 persons	Monetary resettlement: provide land acquisition compensation to affected families (the compensation is RMB 37,924 /mu in Fuxin Town, Tiandeng County, and the compensation is RMB 35,700/mu in Shuolong Town, Daxin county; Eligible affected populations can also receive	The government centralizedly provides support or distribute support payment for households enjoying five guarantees. Border region residents can also obtain living allowances for border region residents.	Households enjoying five guarantees have no working capacity	Construction period	The living allowance for border region residents is RMB 210 /person/year; The standard for households enjoying five guarantees is RMB 595/month/person	County Civil Affairs Bureau and Town Government	Project Office and External Monitoring Entity	Twice/year
Low-income families, 71 households with 274 persons		For those receiving the guaranteed income supplement, the government pays endowment insurance premiums and medical insurance premiums for them, and distributes life and nutrition subsidies and other support to compulsory education	Preferentially provide those who have the ability to work with temporary employment opportunities; Preferentially provide those who meet the employment	After the construction period and operation of the Project	The living allowance for border region residents is RMB 210/person/year; The minimum standard for the guaranteed imcome supplement is RMB 5,100/year; The medical insurance subsidy is RMB 250/person/year for rural residents, and the endowment insurance subsidy is RMB 100/person/year for 16-60 years old and RMB 131 /person/year for the old over 65 years; Living and nutrition subsidy for	County Civil Affairs Bureau and Town Government	Project Office and External Monitoring Entity	Twice/year

	social security resettlement	students. The border region residents can also obtain living allowances for the border region residents.	conditions with fixed jobs		compulsory education students in primary schools is RMB 1800/person/year			
Poverty-stricken households, 112 households with 438 persons		Each household enjoys different targeted poverty alleviation policies according to different conditions, mainly including poverty alleviation on development and production, employment, education, health, asset income and social security. The border region residents can also obtain living allowances for the border region residents.			The living allowance for border region residents is RMB 210/person/year; Medical insurance subsidy for rural residents is RMB 250/person/year; the endowment insurance subsidy is RMB 100/person/year for 16-60 years old and RMB 131 /person/year for the old over 65 years; Living and nutrition subsidy for compulsory education students in primary schools is RMB 1800/person/year	County Civil Affairs Bureau, County Poverty Alleviation Office and Town Government	Project Office and External Monitoring Entity	Twice/year

7.2 The Status of Women and the Implementation of the Programme for Promoting Equal Opportunities

According to statistics, Shuolong Town and Fuxin Town have a population of 35,580 in the Project, with17,339 women accounting for 48.73% of the total. 945 families with 4067 persons are affected by land acquisition and demolition of the Project, and women account for about 48.52% of the affected population according to the questionnaire survey. It can be reckoned that there are about 1973 women in the affected population, accounting for 11.38% of the total women in the Project site.

The Social Assessment Task Force pays special attention to conditions of the women in the project area during the socio-economic survey. They try to fully understand women's education, employment and income, family status, social status, participation in public affairs, etc. in the process of the questionnaire survey and panel discussion. For education, women's education status is lower than that of men as a whole; For employment, men bear more family economic functions, and women take more responsibility for household chores, caring for the elderly and educating their children; For family income, the economic income created by women is clearly lower than that of men.

According to the investigation, women in the affected areas of the project have played an important role in family affairs and social life. Most of the interviewed women have already known about the construction of the Project, and they all hope and support the construction of it. All women have talked about their own opinions and suggestions on compensation and resettlement for land acquisition of the Project, namely, they hoped that the compensation for land acquisition would be paid in a timely manner based on the standards set by the government, so that they can be more guaranteed for the old-age in the future. Young and middle-aged women hoped to obtain employment opportunities around the village during the construction and steady jobs after the Project operation. In general, they all hope that they can take care of their family and meanwhile do some work within their ability, so as to raise the level of household income and better secure children’s education, family daily expenses and

future old-age care.

In order to improve women's awareness and their abilities to participate in public affairs, women's employment, social status, and equal opportunities for both genders to benefit from the Project, a gender action management programme has been developed for the Project, as shown in Table 7.2-1.

Table 7.2-1 Management Programme for Gender Action

Gender Action Plan	Contents of the Plan	Enhancement or promotion measures	Time Arrangement	Implemented by	Monitored by	Monitoring Indexes	Frequency
Women participation	During consultation, supervision and assessment in stages of preparation, implementation and operation of the Project, it is necessary to make sure the participation of women in the Project area, consult and respect their insights, and include their insights in making decisions and plans.	Disseminate information with radios and televisions, publicity columns, brochures and other channels to protect women's right to know about matters related to the Project construction	Preparation, implementation and operation period of women	Project executive office, women's federations at all levels	Project Office and External Monitoring Agency	Ensure participation of 40% women	Twice/year
Increase employment	Try to create employment opportunities for women during the project implementation period and operation period; They can cut down trees and dig roots, clean up the site and serve as toll collectors the site during the construction period; Positions such as toll collectors and cleaning staff should be given priority to women during the operation period.	The Project Employer shall fully understand women's employment needs and wishes during the preparation stage of the Project.	Implementation and operation period of the Project	Project executive office, women's federations at all levels	Project Office and External Monitoring Agency	Provide women with 1/3 of temporary employment opportunities in the construction period and 1/3 of jobs in the operation	Twice/year

						period of the Project	
Focus on families with female householders	Care for families with female householders, preferentially consider their employment needs, and provide them with job opportunities suitable for their participation in a way to improve their living conditions.	The Project Employer shall fully understand and identify the number of families with female householders, population, economic and social conditions, etc. of the affected families during the project preparation stage	Implementation and operation period of the Project	Project executive office, women's federations at all levels	Project Office and External Monitoring Agency	All families with female householders requiring employment	Twice/year

7.3 Occupational Health and Work Safety Management Plan

7.3.1 Establish strict occupational health and work safety management system

The safety and health management organization of the enterprise is responsible for the occupational health and work safety of employees and the daily inspection of the working environment. Enterprises shall establish and improve the investigation and regulation system of potential hazards of work safety accidents, adopt technical and management measures, and timely discover and eliminate hidden dangers of accidents. The investigation and control of hidden dangers of accidents shall be truthfully recorded and notified to staff. The safety and health management organization regularly maintain, preserve and inspect safety equipment to ensure its normal operation. A record of maintenance, preservation and inspection shall be kept and signed by the relevant personnel.

Employees finding hidden dangers of accidents or other unsafe factors shall report to the on-site work safety management or the director of the organization immediately, and the person receiving the report shall deal with it timely.

The employees of the enterprise shall be entitled to know the dangerous elements that exist in the site or position of work as well as the corresponding prevention measures and emergency measures; they shall be entitled to criticize, expose or institute legal proceedings on the ground of the problems that exist in the work safety of the enterprise concerned and have the right to refuse to follow directions contrary to rules and regulations or conduct work at risk. Enterprises shall not lower wages, welfare and other welfares or invalidate labor contracts with the employees because they criticize, report, accuse work safety of the entity or refuse to command against regulations or in a way that forces them to take risks.

7.3.2 Cooperate with the Government Management System to do a good job of Enterprise Safety Inspection

In order to ensure the safety of enterprises and employees' lives, governments at all levels have established a sound management and inspection system in a way that rectifies the hidden dangers of work safety at any time. The government's work safety supervision and management department and other departments responsible for the supervision and management of work safety shall carry out administrative enforcement of work safety for enterprises in accordance with the law, supervise and inspect the implementation of laws, regulations and national or industry standards related to work safety by production and business units, and exercise the following functions and powers: (1) make inspections at the production and business operation entities, gather relevant materials, and inquire relevant entities and persons; (2) correct the acts violating the statutory provisions of law related to work safety discovered during the inspection or demand for correction within a prescribed time limit; make decisions of administrative penalties according to the provisions of relevant laws to those acts that shall be subject to administrative penalties according to law; (3) order to remove the accident potentials found in the inspection; in case that safety cannot be guaranteed before the major potential hazards are removed or when the major potential hazards are being removed, evacuate the operating personnel from the dangerous areas and order to suspend the production and operation or stop using any equipment; permit the production or business operation or use only after hazards are removed, reviewed and agreed; (4) seize up or detain the facilities, equipment and apparatuses that are believed as not meeting the national or industrial standards for guaranteeing work safety; seize the workplaces where dangerous goods are illegally produced, stored, used or operated, and make decisions according to law. Enterprises shall cooperate with the work safety supervision and inspection personnel in performing their supervision and inspection duties according to law, and shall not refuse or obstruct them.

Departments with responsible for the supervision and administration of work safety shall develop a reporting system to accept reports on work safety via public reporting telephone, mails or e-mail address. People's governments at all levels and their relevant departments shall reward meritorious persons reporting hidden dangers of major accidents or activities against laws of work safety.

7.3.3 Strict security measures shall be taken during construction to ensure the safety of the staff and the community residents.

The site shall be treated with "three supplies and one leveling" during the construction preparation stage and before construction. If temporary access roads are to be built, the safety of passing vehicles and pedestrians must be ensured, and clear signs and traffic control measures must be provided. The temporary water use on the construction site should be provided with health and safety guarantee, safety education on water and electricity use shall be conducted for all the staff, and the system for special operation personnel working with certificates shall be strictly implemented.

State-stipulated safety signs, hazardous warning signs and other symbols and slogans shall be hung in construction areas to prevent the community residents from entering the scope of construction protection and dangerous areas.

During and before the subgrade construction, prepare the strict construction management plan, construction specifications, safety technology operation specifications, and determine one -site dispatching personnel, so that safety technical disclosure can be delivered to all staff. Set up safety protection facilities on the construction site, and provide safety protection articles required by staff. Subgrade construction can only be started when everything is ready. During subgrade construction, special personnel be assigned to carry out traffic management in the construction area, and unified command shall be exercised over personnel, vehicles and machinery, so as to avoid personal and mechanical accidents. During excavator construction, a certain construction site must be ensured, and personnel are not allowed to enter within the radius of gyration. Special personnel must be assigned to direct the earthmoving vehicles entering the construction site to ensure safety. Pedestrians are prohibited from passing through the construction sites. When piling up soil, necessary sidewalks must be left in the soil piling area, and soil piling against the wall should be avoided as far as possible. When soil piling is necessary, the height should not exceed 1 m, and good drainage ditches should be set up. During roller compaction, an enough safe distance shall be kept at the edge to prevent accidents. If the manual operation is combined with the mechanical operation, a certain safe distance shall be kept between people and machines.

In the construction stages of the base course and surface course, during the construction of triple combined soil of base course, fences shall be set up to prevent

environmental pollution and not affect the physical and mental health of residents in the community. No one is allowed to stand around the machine. It shall be ensured that the machinery can move forward and backward freely, and special personnel must be assigned for commanding at site to prevent personal casualty accidents. During paving construction, construction personnel shall pay attention to avoiding construction machinery in time and obey the on-site command. At the end of the construction, the site must be cleaned in time, and the remaining materials shall not be dumped on the side of the road, affecting the safety of pedestrians. Before surface course construction, traffic in the construction area must be closed with “wooden horses”, barrier ropes, etc., clear red flags or red lights and other warning signs must be set on barrier railings, and special personnel shall be assigned to manage the traffic. Before construction, the integrity of machines, tools and equipment shall be carefully checked and warranty work shall be done. In the construction of asphalt concrete pavement, attention shall be paid to check the safety of transportation vehicles and electricity utilization at any time. When passing vehicles roll over the road surface, traffic management must be carried out and attention must be paid to avoiding passing vehicles at any time.

7.3.4 Strict Prevention and Control of Epidemics Such as COVID-19

The Employer shall timely and accurately grasp the staff situation, especially the flow of personnel from high and medium-risk areas with epidemics such as COVID-19 and from overseas, establish and improve the staff health archives, and strengthen the staff health management. Carry out regular body temperature testing for staff, and supervise and urge the implementation of personal protection requirements and the reduction of personnel gathering and collective activities; further improve the sanitary conditions in the workplaces and living places, especially the cleaning and disinfection of workplaces, staff canteens and tableware.

Contractors working in the project area shall cooperate with their communities to prevent and control the epidemic; properly carry out staff health education, environmental hygiene control around the residence, and management of staff renting local houses to prevent possible epidemics among staff from being introduced into the community. At the same time, staff renting local houses shall observe various management regulations of tenants and floating population in their communities and villages, and cooperate with epidemic detection and prevention measures in their communities and villages to protect the health of the people in their communities.

7.3.5 Establish an employee appeal mechanism to protect their legitimate rights and interests

A corresponding employee appeal mechanism has been established for the Project in order to ensure that employees' concerns and problems can be known and solved in a way that protects their legitimate rights and interests. When recruiting employees, the appeal mechanism shall be clearly informed.

The main process of the appeal mechanism is:

Stage 1: When the legitimate rights and interests of employees of the enterprise are infringed upon, they shall first appeal to the labor union of the enterprise. Employees can report to the labor union on the violation of the collective contract, improper handling by the enterprise, deduction of wages, failure to provide labor safety and health conditions, illegal command by the enterprise, forcing workers to work at risk, arbitrary extension of working hours, infringing of the special rights and interests of female workers and underage workers, and other matters that seriously infringe upon the labor rights and interests of employees. After receiving the report, the labor union shall organize personnel to conduct an investigation. If the situation is true, the labor union shall negotiate with the enterprise on behalf of the employees and require the enterprise to take measures to correct them. The enterprise shall study and deal with these issues and give a reply to the labor union.

Stage 2: If the enterprise refuses to correct or the employees are not satisfied with the results of the enterprise's handling, the employees may request the human resources and social security authorities of the local people's government to make the handling decisions according to law.

Stage 3: Employees who are not satisfied with the government's handling results may bring a lawsuit to the people's court. If an employee brings a lawsuit to the court, the labor union shall provide support and assistance.

Contract workers employed by the Contractor can use this appeal mechanism.

8 Monitoring and Evaluation of Resettlement Action Plan

In order to ensure the successful implementation of the Resettlement Action Plan, the Project will monitor the whole process of compensation and resettlement. Monitoring is divided into internal and external monitoring.

8.1 Internal Monitoring

The purpose of internal monitoring is to ensure that the resettlement institutions at all levels can maintain good functions during the implementation of the Resettlement Action Plan project, and ensure that the legitimate interests of the personnel affected by the project are not infringed and the project construction proceeds smoothly.

The internal monitoring is hosted by Guangxi Chongzuo City Construction Investment Development Group Co., Ltd. In order to effectively exercise the internal monitoring function, the staff of the Executive Office of Guangxi Chongzuo Border Connectivity Improvement Project of Chongzuo City Construction Investment Development Group Co., Ltd participated in the preparation of the Resettlement Action Plan, and will carry out internal monitoring along with the implementation of the Resettlement Action Plan.

Internal monitoring covers the following:

(1) Implementation of the policies specified in the Resettlement Action Plan;

(2) Grievances and appeals of the APs;

(3) Participation and consultation of the APs during Resettlement Action Plan implementation;

(4) Support for vulnerable groups;

(5) Operation of resettlement agencies.

During implementation, all resettlement agencies will establish a resettlement database, update it dynamically, and report resettlement activities and progress to higher agencies level by level timely to maintain continuous monitoring.

In the above mechanism, the information forms with specified formats will be developed to realize the continuous information flow from a village level to Guangxi Chongzuo City Construction Investment Development Group Co., Ltd., with regular inspection and verification of the Project Executive Office.

8.2 External Monitoring

The project implementing agency will hire an external agency to conduct impact assessment on the implementation of the resettlement action plan.

External monitoring and evaluation are mainly for regular monitoring and evaluation of

the compensation for land acquisition and resettlement activities outside the resettlement organizations, so as to evaluate whether the resettlement objectives are realized. Propose evaluation opinions and suggestions on the whole process of resettlement and the recovery of production and living standards of the resettled people, and provide an early warning system for engineering management departments to provide channels for the resettled people and stakeholder groups to reflect their insights through the external monitoring and evaluation.

8.2.1 Main M&E Indicators

(1) Progress: LA compensation preparation and implementation, resettlement, livelihood restoration, etc.;

(2) Quality: satisfaction of the APs during compensation, etc.;

(3) Funds: disbursement and use of compensation, etc.;

(4) Resettlement: financial status and production of AHs before and after LA.

The physical and financial indicative monitoring indicators will be re-examined before updating the resettlement action plan, and revised according to the finally approved resettlement action plan framework. In addition, it will also follow up the protection of women's rights and interests and benefits obtained by women.

8.2.2 M&E Methods

Monitoring and evaluation activities are based on the base line survey data completed by the external M&E agency. Based on overall investigation and understanding, the evaluation work is a method combining sampling investigation with rapid evaluation.

(1) Baseline survey

The overall base line survey was conducted for the resettled people to collect data of the basic production and living standard of selected samples (selected by the random sampling method). It is required to survey the production and living standards once or twice a year to survey the changes of production and living standards of the samples. The methods of regular survey, random interview and on-site observation are applied to get relevant necessary information. Make statistical analysis and evaluation based on the above conditions.

The questionnaire will cover indicators measuring production level and living standard. These indicators will be compared to reflect changes in production level and living standard truthfully. Whether the design of indicators truly reflects the changes in the production level and living standard of resettled people will be tested by comparing with the data obtained from the baseline survey, and improvement will be made according to the actual situation to ensure that the obtained information can truly reflect the quantity and quality of the production level

and living standard of resettled people.

(2) Public consultation

The external M&E agency will attend township and village public consultation meetings to evaluate the effectiveness of public participation. These activities will continue during and after the implementation of the Resettlement Action Plan.

(3) Listen to and reflect the opinions of the resettled people

The external M&E agency will visit township and village resettlement agencies regularly to collect comments, and give suggestions on improvement to make the resettlement process more effective.

(4) Other duties

The independent M&E agency will also monitor the following activities:

① Resettlement organization network setup;

② Payment and amount of compensation for affected land and houses;

③ Support for vulnerable groups;

④ Production resettlement and livelihood restoration.

8.2.3 Implementation Procedure

(1) Preparing the M&E work outline;

(2) Preparing a survey outline, survey form and record cards of relevant villages and typical households;

(3) Design of sampling survey scheme;

(4) Establishing an M&E information system;

(5) Baseline survey and monitoring assessment survey, including

—Regional socioeconomic survey;

—Survey of related villages;

—Survey of typical households;

—Monitoring by the resettlement implementing agency.

(6) Compiling monitoring data and establishing a database;

(7) Comparative analysis;

(8) Preparing M&E reports.

9 Public Participation and Information Disclosure

9.1 Purposes of Public Participation

Public participation and information disclosure achieve two-way communication between the Project party and the public via environmental assessment and social evaluation. As an important part of environmental and social impact assessment of construction works, it plays a significant role to enhance project decision-making. It aims at distributing the information related to the Project to the project site and the public concerning the construction of the Project, enabling the public to understand the major situations of the Project, the construction and operation characteristics and major environmental and social issues concerning the Project, and helping the appraisers find problems. It can verify that all major environmental problems caused by the Project have been analyzed and evaluated in the environmental and social impact report, and confirm the feasibility of environmental protection measures and implementation of optimizing schemes. Public participation stresses the significance of contact and communication among all parties of the Project and the public, directly reflecting public insights. It enables decision-making departments to discover potential problems in time, and improves design schemes in time in a way that fundamentally solve the problems reflected by the public. Thus, planning, design, environmental monitoring and management of the Project will be more perfect and reasonable, striving for the optimization and unification of environmental benefits, social benefits and economic benefits of the Project construction.

9.2 Identification of Stakeholders

Interested parties of the project can be roughly divided into five groups: governments at all levels and relevant agencies in the project area, project implementing agencies and contractors, various groups served by the project, households affected by land acquisition and demolition, and groups affected by construction. See Table 9.2-1 for details.

Table 9.2-1 Project Stakeholders

Category	Stakeholders
Governments at all levels and relevant agencies in the project area	The project leading team, Chongzuo Municipal Government, governments of Daxin County and Tiandeng County, county natural resources bureau and county housing and urban-rural development bureau, labor and social security bureau at the county level, and governments of Shuolong Town and Fuxin Town
Project implementing agency and	Guangxi Chongzuo City Construction Investment

contractor	Development Group Co., Ltd., contractor
Project service groups	Residents in the project area, various enterprises and institutions closely related to the development of transportation, road users, pedestrians, etc.
Groups affected by land acquisition and demolition and relocation of ancillary facilities	Families affected by permanent land requisition, families affected by house demolition, families affected by temporary land occupation, areas participating in gravel supply, units affected by migration of professional facilities, and areas receiving and resettling people affected by the project
Groups affected by construction	Residents, farmers, shops, institutions, pedestrians and vehicles along the road

9.3 Information Disclosure and Public Participation

The project Employer has organized five large public consultations and information disclosure in the Project preparation according to the Environmental Impact Assessment Law of the People's Republic of China, Notice of the General Office of the National Development and Reform Commission on Printing and Distributing the Interim Measures for Risk Assessment of Social Stability of Major Fixed Assets Investment Projects of the National Development and Reform Commission and the Environmental and Social Framework of the Asian Infrastructure Investment Bank: two rounds of public consultations and information disclosure were in the process of environmental and social impact assessment, in which the first round was after screening environmental issues and before finalizing the EIA work outline, and the second round was when the first draft of environmental and social impact assessment was completed. Consultation on information disclosure and public participation was held once during the assessment of social stability risk, and public participation and consultation were conducted five times during resettlement planning (including the public participation and consultation in the field identification of the Project by AIIB in August and October 2020).

During project implementation, the implementing agency will further conduct public consultation and information disclosure.

Specific methods for public participation and information disclosure are as follows:

(1) Disclose the project-construction-related info on websites and newspapers to solicit insights of stakeholders;

(2) Convene a forum participated by related government functional departments, affected village officials and representatives of the public;

(3) Put up declarations at bulletin boards of the township governments and village committees,

(4) Visit the affected villages and families;

(5) Conduct sampling questionnaire survey among affected families;

(6) Interview stakeholder groups by phone, etc.

9.4 Information Disclosure and Public Participation Completed in Preparation Stage

9.4.1 First Round of Information Disclosure in the EIA

According to the requirements of Measures for Public Participation in Environmental Impact Assessment and Technical General Guidelines for Environmental Impact Assessment (HJ2.1-2016), Component A requires public participation in environmental assessment. In Component A, online publicity, notices posting on the construction site, newspaper publicity and other means were applied to publicize project environmental information and conduct public participation survey. Component A had its first publicity on the website of the Department of Transport of Guangxi Zhuang Autonomous Region in September 2019 to publicize the following information and collect public opinions:

(I) The name of the construction project, site and route selection, construction content and other basic information, as well as the existing project and its environmental protection for renovation, expansion and relocation projects;

(II) The name and contact information of the Employer;

(III) Name of preparation organization of environmental impact statement;

(IV) Internet links to public opinion forms;

(V) Submit public opinions

During the first disclosure period, one feedback was received from the villagers of Xuanjie Village, who believed that the construction of the project occupied land resources, the noise of road operation affected the lives of local residents and the drinking water sources of residents. After verification of the Plan for Designation of Legislation of Drinking Water Conservation in Tiandeng County, Plan for Delineation of Centralized Legislation of Drinking Water Protection in Villages and Towns in Tiandeng County and Plan for Delineation of Centralized Legislation of Drinking Water Protection in Villages in Tiandeng County, there is no approved legislation of drinking water conservation in Xuanjie Village, and the village is in a decentralized drinking water source area. This evaluation suggests that if there is occupation or influence during construction, the Employer will be responsible for

the migration of drinking water sources to ensure the safety of domestic water for the surrounding residents. In this project, two tunnels (Nongwan Tunnel and Buli Tunnel) are designed in the northeast of Xuanjie Village, crossing the mountain 580m in total and covering an area of only 0.0154 hm^2. Small quantities of construction have limited influence on the flow direction and flow rate of groundwater in the region. In view of the complex underground rivers in the project area, it is suggested in this Assessment that further hydrogeological investigation shall be carried out before construction to find out the distribution, type, water content, recharge mode and runoff direction of groundwater in the tunnel area, analyze and demonstrate the possible location and degree of groundwater gushing due to tunnel excavation, and select eco-friendly water plugging materials after formulating the thorough water leakage and gushing prevention and control scheme; according to the noise prediction, the maximum increase of noise level at sensitive points within the assessment scope before and after the project construction reaches 21.5dB (A). By the middle stage of the project operation, a total of 9 sensitive points among the 12 sensitive points can reach the standard at daytime and night, and the remaining 3 sensitive points (Bangtun, Sanjiatun and Rentun) have night noise prediction exceeding the standard at different degrees, and the exceeding range is 1.0 ~ 7.9dB (A). After taking measures such as installing the ventilated soundproof window for the noise sensitive points, the noise during the operation stage of the project will have little impact on the residents along the line; the project construction occupies a certain local land resources. In the design of the project route alignment, the requirements of topography and landform shall be met as much as possible, high filling and deep excavation shall be reduced, land shall be saved, and large demolition shall be avoided as much as possible. Wasteland and inferior land shall be fully utilized to occupy less cultivated land, especially the land in the basic farmland protection area. In addition, the Employer shall assist the local government to strengthen communication with the people in Xuanjie Village in Tiandeng County, do well in the ideological work of the people, and carry out land acquisition and demolition after obtaining the consent of the people.

9.4.2 Second Round of Information Disclosure in the EIA

The second disclosure of Component A was conducted on February 26, 2020 after the draft for comments was completed, including on-line disclosure, bulletins on the construction site and disclosure through the local mainstream medium, Guangxi Daily. The information was published twice through the newspaper within 10 working days. No public

feedback was received during the two public announcements.

1. Online Announcement

The second round of disclosure was conducted for Component A on the official website of Chongzuo Municipal People's Government on February 26, 2020 and ended on March 10, 2020. No feedback was received from the public during the disclosure period.

2. Disclosure in Local Mainstream Media

Component A was disclosed in a local mainstream media, Guangxi Daily on February 28, 2020 and March 5, 2020 from February 28, 2020 to March 12. 2020. No public feedback was received during the disclosure period.

3. Post publicity on the Site

Component A was publicized by posting announcements on bulletin boards of sensitive target villages along the Project from February 26, 2020 to March 10, 2020, including Xuanjie Village, Yixian Village and Rentun in Shuolong Community. No public feedback was received during the disclosure period.

9.4.3 Information Disclosure and Public Consultation during Risk Assessment of Social Stability of the Project

In October and November 2019, the Social Stability Risk Assessment Working Group went to Daxin County and Tiandeng County to hold symposiums attended by personnel from government departments concerned such as governments of Fuxin Town and Shuolong Town and representatives of some affected villages to listen to the opinions and suggestions of the participants on the Project. They went to villages greatly affected by the Project to collect relevant documents and materials, understand the opinions and demands of villagers and interested parties, and launch extensive public participation.

The Task Force held a forum in Daxin County Municipal People's Government on the morning of October 17, 2019, inviting representatives of relevant departments of Daxin County Municipal People's Government and Shuolong Town People's Government. A forum was held in Shuolong Town People's Government on the afternoon of October 17, inviting representatives from relevant departments of Shuolong Town People's Government, Shuolong Community, Yixian Village, Xiangkou Village and Yining Village.

The Task Force held a forum in Tiandeng County Municipal People's Government on the morning of November 7, 2019, inviting representatives of relevant departments of Tiandeng County Municipal People's Government and Fuxin Town People's Government. A forum was held in the village committee of Xuanjie Village, Fuxin Town on the afternoon

of November 7, inviting representatives of relevant departments of Fuxin Town Municipal People's Government and Xuanjie Village People's Government.

At the forum, the leader of the task force gave a detailed introduction to the background and basic construction of the proposed project, and the participants expressed their opinions and opinions on the project from different point of view. There are mainly the following points from opinions, suggestions and demands of the participants:

(I) Route design

1. The drainage ditches shall be reasonably designed to prevent the cultivated land from being flooded during rainy seasons.

2. Pay attention to road noise during design.

3. Toll stations are suggested to be located between K4 and K5 to avoid occupying basic farmland;

(II) Compensation for land acquisition

1. Publicity and interpretation of compensation and resettlement policies for land expropriation and demolition shall be ensured in the project area.

2. Land acquisition and relocation shall be carried out in accordance with the laws and regulations, and compensation shall be timely in place in full amount according to the government standards.

3. Since 606 mu of agricultural land has been requisitioned for the rural scenery tourism project in Xuanjie Village, Fuxin Town, the agricultural land of Xuanjie Village shall be requisitioned at the minimum for the Project, with proper resettlement of the public of land acquisition.

(III) Precautions in construction

1. The Contractor shall recruit employees in accordance with laws and regulations.

2. The project management department shall be well managed during the construction period to grantee safe and civilized construction.

3. During the construction, the local ethnic customs shall be respected, the relations with the local people shall be improved, and the reasonable demands of the masses shall be satisfied as far as possible during the construction.

4. During construction, the water conservancy infrastructure shall not be affected or less affected as far as possible. Damage to the original drainage ditch should be avoided as far as possible, and if damaged, the drainage ditch shall be restored in time.

5. Pay attention to pollution problems like noise and sewage during construction to avoid polluting water source protection areas.

6. After the construction, the temporary land occupation shall be reclaimed and the solid wastes shall be cleared.

(IV) Relocation of discipline facilities

1. If the relocation of telecommunication facilities is involved, communication should be made with the telecommunication department in advance.

2. The route plan should be provided to the China Southern Power Grid in time to facilitate its preparation of relocation plan.

3. During the construction, consideration should be given to the relocation of related hydropower across the highway.

Investigators Hold a Forum in Daxin County Government

Investigators Hold a Forum in Shuolong Township Government of Daxin County

Investigators Hold a Forum in Tiandeng Government

Investigators Hold a Forum in Village Committee of Xuanjie Village in Fuxin Town of Fuxin Township

Figure 9.4-1 Site Map of Forum during Risk Assessment of Social Stability

9.4.4 Information Disclosure and Public Participation during Social Evaluation and Resettlement Planning

From March 18 to April 3, 2020, the task force on social assessment and resettlement action plan, together with the staff of the leading team for resettlement of Guangxi Chongzuo Border Connectivity Improvement Project, went to Daxin County and Tiandeng County,

visited the planning and natural resources department, human resources and social security department, housing and construction department and other relevant government functional departments, and held forums with the leaders and relevant staff in charge of land acquisition compensation and resettlement of landless peasants; went to Liliang Village and Xuanjie Village in Fuxin Town, Detian Village, Aijiang Village, Shuolong Community, Yining Village and Yixian Village in Shuolong Town, as well as Aijiang Forest Farm in Daxin County affected by land acquisition and demolition of the Project, and held extensive investigation and negotiation on the understanding of the villagers and forest farm workers about the project, their attitudes, compensation wishes and opinions and suggestions.

Feedback from survey on public participation is as follows:

(1) The local government and relevant competent authority of industries of the local development and reforming authority, construction, land, planning, transportation, tourism, water conservancy, environmental protection, and forestry all agreed with the construction of the project, expressed the desire to start construction as soon as possible, and strongly supported the implementation of the project.

(2) Most of the surveyed public thought that the route of the project was basically reasonable. The construction of the project would be conducive to improving the local traffic conditions and most of the surveyed public desire that the construction of the project could promote the local economic development.

(3) They believed that the local environmental adverse effects of noise, tail gas and dust generated in the construction of the project were temporary and acceptable, but meanwhile they hoped that the construction party of the project would take corresponding measures to reduce the impact to a minimum, especially dust and noise control measures.

(4) Most of the public held that they would agree to land acquisition/relocation if the project was required. A small number of the public held indifferent attitudes because of the little possibility of land acquisition/relocation. Some of the public did not agree to land requisition/relocation for fear of losing their main source of livelihood after the land was requisitioned, and they also expressed their willingness to land acquisition/relocation if the compensation problem could be properly solved.

(5) There were still some of the public who had a smattering knowledge of the policy of land acquisition/relocation. They only knew that the state has formulated relevant policies, but they did not know the specific contents of the policies. For the compensation requirements for land acquisition/relocation, most of the public hoped to get economic compensation. Villagers along the proposed highway, especially those who may be subject

to land acquisition or relocation, held that the general requirement of compensation was to meet the needs of future life and ensure long-term life.

According to the questionnaire survey, more than 60% of the villagers knew about the project one month ago, 84.6% of the villagers supported the construction of the project, 1.9% of the villagers did not support the construction of the project because they did not know about the project, and 98.1% of the villagers agreed to occupy part of their land under the condition that the compensation standard was legal and the compensation fee could be paid in time. Nearly 70% of the villagers knew more about the local policies and standards for compensation for permanent and temporary land expropriation, and 57.7% of the villagers knew the complaint ways and means. The working group explained the construction scope and impacts of the Project, compensation rates for land acquisition and land occupation, construction method and schedule, and appeal mechanism, etc. to the villagers who attended the forum and accepted the questionnaire survey. By the end of the investigation, all villagers were fully aware of the Project and fully supported the Project. They said that as long as they could receive compensation in full and on time after their land was acquired or occupied, they would agree to the occupation of their land for the Project.

Figure 9.4-4 Forums between the Social Assessment and Resettlement Planning Team and Relevant Departments and Village Committees

9.4.5 Public Participation during the Field Identification of the Project by AIIB

In order to cooperate with the AIIB for successful identification of the Project, the Implementing Agency organized a forum in the Shuolong Town People's Government, Daxin County on August 11, 2020, aiming at the problems requiring further understanding in AIIB experts' opinions during the review of the Resettlement Action Plan. The participants included Chongzuo Transportation Bureau and representatives of government agencies such as Shuolong Town, Daxin County and Fuxin Town, Tiandeng County, as well as mass representations from Yixian Village, Yining Village, Xiangkou Village, Shuolong Community, Detian Village and Aijiang Village in Shuolong Town, Daxin County.

Feedback from the public is as follows:

The attendee representatives all expressed their support for the construction of the Project, and proposed the following insights and suggestions on compensation for land acquisition and demolition, resettlement and mitigation of construction impact.

(I) Compensation for land acquisition and demolition

1. Recognition of the compensation standard items of the irrigated land and the non-irrigated land determined in the Resettlement Action Plan: The masses reflected that the benefits of the irrigated land and the non-irrigated land were similar, so they understand the same compensation price of them.

2. Recognition of the Resettlement Action Plan: The masses would agree with the resettlement action plan in case of resettlement near the site; In case of resettlement at other places, most persons said that it had little impact on their livelihood, but a few of them felt that it was inconvenient for their children to go to school, and they were a little reluctant to leave their neighborhood.

3. Insights on the compensation rate for land acquisition: Certain representatives of the affected group thought that the compensation for land acquisition was slightly lower than

the resettlement cost, and they hoped to improve the compensation standard if possible.

(II) Alleviate the impact of construction

1. It is expected that more viaducts will be built on the cultivated land sections, so that less cultivated land will be occupied and convenient conditions will be created for farming on both sides of the route.

2. It is expected that attention will be paid to drainage design in depressions prone to waterlogging and flood discharge channels.

3. The fields, roads, canals and irrigation facilities damaged during construction should be repaired in time.

4. In the farming season, temporary measures should be taken to ensure the smooth traffic of tractor roads.

(III) Employment and income opportunities during Project implementation

1. It is expected the construction team could employ as many local workers as possible.

2. It is expected that the construction team would purchase living supplies locally as much as possible, especially agricultural products such as grain and vegetables, and they are willing to provide catering services.

3. It is expected that the construction contractor would rent local vacant houses as much as possible as production and living places.

4. According to the feedback from the masses, not much land would be left after land acquisition. They need to make a living and take care of children and the elderly at home, so they expected to find a suitable job locally.

Figure 9.4-5 Forum on Issues Related to Resettlement Planning Held by Project

Implementing Agency

On March 30, 2021, the project implementation unit held a symposium in the conference room on the fourth floor of the government of Shuolong Town, Daxin County to collect stakeholders' opinions/observations on ESIA, ESMP and RAP. The stakeholders' representatives at the meeting listened to the project implementation unit's explanations on the project impact scope, recent progress, the purpose of the meeting, etc. The representatives of the people's governments of Shuolong Town and Fuxin Town and the villagers' representatives of various villages/communities verbally expressed their support for the project construction and put forward some comments and suggestions:

I. The villagers' representatives of Xuanjie Village hope that the project design will be optimized as much as possible during the implementation of the Project to avoid unnecessary land occupation.

II. Some villagers of villages in Shuolong Town hope to further understand more detailed information about the Project; those involved in house demolition hope to be resettled on the roadside; construction personnel shall be trained in advance to respect local customs and habits before entering; the owner of the house shall coordinate with the surrounding neighbors, respect and understand each other.

III. Fuxin Town Government hopes that the design institute will go deep into villages as much as possible, communicate with local people, and especially consult the people on the direction of waterways and tractor roads. Emphasize the importance of hygiene of temporary construction camps and rented houses, do not litter, and maintain rural environmental hygiene. Relevant authorities shall deploy the villagers to resume the cultivation and production in advance, and the construction can be carried out only after the compensation is in place.

IV. Shuolong Community hopes that this Project can do a good job of material handover, and transfer funds to the account within one week after signing the agreement. For relocation and resettlement in other places, more ideological work needs to be done for the elderly.

Figure 10.4-4 Stakeholder Symposium Held by Project Implementing Unit

9.5 Schedule of Information Disclosure and Public Participation in Resettlement Action Plan during Project Implementation

The Social Environmental Impact Assessment Report, Environmental and Social Management Plan and Resettlement Action Plan of this Project will be publicly released on the website of AIIB after being approved by AIIB. The text will also be published in the website of the project owner (http://www.czcjjt.com.cn/c600.html). The Project Owner will also compile the resettlement information book in Chinese and distribute it to the village committees of all affected villages/communities, and the book will be kept by special personnel. All affected people can borrow it at any time to fully understand their rights and interests.

Public participation will be encouraged during the whole process of RAP preparation:

Public participation during the DMS: Each AH will sign to confirm LA and occupation impacts, and compensation amount, and each village will disclose all compensation and resettlement matters for public supervision.

Public participation in land compensation management, distribution and use: village committees and villagers' groups must distribute and use the land compensation jointly owned by the collective with the approval of the village congress and under the supervision of villager representatives or villagers.

Public participation in project construction: Public participation will be encouraged during construction to ensure that the affected people benefit from the Project, and local building materials and laborers will be used with priority under equal conditions.

See table 9.5-1 for details of information disclosure and public participation plan of

Resettlement Action Plan of the Project.

9.6 Plan of Stakeholders during Project Implementation

Stakeholders of this Project include governments at all levels and relevant institutions in the project area, project implementation institutions and construction units, various groups served by the project, households affected by land acquisition and demolition, and construction-affected groups. The Plan of Stakeholders during the project construction period is as follows:

(1) Public complaints during the construction period: the Construction Contractor, Executive Office and Ecological Environment Bureau of the proposed project should pay attention to the project progress in time and understand the inconvenience caused by project construction to the surrounding people. The construction contractor shall publish the name, contact information and other information of the person in charge of environmental protection, so as to facilitate public supervision and complaints. The Executive Office shall set up a special organization to receive complaints from the public, assign a special person to be responsible for it, and publish the contact number of the responsible person, so as to timely know the comments of the public. For the people who complain through telephone consultation or door-to-door, a "People's Opinion Book" shall be set up, and their names, contact information and the impact of project implementation shall be recorded in the Opinion Book in time, so as to understand the voices of the public, put them on record and report them in time. It is required to reply to the questions raised by the public within three working days. According to the difficulty of handling, the solution shall be put forward and implemented within 10-15 working days, and the final result of the implementation process and coordinated solution shall be added to the "Book of Acceptance of Comments of the Public". If the complainant is still dissatisfied with the handling opinions of the Executive Office or the Ecological Environment Bureau, after receiving the handling opinions, the complainant may bring a lawsuit to the local people's court in accordance with the "Civil Procedure Law of the People's Republic of China", and the court shall hear and decide.

(2) Supervision during the operation period: the public can directly raise any problems to the Executive Office or the Ecological Environment Bureau (the environmental complaint telephone number is 12369), and the Executive Office or the Environmental Protection Bureau will record, study and discuss the complaint, reply within 3 working days, and propose solutions and implement them within 10-15 working days according to the handling

difficulty. If the complainant is still dissatisfied with the handling opinions of the Executive Office or the Ecological Environment Bureau, after receiving the handling opinions, the complainant may bring a lawsuit to the local people's court in accordance with the "Civil Procedure Law of the People's Republic of China", and the court shall hear and decide.

The above appeal channels will be informed to the public through meetings or other means, so that the public can fully understand that they have the right to appeal. At the same time, media tools will be used to strengthen publicity and reporting, and agencies accepting complaints will not charge any fees, and expenses incurred due to complaints will be paid by the Executive Office in contingency.

Table 9.5-1 Information Disclosure, Public Participation and Consultation Plan during the Implementation of Resettlement Action Plan

	Purpose	Method	Time	Agency	Participant	Theme
1	Announce the draft Resettlement Action Plan and distribute the manual of resettlement information	Official website, village bulletin board, Village Committee Office	April 2021	Project Executive Office, town government and Village Committee	Affected villagers	Announce the draft Resettlement Action Plan and distribute the manual of resettlement information
2	Publish the draft resettlement action plan	AIIB website	April 2021	AIIB	Affected villagers	Publish the draft Resettlement Action Plan on the AIIB website
3	Measure and update the resettlement action plan in detail	Field investigation and consultation	October-December 2021	Project Executive Office, Land Acquisition and Demolition Sub-headquarters, Township Government and Village Committee	Affected villagers	1) Carry out detailed measurement 2) Detailed investigation of land, houses, young crops and ground attachments of affected villagers 3) Prepare compensation agreement
4	Publish the updated resettlement action plan and information manual	Official website, village bulletin board, Village Committee Office	December 2021	Project Executive Office, Land Acquisition and Demolition Sub-headquarters, Township Government and Village Committee	Affected villagers	Formally publish the Resettlement Action Plan and information manual
5	Publish the updated resettlement action plan	AIIB website	December 2021	AIIB	Affected villagers	Publish the updated Resettlement Action Plan on the AIIB website
6	Notice of land acquisition	Village announcement and village meeting	October 2021	Land Acquisition and Demolition Sub-headquarters, Township Government and Affected villages	Affected villagers	Announce the land acquisition area, compensation rates, resettlement channels, etc.
7	Publish the compensation and resettlement scheme for land acquisition	Village bulletin board and village meeting	December 2021	Land Acquisition and Demolition Sub-headquarters, Township Government and Affected villages	Affected villagers	Compensation amount and payment method
8	Determine the revenue	Affected villagers'	Before	Project Executive	Affected	Discuss the management,

	Purpose	Method	Time	Agency	Participant	Theme
	recovery plan and implement it	meeting	implementation	Office, sub-headquarters, Township Government and Affected villages	villagers	distribution and use of land compensation fees
9	Participation in project construction	Affected villagers' meeting	October 2021 to October 2024	Project Executive Office, Land Acquisition and Demolition Sub-headquarters and Township Government	Affected villagers	Give priority to the use of local building materials, living materials and laborers,
10	Monitoring	Forum, field visit, site inspection	October 2021 to December 2024	Project Executive Office, Land Acquisition and Demolition Sub-headquarters, Township Government and Affected Villages	Affected people	1) Resettlement progress and impact 2) Payment of compensation 3) Information disclosure 4) Recovery of production and life

10 Establishment and Management of Appeal Mechanism

As required by AIIB's Environmental and Social Framework, an appropriate appeal mechanism shall be established in accordance with the ESP and ESS to understand and help the concerns, complaints and dissatisfaction raised by the affected groups in the compensation for land acquisition and resettlement of the Project, the safety of life and property related to construction, and the prevention and control of environmental pollution, and ensure that relevant interest groups (subject to negative impacts) can protect their rights and interests through this appeal mechanism.

The leading team for Resettlement of Guangxi Chongzuo Border Connectivity Improvement Project shall establish an appeal team to receive and respond to the concerns, complaints and appeals raised by stakeholders.

10.1 Scope of Appeals

The scope of appeals includes, but is not limited to, the following:

(1) Issues related to LA compensation and resettlement, including the measurement of affected land and houses, calculation of compensation fees, payment of compensation fees, and resettlement for production and living of resettled people, etc.;

(2) Issues related to the safety of people's lives and property related to construction, including any personal injury caused by inadequate construction protection; Property losses of related people or entities caused by construction activities, including damage degree judgment, loss quantity measurement, and compensation calculation, etc.;

(3) Prevention and control of environmental pollution related to construction, including noise pollution caused by vehicle traffic, and machinery, etc.; Air pollution caused by construction activities; Water pollution caused by treatment of various wastes;

(4) Damages to cultural resources out of the project area

10.2 Appeal Modes

The channels of appeal are as follows:

(1) Letter or e-mail;

(2) Appeal by telephone. All appeals by phone shall be recorded and documented;

(3) Oral appeals: all oral appeals be recorded and documented.

The above appeal modes have been disclosed in the affected area, and mass media utilized to strengthen publicity and reportage to make the stakeholder groups full aware of their appeal right.

10.3 Appeal Channels

In order to timely and effectively solve the specific problems in the process of project construction and protect the legitimate rights and interests of immigrants and related interest groups, Guangxi Chongzuo City Construction Investment Development Group Co., Ltd. has established the public complaint channel for this Project, including Village Committee, Forest Farm Resettlement Team, Township Government, Project Land Acquisition and Demolition Sub-headquarters, County Natural Resources Bureau, Housing and Urban-Rural Construction Bureau, County Human Resources and Social Security Bureau, Ecological Environment Bureau, Complaint Handling Bureau and Project Resettlement Work Leading Group, Guangxi Guangxi Chongzuo Border Connectivity Improvement Project Executive Office, court, etc., to receive and respond to concerns, complaints and appeals raised by stakeholders. .

The general appeal procedure is as follows:

(1) Where a resettled people or other stakeholder groups are not satisfied with the compensation and resettlement scheme for land acquisition and demolition, and the safety and environmental problems caused by construction, they may file oral or written appeals to the local villagers' committee and the resettlement team of the forest farm. For an oral appeal, the villagers' committee and the resettlement team of the forest farm shall keep a written record. The villagers' Committee and the resettlement team of the forest farm shall deal with the appeals within 2 weeks.

(2) Where the resettled people or the stakeholder groups are not satisfied with the dealing results of villagers' committees or the resettlement team of the forest farm, they can file the appeal to the local town government office orally, by telephone or in writing after receiving the results. For an oral appeal or appeal by telephone, the town government office shall keep a written record. The town government office shall, within 2 weeks, obtain the original complaint records from the villagers' committee and the

forest farm resettlement team, deal with the complaints, and give a written decision to the complainants.

(3) If immigrants or related interest groups are not satisfied with the treatment results of the town government, they can submit written complaint to the corresponding project land acquisition and demolition sub-headquarters after receiving the decision. The Project Land Acquisition and Demolition Sub-headquarters should obtain the original complaint records from the town government within 2 weeks, deal with the complaint matters, and issue a written treatment decision to the complainant.

(4) If immigrants or related interest groups are not satisfied with the processing results of the project land acquisition and demolition sub-headquarters, they can submit written complaints to the local county natural resources bureau, Housing and Urban-Rural Development Bureau, Human Resources and Social Security Bureau, Ecological Environment Bureau or Complaint Handling Bureau after receiving the decision. The county Natural Resources Bureau, Housing and Urban-Rural Development Bureau, Human Resources and Social Security Bureau and Ecological Environment Bureau should retrieve the original complaint records from the Project Land Acquisition and Demolition Sub-headquarters within 2 weeks and make a decision on the complaint matters; The Complaint Handling Bureau shall reply within 1 week, or transfer it to the Natural Resources Bureau, Housing and Urban-Rural Development Bureau, Human Resources and Social Security Bureau, and Ecological Environment Bureau for specific treatment. The department receiving the written grievance shall issue a written decision to the filing person.

(5) If the resettled person or stakeholder groups are dissatisfied with the handling results of the relevant functional departments of the county government, they can bring a lawsuit to the people's court according to the Civil Procedure Law after receiving the decision.

The immigrants or related interest groups can also directly appeal to any level in the appeal channel, or directly appeal to the project resettlement work leading group or AIIB, which will be handled by the project resettlement work leading group and AIIB project team.

All oral or written appeals will be reported to AIIB in internal and external resettlement monitoring reports.

For the appeal channel and the procedure structure of the Project, see Figure 10.3-1.

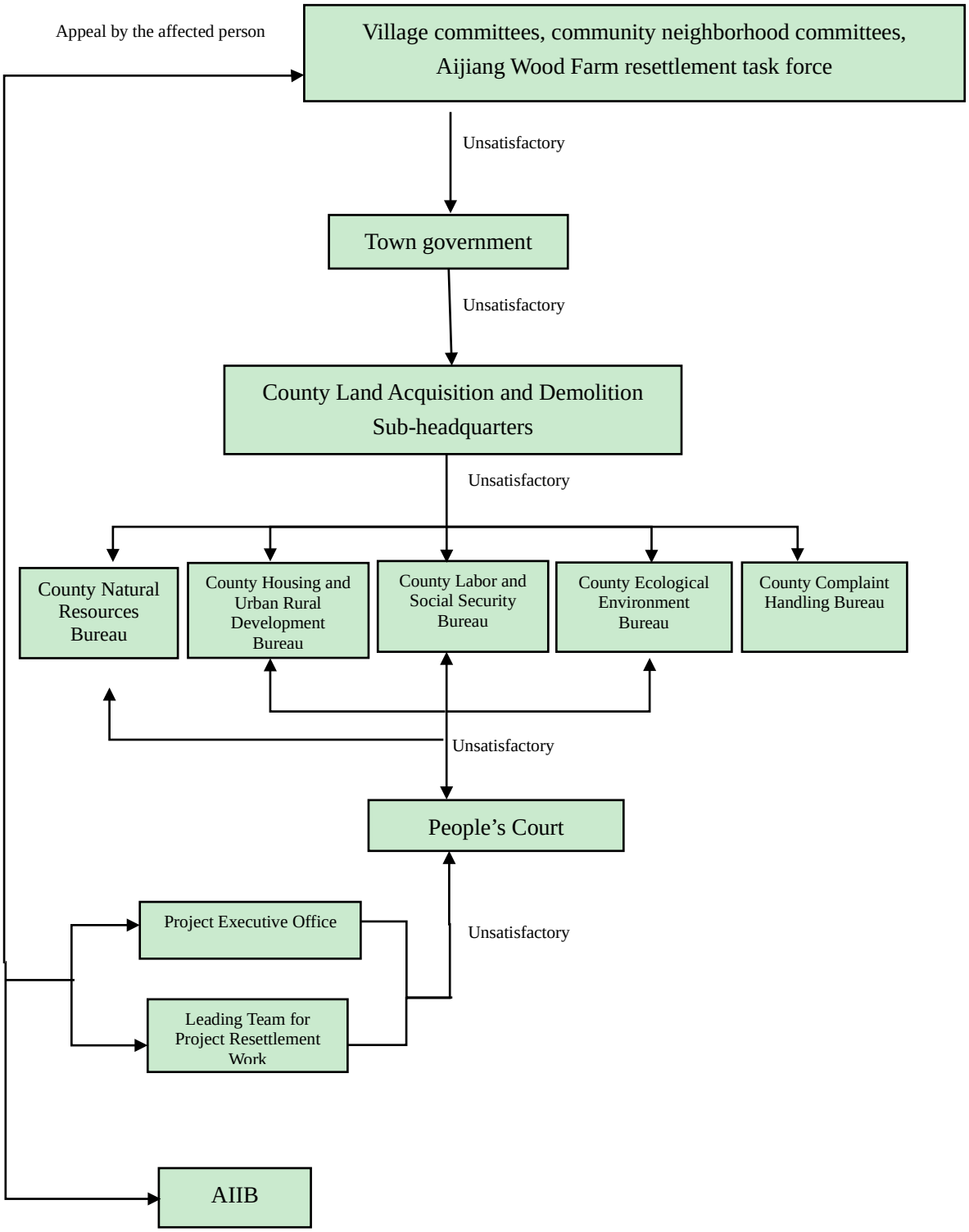

Figure 10.3-1 Appeal Channel and Procedure Structure

Organizations at all levels receiving appeals from the resettled people and stakeholder groups will assign personnel to receive and deal with complaints and appeals. For the name, office address and telephone of the director, see table 10.3-1.

Table 10.3-1 Information on Organizations and Personnel Receiving Appeals from Affected Personnel

County	Organizations and Departments	Contact Person	Address/Mail	Tel.
Tiandeng County	Village Committee of Liliang Village, Fuxin Town	Zhao Shaoqiu	/	18307808879
	Village Committee of Xuanjie Village, Fuxin Town	Lyu Yongjiang	/	13471106011
	Fuxin Town Government	Huang Hedi	tdfxxf@163.com	0771-3570023
	Tiandeng County Project Land Acquisition and Demolition Sub-headquarters	Zhao Yihan	tdxfzhb@163.com	0771-3528886
	County Natural Resources Bureau	Xu Yongliang	tdxzrzyj@163.com	0771-3521223
	County Labor and Social Security Bureau	Liang Zhicheng	tdrs112@163.com	0771-3521112
	County Ecological Environment Bureau	Nong Baoguang	hbj3527685@163.com	0771-3527685
	County Housing and Urban Rural Development Bureau	Bi Weiqi	tdjs2007@163.com	0771-3521287
	County Complaint Handling Bureau	Yang Lindao	tdxxfj@163.com	0771-3521636
Daxin County	Village Committee of Yining Village, Shuolong Town	Zhao Jiancheng	/	18275950561
	Village Committee of Yixian Village, Shuolong Town	Tang Xiuqun	/	18275952436
	Village Committee of Gangkou Village, Shuolong Town	Zhao Shimin	/	13737904084
	Shuolong Community neighborhood Committee of Shuolong Town	Liang Haiyan	/	13737905313

County	Organizations and Departments	Contact Person	Address/Mail	Tel.
	Aijiang Wood Farm resettlement task force	Bi Yuxiong	Dxajlc@163.com	0771-3773604
	Government of Shuolong Town	Huang Zhonghui	No.248 Shuolong Street, Shuolong Town/sl3773359@163.com	0771-3773236
	Daxin County Project Land Acquisition and Demolition Sub-headquarters	Huang Jianhua	No.462 Yangli Road, Taocheng Town, Daxin County /dxgs3626740@163.com	0771-3626740
	County Natural Resources	Xu Wanshu	dxgtj@126.com	0771-3622091
	County Labor and Social Security Bureau	Zhao Congping	No.192 Anping Avenue, Taocheng Town, Daxin	0771-3622147
	County Ecological Environment Bureau	Huang Haihong	No.84 Minzhu Road/dxhb12369@163.com	0771-3627599
	County Housing and Urban Rural Development Bureau	Huang Zhengfu	No.81 Minzhu Road, Taocheng Town, Daxin County	0771-3623132
	County Complaint Handling Bureau	He Yuheng	No.95 Minzhu Road, Taocheng Town, Daxin	0771-3622319
Project Executive Office		Huang Yanhui	GCCCID, No.18 Lanhuaishan Road,	0771-7837718
Leading Team for Project Resettlement Work		Tao Yanyan	Office Building of Chongzuo Transportation Bureau, Youyi	0771-7863411

11 Environment and Social Management Training

11.1 Training Purpose

The purpose of environmental and social management training mainly includes two parts:

I. In order to help immigrants create an environment of self-reliance and self-development, and try to restore or improve the living standards of immigrants in a short time, the project executing agency will cooperate with the labor and social security, finance, education, science and technology, women's federations and other departments in Tiandeng and Daxin County to organize free training on financial management knowledge, professional knowledge and skills for land-losing people caused by this Project. The provision of appropriate technical training for the workforce will be an effective action to restore and improve the income of affected people. The correct financial management concept guidance for the people receiving monetary compensation can promote the liquidity and value-added of the compensation funds in the hands of the affected people, and can help prevent the poverty caused by the careless spending of money.

II. In order to ensure the smooth and effective implementation of environmental and social management, make relevant personnel familiar with the contents and procedures of environmental and social management, improve the environmental and social management ability of environmental and social management personnel, and ensure the effective implementation of various environmental protection measures. It is the environmental and social managers and supervisors who need to improve their environmental management capabilities, and staff training is part of the technical support of the Project. In addition, the Employer and construction workers should receive training during project implementation. Prior to the commencement of works, all contractors and management organizations shall receive environmental health and safety training.

11.2 personnel arrangement and training objects

Land Acquisition and Demolition Sub-headquarters of the Autonomous Region, Chongzuo City, Tiandeng County and Daxin County shall assign special personnel, who have knowledge of environmental protection and are familiar with environmental protection laws and regulations, project environmental and social impact assessment

and environmental and social management plan reports, to be responsible for the implementation of environmental and social management plan.

During the construction preparation period, the training objects of social management are: those who lost land caused by this Project, those who received monetary compensation, and external workers. Technical training and financial management training are aimed at all affected people, especially the directly affected labor force, poor households and women, and more than 50% of women are guaranteed to participate in each training.

Training objects of environmental management during construction period are: Chongzuo Project Management Office, Land Acquisition and Demolition Sub-headquarters of Tiandeng Municipal People's Government, Land Acquisition and Demolition Sub-headquarters of Daxin County Municipal People's Government, Project Executive Office and other personnel, representatives of engineering supervision institute, environmental monitoring agency, engineering technical director of contractors and full-time management personnel, etc.

The training objects of environmental management during the operation period mainly were the operational management personnel of each Component.

11.3 Training content

The social management training in the construction preparation period includes three parts:

I. Technical skills training for land-losing people. Technical training will be carried out according to the adjustment of economic structure, the change of labor market and the requirements of employers in each county, adhering to the principle of practicality and effectiveness. Such trainings cover:

(1) Training on community public welfare posts such as community security, sanitation, public environment greening, public facility maintenance and parking lot management;

(2) Horticultural techniques, women's sewing and knitting, beauty salons and nail art skills training;

(3) Training on maintenance skills of motorcycles, automobiles and electrical appliances;

(4) Training on management of automobile beauty and cleaning equipment;

(5) Training on catering and hotel service, domestic service and cleaning skills;

(6) Product promotion, registration and operation of small businesses.

(II) Training on financial management capacity for all affected people. Such trainings cover:

(1) Common knowledge of law and rights protection.

(2) Basic knowledge of investment and financial management

(3) The guidance of wealth management concept;

(4) Examples of successful financial management schemes.

(III) Social integration training for external workers. Such trainings cover:

(1) Explain local customs and habits, especially the taboos of Zhuang nationality, so as to integrate into local social life as soon as possible;

(2) National defense safety education in border areas;

(3) Civilized construction education. The temporary land and houses shall be kept clean, the environment shall be protected, and construction waste and domestic waste shall not be thrown at will. Don't touch the villagers' things. Respect the surrounding people, understand each other and tolerate each other.

(4) Public moral education. It is required to respect women, help the weak and provide assistance and care as much as possible.

The skills training for the affected people will be conducted once every half a year three months before the resettlement, and the training will be jointly organized and implemented by the town government, village committee, women's Federation and vocational and technical education department where the project is located.

The government and relevant executive agencies, women's federations and village committees have reached an agreement that women's federations will directly intervene in the guidance and consultation of women's income recovery work and participate openly. Human resources and social security will guide and help land-lost farmers to develop tourism-related industries through free professional training, and combine the free training provided by these departments with the jobs provided by the current projects, so that the affected people can earn enough money to support their families and improve their living standards after land acquisition and demolition.

Environmental management training during construction encompassed:

1. Laws, documents and relevant requirements of the state and Guangxi on environmental protection and water and soil conservation in management of construction projects;

2. Requirements of Asian Infrastructure Investment Bank for project

environmental management; Management mode of Asian Infrastructure Investment Bank and environmental terms in the loan agreement;

3. The environmental protection measures proposed in the design of the Project and the environmental protection requirements during the construction period;

4. Guidelines for environmental protection during the construction period of the Project;

5. Management plan for Project environmental protection;

6. Responsibilities and interrelations of environmental management personnel, monitoring personnel and contractors;

7. Preparation of the environmental management report, the environmental monitoring report and the contractor monthly report;

8. Training on highway noise pollution.

The instructor of the training may invite the eco-environment bureau, the environmental protection design director of the Designer, the relevant experts of the environmental assessment organization and the monitoring agency, and the environmental protection experts of the Asian Infrastructure Investment Bank;

Training of environmental management during the operation period encompassed:

1. Laws, documents and relevant requirements of the state and Guangxi on environmental protection and water and soil conservation in management of construction projects;

2. Related requirements of environmental protection acceptance and three synchronizations management for project completion;

3. Training on pollution measures such as noise pollution, air pollution, sewage pollution and immobilized waste during the operation period of expressways;

3. Operational management of relevant environmental protection measures during the operation period.

Environmental protection experts from universities, research institutes and operation management companies can be hired for teaching or short-term training courses.

11.4 Training expenses

11.4.1 Expenses of Environmental Management Training

The training funds of the environmental management plan during the construction period are planned to be included in the project budget, while the training funds during the operation period are included in the operation and maintenance costs. For the capacity building and training plan, see table 11.4-1.

Table 11.4-1 Capacity Building and Training Plan

Training Participants	Trainees	Specific Training Content	Number of Times	Days/ Times	Number of persons/ time of each project	Budget (10,000 yuan)
Construction preparation period						
Technical skills training	Land-losing people	According to the economic structure adjustment of each county, labor market change and the requirements of the employer, the principle of practicality and effectiveness shall be adhered to and carried out in a targeted manner.	8	1	100	0
Training on financial management ability	All affected people	(1) Common knowledge of law and rights protection. (2) Basic knowledge of investment and financial management (3) The guidance of wealth management concept;	8	0.5	50	0

Training Participants	Trainees	Specific Training Content	Number of Times	Days/ Times	Number of persons/ time of each project	Budget (10,000 yuan)
		(4) Examples of successful financial management schemes.				
Training on social integration	External workers	(1) local customs, especially the taboos of Zhuang nationality; (2) National defense safety education in border areas; (3) Civilized construction education. (4) Public moral education.	8	0.5	100	0
Construction Period						
Environmental protection regulations and policies	Project office of the County (City) , the Project Owner, the Contractor, the Monitoring Agency and the Supervisor	I Environmental protection laws and regulations	1	1	3	12
		II Environmental policies and plans	1	1	3	
		III AIIB environmental management	1	1	3	
Construction environmental management plan	Contractor[1], the Project Owner	I Responsibilities of environmental protection during project construction	1	0.5	4	15
		II The main task of environmental protection during the construction	1	0.5	4	

Training Participants	Trainees	Specific Training Content	Number of Times	Days/ Times	Number of persons/ time of each project	Budget (10,000 yuan)
		period of the Project				
		III Main contents of environmental protection during project construction	3	0.5	4	
		IV Environmental management plan (including environmental management regulations)	2	0.5	4	
		V Improvement or modification of the environmental management plan	1	0.5	4	
		VI Internal monitoring methods, data collection and processing, etc.	1	0.5	4	
Subtotal of construction period						**27**
Operation Period						
Environmental monitoring, inspection and report	The Project Owner	Environmental protection facilities, ecological restoration, environmental quality monitoring and preparation of reports	2	1	2	13
Environmental protection facilities and measures	The Project Owner	I Rules, regulations and procedures on environmental safety	2	1	2	12
Subtotal of operation period						25

Training Participants	Trainees	Specific Training Content	Number of Times	Days/ Times	Number of persons/ time of each project	Budget (10,000 yuan)
Total						52

Note 1: The Project Office conducted environmental management plan training for the Contractor before mobilization, while the Contractor prepared the on-site environmental plan according to the environmental management plan, and delivered specific training for internal employees.

Note 2: According to the consultation, the annual budget training expenses of labor and social security, finance, education, science and technology, women's federation and other departments in Tiandeng County and Daxin County are sufficient. The Project Owner does not reserve additional social training expenses in the project budget.

12 Reporting Mechanism

12.1 Information Exchange

It is important to exchange necessary information among different departments and posts of the project office, the Owner, the Contractor, and the Operator, and inform external parties (interested parties, the public, etc.) of relevant information for environmental and social management.

Internal information can be exchanged in means such as meetings and internal briefings, but a formal meeting is required once a month. All information exchange shall be recorded and archived. External information shall be exchanged once half a year or a year, and information exchange with cooperative organizations shall be summarized and filed.

12.2 Recording Mechanism

The organization must develop a perfect recording system and keep the following records to effectively operate the environmental and social management system:

(1) Requirements of laws and regulations;

(2) Administrative license;

(3) Environmental factors and related environmental and social impact assessment documents and EMP reports;

(4) Training records;

(5) Check, review and maintain activity records;

(6) Monitoring data;

(7) Effectiveness of corrective and preventive measures;

(8) Information of stakeholders; Records of complaint and handling process, results

Furthermore, it is necessary to control the above records, including identification, collection, cataloging, filing, storage, management, maintenance, inquiry, retention period, disposal and other links of records.

12.3 Reporting Mechanism

The contractors, operators, monitoring unit, construction supervision engineer and Project Office shall record the project progress, ESMP implementation, environmental monitoring results, RAP implementation, RAP implementation monitoring results, etc. during the project implementation process and timely report them to relevant

departments. It is also required to regularly grasp and collect the monitoring records of the operation conditions of the spoil area, the mixing plant, construction production and living areas involved in the Project. Relevant requirements are included in the monitoring plan. This manual mainly includes the following 6 parts:

(1) The construction Supervision Engineer of the Project shall keep detailed records on the implementation of ESMP on a monthly basis, and submit monthly reports, including the implementation of environmental protection measures, development of environmental monitoring and monitoring data, to the Project Owner and the project office timely.

(2) The Contractor and the Operator shall keep detailed records on the progress of the Project and the implementation of ESMP on a monthly basis, report to the Project Office half a year, and send a copy to the local Ecological Environment Bureau at the same time. The requirements shall be specified in the contractor's contract.

(3) After completing the monitoring entrusted task, the Monitoring Agency shall submit the monitoring report to the Contractor (Operator) and the construction Supervision Engineer in a timely manner;

(4) Both the Contractor and the Operator shall submit the project environmental monitoring report to the local Ecological Environment Bureau and the Project Office in a timely manner. The Project Office shall timely submit monthly, quarterly and annual reports on the progress and effectiveness of ESMP implementation to the local Ecological Environment Bureau and relevant organizations, and submit them to the AIIB if necessary.

(5) The construction Supervision Engineer and the Project Office will inform the local ecological environment administrative department and report it level by level if necessary under any special violation in environmental protection.

(6) Submit the EMP implementation report of the Project twice a year to AIIB. The EMP implementation report may include the following:

a. The progress of the project, such as the construction progress of pavement works, bridge works and tunnel works;

b. Implementation of project environmental protection measures

c. Development and main results of environmental monitoring;

d. Implementation of the training plan;

e. Continuous public participation;

f. Public complaints: whether there are public complaints, and if there are

complaints, record the main contents, solutions and public satisfaction of the complaints;

g. Existing problems and solutions;

h. ESMP implementation plan for the second half of the year.

The RAP external monitoring and evaluation report shall be submitted to the Project Owner and the AIIB by the external monitoring agency at the same time every six months until the resettlement work is completed. A summary report will be submitted to AIIB after the completion of resettlement.

The RAP internal monitoring report shall be submitted quarterly by the project implementing agency to the Project Owner, external monitoring and evaluation agency and AIIB.

In RAP Monitoring project, it is necessary to pay close attention to the compensation, resettlement and income recovery of vulnerable groups, check the implementation of the supportive policies they shall enjoy, assess the impact and recovery, and compile them into the monitoring report during the monitoring.

Table 12.3-1 RAP Monitoring and Assessment Timetable

S/N	RAP M&E Report	Date
1	Baseline socioeconomic survey report	October 2021
2	Monitoring report (No.1)	December 2021
3	Monitoring report (No.2)	March 2022
4	Evaluation report (No.1)	March 2022
5	Evaluation report (No.2)	September 2023
6	Evaluation report (No.3)	March 2024
7	Evaluation report (No.4)	September 2024
8	Summary evaluation report	December 2024