World Bank Loaned Lushan Earthquake Reconstruction and Risk Reduction Project

Environmental Management Plan

Urban Infrastructure Component

Sichuan Urban Environment Project Office

Southwest Jiaotong University (SWJTU)

March 2016

Contents

1. Project Overview

1.1 Introduction

At 8:02, April 20, 2013, a Magnitude 7.0 earthquake struck Lushan, Sichuan, causing severe damages to people's life and properties in the disaster area. Lushan earthquake affected around 2,184,000 people in 32 counties (cities or districts) including Ya'an, Chengdu, Leshan, Meishan, Ganzi, Liangshan and Deyang in Sichuan. For Ya'an City, 4.20 Lushan Earthquake damaged the urban infrastructures in "2 districts and 6 counties" in Ya'an City to a certain degree, seriously affecting local residents' production and life and causing heavy losses to local economy. According to the *State Council's Comments on Supporting Policies and Measures for Post-Lushan Earthquake Recovery and Reconstruction*, Post-4.20 Lushan Earthquake Reconstruction will be implemented using WB loans in order to improve the disaster preventing function of the urban area, restore local residents' production and life, guarantee people's life and property safety and implement the strategy of sustainable development for cities and towns. In accordance with the requirements and work arrangements of the National Development and Reform Commission and taking into account the needs of post-disaster reconstruction, urbanization and industrialization of the disaster area in Sichuan, the WB loans of 270 million US dollars are intended for the development of urban infrastructures in 7 counties (districts) in Ya'an City, i.e. Lushan, Yucheng, Tianquan, Mingshan, Yingjing, Baoxing and Shimian determined in the *Mater Plan for Post-Lushan Earthquake Recovery and Reconstruction.* According to the *State Council's Comments on Supporting Policies and Measures for Post-Lushan Earthquake Recovery and Reconstruction* and relevant principles of the National Development and Reform Commission, the district/county governments, with the theme of scientific development in mind, endeavor to develop the urban infrastructures in the disaster area to improve people's production and living conditions in the disaster area, promote the recovery and reconstruction of the disaster area and realize development and revitalization of the disaster area as early as possible.

Based on the above background conditions, World Bank Loaned Lushan Earthquake Reconstruction and Risk Reduction Project is proposed to promote the development of traffic, transportation and regional economy, road construction of cities in the project area, fast and steady growth and development of economies in the project area as well as to strengthen development of disaster prevention, mitigation and emergency response capabilities and ensure safe, sustainable development of cities.

The Environmental Management Plan (EMP) applies to World Bank Loaned Lushan Earthquake Reconstruction and Risk Reduction Project and is implemented by Sichuan Urban Environment Project Office. Environmental impacts of the project have been identified in the Environmental Impact Assessment (EIA) of World Bank Loaned Lushan Earthquake Reconstruction and Risk Reduction Project. The EIA Statement is prepared by Southwest Jiaotong University (SWJTU) and China Railway Eryuan Engineering Group Co., Ltd. It includes analysis of regulations and policies, project overview and analysis, environment overview & status quo assessment, Environmental Impact Assessment, water and soil conservation, Resettlement Plan, public participation, environmental protection measures and technical and economic demonstration of such measures, environmental protection and management, environmental monitoring and environmental economic cost-benefit analysis.

The geographical location of the project is shown below:

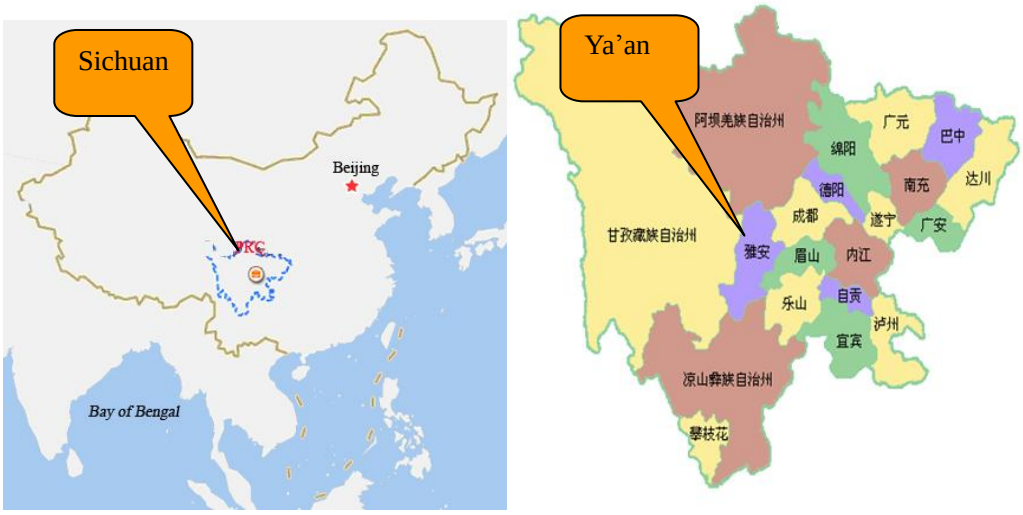

Fig. 1 Location of Sichuan Province

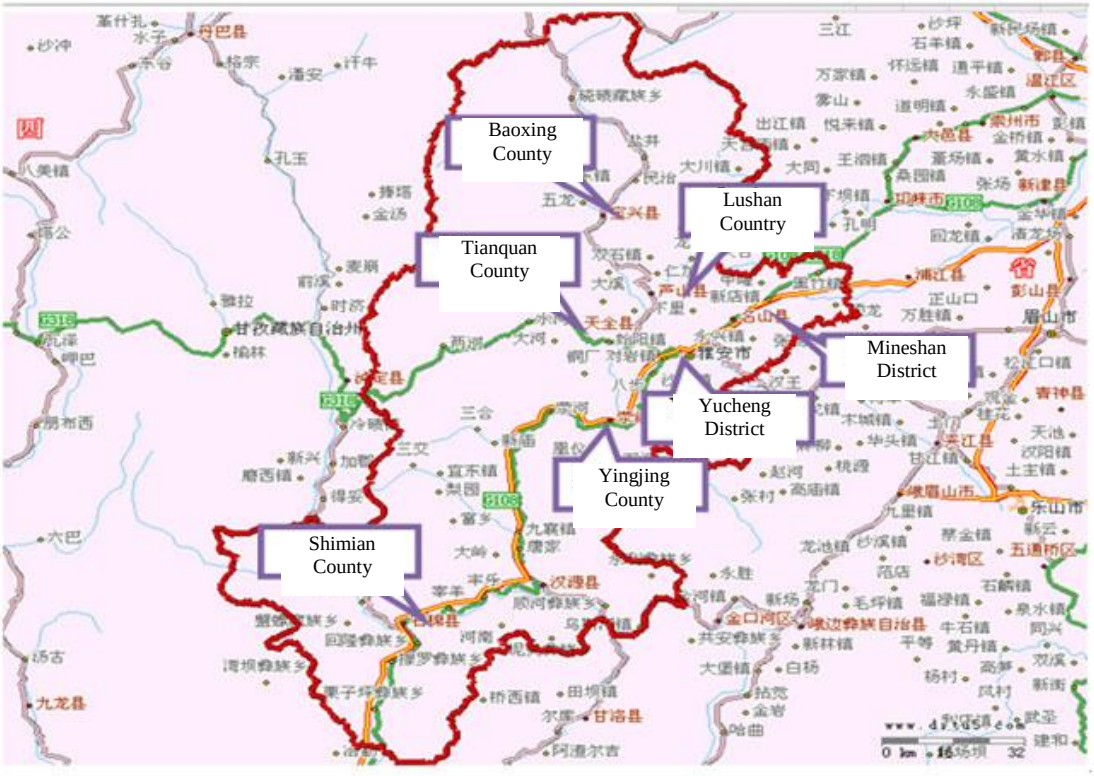

Fig. 2 Distribution of Subprojects of World Bank Loaned Lushan Earthquake Reconstruction and Risk Reduction Project

1.2 Project summery

Subproject name	Contents of Construction	Main works and scale		Gross investment (10,000 yuan)
Baoxing County Subproject	Emergency evacuation and refuge passage along Yanjiang Road, Zhongling Road North	Main works	(1) 1 new water plant with an area of 4.63mu, water supply capacity of 2500t/d, 680m-long associated water pipes, 2342-long associated pipe network and auxiliary facilities in the plant area. (2) Emergency evacuation and refuge passage along Yanjiang Road: about 2119m in full length including Section A which is 885.5m	

Subproject name	Contents of Construction	Main works and scale			Gross investment (10,000 yuan)
	and Lianghekou Water Plant in Baoxing County			long from Yongfu Temple intersection to Red Army Square and Section B which is 1233.304m long from Qingyiyuan Bridge to the south end of Lianghekou Bridge. It is an urban trunk road with a design speed of 40km/h. (3) Zhongling Road North is reconstructed from Xinqiao Street to Jianlian Resettlement Compound with a full length of 6196.977m including K0+000~K0+664.706 which is an urban trunk road with a width of 21~29m and a design speed of 40km; K0+664.706~K1+026.033 which is an urban trunk road with a width of 16m and a design speed of 40km; and K1+026.033~ K6+196.977 which is an urban secondary trunk road with a width of 8m and a design speed of 30km.	21001.06
		Auxiliary works		Administration building for the water plant, guardhouse, etc. Road facilities: traffic signs, traffic markings, signal facilities, separation facilities, safety barriers, crash barriers, etc.	
Lushan County Subproject	Road works, bridge works and emergency refuge square	Main works	Road works	New roads: Xijiang Binhe Road, 1303m; Link to Xijiang Road: 146m; Jindingge Road: 656m. Reconstructed roads: Right-bank Binjiang Road: 773 m; Shuidian Road: 194 m; Wanghui Road: 200 m; Xiangyang Road: 698 m; Community Group Road: (No.1 Road: 557 m; No.2 Road: 100m; No.3 Road: 181m); Fuyuan Road: 950m.	28815.83
			Bridge works	New Right-bank Major Bridge on Binjiang Road is 372.06m in full length and of half-road-half-bridge type; half of the deck is 10m wide.	
			Emergency refuge square	4 new Class III emergency refuge squares; including North Refuge Square with an area of 9,600m^2; Guangyuan Refuge Square with an area of 9,300m^2; Central Refuge Square with an area of 8,900 m^2; and South Refuge Square in Xincheng District with an area of 8500 m^2	
		Auxiliary works		Xijiang Binhe Road and Link to Xijiang Road include associated water supply network, sewage pipe network, rainwater pipe network, traffic safety, power pipe trenches, lighting works, landscaped separators, traffic works and street lamp monitoring facilities. Other roads include associated sewage pipe network, rainwater pipe network, traffic safety, lighting works and traffic works.	
Mingshan District Subproject	Road works, bridge works, emergency refuge square and levee works	Main works	Road works	New roads: 1) Pingqiao Road 1: 285.335m long and 18m wide 2) Pingqiao Road 2: 138.033m long and 18m wide 3) Pingqiao Road 3: 162.561m long and 18m wide 4) Pingqiao Road 5: 195.216m long and 18m wide	24030.00

Subproject name	Contents of Construction	Main works and scale			Gross investment (10,000 yuan)
				5) Pingqiao Road 6: 1,111.527m long and 15m wide 6) Minsheng Road Extension: 583.037m long and 18m wide	
			Bridge works	One new Mingshan River-crossing simply-supported prestressed hollow slab bridge for pedestrians; its deck is 5.5m in full width (including railings) and the bridge is 40m in full length.	
			Emergency refuge square	2 emergency refuge squares: one new Class III emergency refuge square with an area of 7287m^2 on the north side of Mengdingshan Avenue; one reconstructed Class II emergency refuge square (the former Wulizhen Square) with an area of 22000m^2	
			Levee works	New levee (812.373m long) on the west side of Mingshan River with associated landscaped leisure belt (13,000m^2), new levee (746.564m long) on the left bank of Huaixi River and new levee (790.364m long) on its right bank with associated landscaped leisure belts	
		Auxiliary works		Implementation of associated water supply works, drainage works, lighting works, power and communication pipeline works, landscaping works, etc.	
Yingjing County Subproject	Road works, flood discharge channel works and emergency refuge site works	Main works	Road works	New roads: 1) West section of Jinghe Road, 3427.052m long and 20m wide; 2) Park Branch Road, 352.156m long and 12m wide. Asphalt concrete pavement; sidewalks paved with granite tiles; sidewalks are 3m and 2.25m wide respectively. Reconstructed roads: 1) Fuyu Road, 3522.888m long and 7~11m wide; 2) Fuwu Road, 261.699 m long and 9m wide. Asphalt concrete pavement; sidewalks are arranged according to existing conditions with a width of 0-2m.	20326.32
			Flood discharge channel works	Reconstructed flood control channel 3240.324km long and 1.5~5m wide, as per twenty-year flood control standard. Qingzhu Creek 793.422m long, Zengjiagou 1431.624m long and Qianjiagou 1024.239m long.	
			Emergency refuge site works	One reconstructed Class III refuge site (the former Yangliuhe Park) with additional emergency refuge facilities, covering an area of around 7000m^2	
		Auxiliary works		Road works: Implementation of associated water supply works, drainage works, lighting works, power and communication pipeline works, landscaping works, etc. Flood discharge channel works: associated intercepting sewer (pipe diameter 500mm; about 800m in length) and landscaping works along the channel in Qingzhu Creek Section. Cleaning works in flood discharge channel and new refuse collection system works;	

Subproject name	Contents of Construction	Main works and scale			Gross investment (10,000 yuan)
				Emergency refuge site: build medical station, material reserve center, water supply facilities, supporting facilities such as radio communication, upgrading of toilet, etc.	
Shimian County Subproject	Road works, bridge works, refuge square and levee works	Main works	Road works	The road is 8373.78m in total length including about 6607m new roads (Yanzi Road, Xuefu Road, Mountain Road 2 (S2), No.1 Road (1DL), No.2 Road (2DL), No.3 Road (3DL), Dianli Road) and about 1766.41m reconstructed roads (G108, S211, Mountain Road 1 (S1)). Associated drainage, landscaping, lighting, bus stop, traffic safety and management facilities (signs and markings, road barrier-free facilities and traffic lights) including water supply, power and communication works for Dianli Road in Shunhe Zone and power and communication works for Yanzi Road.	39335.36
			Bridge works	1. One new major bridge crossing Dadu River at Lianpowan, 594m in full length; 2. One new medium bridge crossing Nanya River, 60m in full length; 3. One new major bridge on National Highway G108, 372m in full length; 4. One new medium bridge on Yanzi Road, 30m in full length	
			Levee works	New levee in Yanzi Zone, around 1705.48m long	
			Refuge square works	1. New emergency refuge square in Yanzi Zone with an area of about 8,500m^2 and emergency facilities, equipment and auxiliary works; 2. New emergency refuge square in Chengbei Zone with an area of about 28,600m^2 and emergency facilities, equipment and auxiliary works;	
		Auxiliary works	Water supply pipeline works	New associated water supply pipelines along Dianli Road;	
			Drainage pipeline works	Design of associated drainage pipe network for new and reconstructed roads in the Subproject (separate flow of rainwater and sewage)	
			Power supply and lighting works	Design of associated power supply and lighting works for new and reconstructed roads (excluding new off-class road in Chengbei Zone) in the Subproject	
Yucheng District Subproject	Road works and refuge square works	Main works	Road works	The east section of South Outer Ring Road includes main line and branch line. The main line starts from the planned Yaan Avenue and ends at the place about 520m away from the west side of Daxing Power Station Dam Crest Road, 5773.501m long in total, with subgrade of 19m and 29m wide and with design speed of 50km/h, which is the urban main road. The branch line starts from the east section of South Outer Ring Road and ends in the link road of Yaan-Kangding Expressway, 543.9m long in total, with subgrade	50407.83

Subproject name	Contents of Construction	Main works and scale			Gross investment (10,000 yuan)
				of 29m and with design speed of 50km/h, which is the urban main road. Besides, the asphalt concrete pavement is adopted for the whole line.	
			Refuge square works	New emergency refuge square in Beijiao Park with an area of 34,149.59m^2 which can accommodate about 10,000 people and provided with emergency facilities, equipment and auxiliary works.	
		Auxiliary works	Water supply pipeline works	New associated water supply pipelines along Dianli Road;	
			Drainage pipeline works	Design of associated drainage pipe network for new roads in the Subproject (separate flow of rainwater and sewage)	
			Power supply and lighting works	Design of associated power supply and lighting works for new road in the Subproject	
Tianquan County Subproject	Road works and refuge square works	Main works	New road	9 new roads in Shaba Zone (i.e. Roads A1, A2, A3, C2, C3, C4, D1, D2 and D3), 3839.6m in total length and 14~20m in width	30879.9
			Reconstructed road	6 reconstructed roads in Old Town (i.e. Anju Road South, Guangjian Road South, Wenxing Road, Binhe Road, Dengzhan Road and Jiancai Road South), 2207.5m in total length and 11~28m in width, including adjustment of pavement cross section layout, pavement upgrading, etc.	
			Emergency refuge square	Two new Class III refuge sites in Old Town and Shaba Zone; The refuge square in Old Town covers an area of 8,003m^2; the refuge square in New Town covers an area of 10,539m^2.	
		Auxiliary works	Road works	Comprehensive pipeline works including drainage pipe network (sewage pipe 6789m in length and d400 in diameter; rainwater pipe 6401m in length and d500~d1200 in diameter), power pipe 489m in length with 6-hole duct bank (Anju Road South and new roads in Shaba Zone), traffic safety and management facilities (signs and markings, road barrier-free facilities and traffic lights), landscaping, lighting and other associated works.	
			Emergency refuge square	Build emergency administration building, emergency toilet, emergency refuse storage area, emergency water and power supply facilities, emergency medical facilities and associated water, power and lighting facilities, underground parking lot, landscaping works, etc.	

2. Environmental Laws, Policies and Regulations

2.1 Environmental protection laws, regulations and relevant documents

(1) *Environmental Protection Law of the People's Republic of China* (implemented on Jan. 1, 2015);

(2) *Law of the People's Republic of China on Promotion of Cleaner Production*

(implemented on Sept. 1, 2003);

(3) *Law of the People's Republic of China on Prevention and Control of Pollution from Environmental Noise* (implemented on Mar. 1, 1997);

(4) *Law of the People's Republic of China on the Prevention and Control of Water Pollution* (implemented on June 1, 2008);

(5) *Law of the People's Republic of China on the Prevention and Control of Atmospheric Pollution* (revised on Aug. 29, 2015 and implemented on Jan. 1, 2016);

(6) *Law of the People's Republic of China on Prevention and Control of Environmental Pollution by Solid Wastes* (implemented on Apr. 1, 2005);

(7) *Law of the People's Republic of China on Water and Soil Conservation* (implemented on Mar. 1, 2011);

(8) *Regulations on the Administration of Construction Project Environmental Protection* (Decree No. 253 of the State Council of the People's Republic of China) (implemented on Nov. 29, 1998);

(9) *Circular on Implementing Regulations on the Administration of Construction Project Environmental Protection* (HF [1999] No. 107 of State Environmental Protection Administration, implemented on Apr. 29, 1999);

(10) *Circular on Relevant Issues of Implementing EIA System for Construction Project* (HF [1999] No. 107 of State Environmental Protection Administration, implemented on Apr. 29, 1999);

(11) *Circular on Stepping up Environmental Protection for Construction Project* (HF [2001] No. 19 of State Environmental Protection Administration, implemented on Feb. 21, 2001);

(12) *Classified Directory for Environmental Impact Assessment of Construction Project* (implemented on Jun. 1, 2015);

(13) *Measures for Environmental Protection Management of Traffic Construction Project* (implemented on Jun. 1, 2003);

(14) *Circular on Printing and Issuing the Regulations on Soil and Water Conservation in Highway Construction Project* (SB [2001] No. 12 Document of Ministry of Communications and Ministry of Water Resources, implemented in 2001);

(15) *Circular on Stepping up Regulation of Environmental Impact Assessment* (HB [2002] No. 88 of the State Environmental Protection Administration, implemented in 2002);

(16) *Sichuan Province's Regulations on Environmental Protection* (implemented on Sep. 24, 2004);

(17) *Urban and Rural Planning Law of the People's Republic of China* (implemented on Jan. 1, 2008);

(18) *Law of the People's Republic of China on the Protection of Cultural Relics* (revised on Jun. 29, 2013) and *Implementation Rules for the Laws of the People's Republic of China on the Protection of Cultural Relics*;

(19) *Guidelines for Developing Innovative Traffic Industry* (Ministry of Communications, Jul. 24, 2006);

(20) *Notice on Standardization of Acceptance of Construction Project Environmental Protection* (CHF [2003] No. 56);

(21) *Circular on Stepping up Environmental Protection in Distributed Drinking Water*

Source Zone (HB [2010] No. 132 of General Office of the Ministry of Environmental Protection of the P.R.C.)

(22) *Circular on Scheme for Dividing Source Protection Zone for Centralized Drinking Water in Cities/Towns from General Office of People's Government of Sichuan Province* (CBH [2010] No. 26)

(23) *Circular on Strengthening EIA Management of Construction Project Financed by International Financial Institution* issued by State Environmental Protection Administration (HJ [1993] No. 324)

2.2 Guidelines and technical specifications

(1) *Technical Guidelines for Environmental Impact Assessment - General Programme* (HJ 2.1-2011);

(2) *Technical Guidelines for Environmental Impact Assessment - Atmospheric Environment* (HJ 2.2-2008);

(3) *Technical Guidelines for Environmental Impact Assessment – Surface Water Environment* (HJ/T 2.3-93);

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

(5) *Technical Guidelines for Environmental Impact Assessment – Groundwater Environment* (HJ 610-2011);

(6) *Technical Guideline for Environmental Impact Assessment – Ecological Environment* (HJ 19-2011);

(7) *Technical Guidelines for Environmental Risk Assessment on Projects* (HJ/T 169-2004);

(8) *Technical Criterion for Eco-Environmental Status Evaluation (Trial)* (HJ/T 192-2006);

(9) *Regulation of Techniques for Comprehensive Control of Soil Erosion* (GB/T 16543.1~16453.6-2008);

(10) *Technical Code on Soil and Water Conservation of Development and Construction Projects* (GB 50433-2008);

(11) World Bank Operations Manual - OP4.01 World Bank Procedures on Environmental Impact Assessment;

(12) World Bank Operations Manual - BP4.01 World Bank Procedures, Environmental Impact Assessment;

(13) World Bank Operations Manual - OP4.04 World Bank Policies on Natural Habitat;

(14) World Bank Operations Manual - OP4.11 World Bank Procedures on Cultural Property;

(15) World Bank Operations Manual - OP4.12 World Bank Procedures on Involuntary Resettlement

2.3 Technical documents related to the Project

Feasibility Study Report on Subprojects;

EIA Report on Subprojects;

Resettlement Action Plan Report on Subprojects;

Social Impact Assessment Report on Subprojects;

2.4 World Bank security policy

2.4.1 10 World Bank security policies and compliance analysis

World Bank has produced ten security policies on social and environmental operation. On the basis of the project nature, layout, the defined scope of assessment and site survey, the applicability of the ten policies to the Project is identified as shown in the table below:

Table 2-1 Analysis of compliance of the Project with World Bank security policies

S/N	Security policy	Applicable or not	Compliance
1	OP/BP4.01 *Environmental Impact Assessment*	Yes	Category B project; The environment screening of the project is classified as World Bank Loaned Project Category B which has been confirmed by WB.
2	OP/BP4.04 *Natural Habitat*	No	Shimian, Baoxing and Lushan Subprojects involve bridge works; Yingjing, Shimian and Lushan Subprojects involve existing drinking water source protection zone (suspended now and to be canceled later); Baoxing Subproject involves water plant works and levee works; Yingjing Subproject involves improvement of flood discharge channel; the above subprojects may have disturbing effect on the species in the local surface water. Therefore, this policy applies.
3	OP/BP4.36 *Forest*	No	This policy is not launched. The Project will not fund major transformation or degradation activities involving important areas or relevant key natural habitats defined in this policy.
4	OP/BP4.09 *Pest Management*	No	This policy is not launched. The Project will not purchase any insecticide or cause increased consumption of insecticides. No action will be required according to this policy.
5	OP/BP4.11 *Physical Cultural Resources*	Yes	Only Shimian County Subproject involves a suspension bridge on Dadu River in Xinmian which is a Municipality Protected Historic Site. If encountering underground cultural relics during construction, the Construction Contractor shall suspend construction, protect the site and report to the authorities in accordance with the *Law of the People's Republic of China on the Protection of Cultural Relics*.
6	OP/BP4.37 *Dam Safety*	No	This policy is not launched. There is no dam in the project area.
7	OP/BP4.10 *Indigenous People*	No	This policy is not launched. No indigenous people live in the project area nor are they affected.
8	OP/BP4.12 *Involuntary Resettlement*	Yes	It is applicable to resettlement and *Resettlement Action Plan* shall be prepared;
9	OP/BP7.50 *International Waterway Project*	No	This policy is not launched. The project does not involve any international waterway.
10	OP/BP7.60 *Disputed Area Project*	No	This policy is not launched. The Project does not involve any disputed site.

2.4.2 Analysis of project compliance with World Bank *EHS Guidelines* and relevant policies

World Bank *EHS Guideline* (general guideline), sewage treatment part of *Water, Hygienic Condition, Health and Safety Guideline*, *EHS Guideline for Toll Roads*, and waste collection and transportation part of *EHS Guideline for Waste Management Facilities* also apply to the Project. Mitigation measures included in the *Environmental Management Plan* of the Project are in full compliance with the above guidelines, especially the provisions related to construction management. It should be noted that provisions in the Guidelines are basically consistent with China's laws, regulations, guidelines and construction management codes.

Table 2-2 List of project compliance with *World Bank EHS Guidelines*

World Bank EHS Guidelines	**Compliance with Environmental Impact Assessment/ Environmental Management Plan**
If facilities or projects are close to identified ecologically sensitive regions (such as national park), reduce increase of pollution level as much as possible. In addition, appropriate mitigation measures include application of clean fuels and technologies and implementation of comprehensive pollution control measures.	Clean energy will be used for the construction of the project to reduce pollution levels. Lushan County Subproject involves existing drinking water source protection zone for the 2nd Water Plant in Luojiaying County; Yingjing County Subproject involves existing Jinghe drinking water source protection zone; Shimian County Subproject involves existing spring water and drinking water source zone in Yanzi Village. The intake points at the above water sources have been out of service and will be canceled in urban development planning in the future. Therefore, there are no ecologically sensitive regions around the project area.
Dust or particulate matters (PM) are the most common pollutants of unorganized emissions. Particles may be generated by certain operations (transportation and open storage of solid materials) and exposed soil surfaces (including unpaved roads).	During the construction period, apply dust control methods (including covering, water spraying or increasing water content of material stack in the open air) and use water spraying method to control delivered materials on paved or unpaved roads.

Table 2-3 List of project compliance with World Bank Water, Hygienic Condition, Health and Safety Guideline

Water, Hygienic Condition, Health and Safety Guideline	**Compliance with Environmental Impact Assessment/ Environmental Management Plan**
Industrial wastewater, domestic wastewater, wastewater generated by operation of utilities and rainwater, which is to be discharged to public or private wastewater treatment systems, shall meet pretreatment and monitoring requirements of the wastewater treatment systems.	During the construction period, no industrial wastewater is discharged and domestic wastewater is treated by existing sewage treatment facilities of rented houses. During project operation period, domestic sewage is transported by sewage truck to sewage treatment plant.
Rainwater shall be separated from industrial and domestic wastewater so as to reduce the wastewater that is allowed to be discharged only after treatment;	Rainwater is separated from sewage in project area.
If it is expected that noise generated by project facilities or operations exceeds relevant noise indexes at the most sensitive receiving point, noise prevention and control measures shall be taken.	Select equipment with a low sound power level, install vibration isolation devices for mechanical equipment, and limit operation time of special equipment or operations, especially mobile noise sources passing through communities.

Table 2-4 List of project compliance with *World Bank EHS Guideline for Toll Roads*

EHS Guideline for Toll Roads	**Compliance with Environmental Impact Assessment/ Environmental Management Plan**
Under appropriate conditions, avoid important land and hydrophytic habitats (including old-growth forests, wetlands and fish spawning habitat) by selecting appropriate locations of roads and supporting facilities and applying existing traffic corridors.	The project area does not belong to important land and hydrophytic habitats.
During the construction period, reduce removal of local plants as much as possible and replant local plants in disturbed areas.	Prepare a water and soil conservation scheme specially and plant proper local herbaceous plants as per the water and soil conservation scheme.
Pave the road in dry days to prevent loss of asphalt and cement materials.	During the construction period, do not pave under strong wind, and confirm the construction site appropriately.
No matter whether much grease will be increased, oil-water separators shall be applied during treatment.	Machine oil-sewage collectors are arranged at the construction site for collecting oil and sewage. Collected oily water is delivered to the organization with treatment capacity for treatment. Do not directly discharge the oily water.
Prevent pollution caused by asphalt cleaning by the	Requirements on “storage of fuels, oils and dangerous and

following measures: use vegetable oil instead of diesel as releasing agent and cleaning agent, prevent leakage of cleaning product and polluted asphalt, scrap before cleaning, and clean at the place far away from surface water or drainage facilities.	toxic substances" are specifically specified in the Contractor's specification. All fuels at the construction site shall be fenced and the capacity of storage area shall be 110% of that of fuel storage container provided with secondary cofferdam. The fuel storage area shall not be close to any water source (namely, within 100m from the water source).
Take soundproof measures for surrounding buildings (replace windows generally). Use pavement with low pavement/tyre friction noise such as stone mastic asphalt pavement.	During the road operation period, limit functions of areas along the trunk road, plan buildings at road sides, optimize acoustic design and strengthen speed control management.

Table 2-5 List of project compliance with World Bank EHS Guideline for Waste Management Facilities

EHS Guideline for Waste Management Facilities	**Compliance with Environmental Impact Assessment/ Environmental Management Plan**
Collection and transportation of wastes	The wastes are sent to the local waste treatment plant for unified disposal.
Encourage the use of dustbin or garbage bags at the refuse collecting stations around each house and building; collect refuse at a frequency high enough to avoid garbage accumulation; cover the refuse collecting and transport vehicle to prevent refuse being blown away by wind on the road;	Garbage is placed at designated points and sent uniformly by Sanitation Service to the refuse processing plant.
Collect garbage regularly; Prepare cleaning plans for garbage collection vehicles and all garbage collection vessels of the enterprises; Promote use of garbage bags to avoid polluting garbage collection equipment.	
Optimize garbage collection route to reduce travel distance, fuel consumption and emissions; Set up transfer stations for small garbage collection vehicles to transfer the collected garbage to a large vehicle to send the garbage to the refuse processing plant.	

2.5 Environmental quality standard

2.5.1 Ambient air quality

The assessment of current ambient air quality complies with Class II standard in *Ambient Air Quality Standards* (GB3095-2012).

Table 2-6 Ambient air quality standards

Pollutant	**Concentration limit of each pollutant (mg/m^3)**			**Basis**
	Hourly average	**Daily average**	**Annual average**	
SO_2	0.50	0.15	0.06	Class II standards in GB3095-2012
NO_2	0.20	0.08	0.04	
PM_{10}	—	0.15	0.07	
$PM_{2.5}$	—	0.075	0.035	

2.5.2 Water environment quality

Surface water complies with Class III standards in *Environmental Quality Standard for Surface Water* (GB3838-2002).

Table 2-7 Environmental quality standards for surface water

Indicator	**Standard value (mg/L)**	**Basis**
pH	6-9	Standards for class-III water specified

Ammonia nitrogen	≤1.0	in GB3838-2002
Volatile Phenol	≤0.005	
Petroleum	≤0.05	
Chemical oxygen demand	≤20	
Five-day biological oxygen demand	≤4.0	
Fecal coliforms	≤10000 Nr.	

2.5.3 Acoustic environment quality

Apply Class 4a and 2 standards in *Environmental Quality Standard for Noise* (GB3096-2008). Refer to the following table for standard values:

Table 2-8 Acoustic environmental quality standards

Application area	Standard value (Leq: dB(A))		Basis
	Day	Night	
Mixed living, commercial and industrial area	60	50	Class-II standards in GB3096-2008
Both sides of main traffic trunk roads	70	55	Class-4a standards in GB3096-2008

3. Environmental Impact and Mitigation Measures

3.1 Environmental Protection Measures and Suggestions in Design Stage

Table 3-1 Environmental Impact and Mitigation Measures during Design Stage

Link and elements	Potential impact/issue	Mitigation measures	Executor	Supervisor	Monitoring inidcators	Monitoring frequency
Land acquisition and resettlement	Potential impact on original residents within the project area	Compile resettlement plan according to national policies and World Bank policies	Fanglue Company	Sichuan Urban Environment Project Office, Ya'an Municipal Urban Environment Project Office, World Bank	Resettlement action plan approved by World Bank	Before assessment
Acoustic environment	Impact on construction workers	Due to a pretty loud noise produced in the construction of building works and road works, reasonable noise isolation and reduction measures shall be taken in the project design to mitigate the impact of construction noise on the field construction workers.	Local Urban Environment Project Office, environmental assessment consultant	Sichuan Urban Environment Project Office, Ya'an Municipal Urban Environment Project Office, World Bank	Environmental Impact Assessment approved by World Bank and Environmental Protection Bureau of Ya'an City	Before assessment
	Traffic noise impact on residents of sensitive areas along the line	The standard distance for the function area provided by the planning department shall be arranged rationally and no sensitive structure shall be built within the standard distance.	Environmental assessment consultant	Sichuan Urban Environment Project Office, Ya'an Municipal Urban Environment Project Office, World Bank	Environmental Impact Assessment approved by World Bank and Sichuan Environmental Protection Bureau	Before assessment
Ambient air environment and acoustic environment	Impact of dust from transportation on surrounding residents	Raw materials shall be purchased locally	Environmental assessment consultant	Sichuan Urban Environment Project Office, Ya'an Municipal Urban Environment Project Office, World Bank	Environmental Impact Assessment approved by World Bank and Sichuan Environmental Protection Bureau	Before assessment
Ecological Environment	Impact of water and soil loss	Make a good water and soil conservation plan which shall not only take into account sufficiently the type, mode and intensity of water and soil loss caused by the project	Environmental assessment consultant	Sichuan Urban Environment Project Office, Ya'an Municipal Urban	Environmental Impact Assessment approved by World Bank and Sichuan Environmental	Before assessment

Link and elements	Potential impact/issue	Mitigation measures	Executor	Supervisor	Monitoring inidcators	Monitoring frequency
		construction, but integrate the general plan of the management area of project operation period.		Environment Project Office, World Bank	Protection Bureau	
	Land acquisition impact:	The project design shall comprehensively consider the surrounding environment and shall further refine the permanent land occupation design to use land reasonably.	Environmental assessment consultant	Sichuan Urban Environment Project Office, Ya'an Municipal Urban Environment Project Office, World Bank	Environmental Impact Assessment approved by World Bank and Sichuan Environmental Protection Bureau	Before assessment
	Landscape impact	Road landscaping design shall be conducted at the same time with the main works design. Meeting the regional planning requirement, the route of roads shall maintain the natural landscape and harmonize with the surrounding environment as much as possible. To reduce damage to the existing ecological environment, landscaping and ecological construction works shall be carried out simultaneously in the project design.	Environmental assessment consultant	Sichuan Urban Environment Project Office, Ya'an Municipal Urban Environment Project Office, World Bank	Environmental Impact Assessment approved by World Bank and Environmental Protection Bureau of Ya'an City	Before assessment

3.2 Environmental Protection Measures and Suggestions in Construction Period

Table 3-2 Environmental Impact and Mitigation Measures during Construction Stage

Link and elements	Potential impact/issue	Mitigation measures	Implementation responsibilities	Monitoring responsibilities	Monitoring indicators	Monitoring frequency
Social environment	Transportation issues	(1) Formulate traffic direction, diversion and temporary access plans, setting up sufficient traffic direction signs. Information shall be released through broadcast, television, newspapers and magazines. (2) Enhance management on bridge construction, especially the construction management of buildings. Construction should be coordinated with relevant departments, in aspects of construction time and traffic hours, with obvious warning lights set up at the piers, etc. alerting the passing vehicles. (3) Warning lights should be set up along the construction road sections, guiding the access of vehicles.	Contractor	Environmental supervision engineer and independent environmental management consultant	Filed supervision by the environmental supervision engineer; Compliance to the specifications	Pre-construction
	Preservation of Cultural Relics	Shimian County Subproject involves a suspension bridge over Dadu River in Xinmian which is a Municipality Protected Historic Site. It may have adverse impact on the cultural relics protection organization without education and system restraints on the construction workers during the pre-construction stage and strict management during the construction stage. It may even impair the integrity and function of the cultural relics protection organization. Therefore, the following mitigation measures shall be taken: (1) During the pre-construction period, provide publicity and education, especially legal education on the construction workers and management personnel to make them have the awareness of protecting cultural relics. (2) Prior to commencement, the Employer and the Construction Contractor shall sign a contract for cultural relics protection with relevant departments to make protection responsibilities assigned to the project construction-related personnel and establish & complete cultural relics protection responsibility system. (3) During construction, the construction operation zone shall be located within the boundary line, and no activities that may	Contractor	Environmental supervision engineer and independent environmental management consultant	Provide promotion and training; site tour	Daily

Link and elements	Potential impact/issue	Mitigation measures	Implementation responsibilities	Monitoring responsibilities	Monitoring indicators	Monitoring frequency
		cause any damage or negative effect on the cultural protection organizations shall be allowed to be carried out outside the area. Then the completeness and functionality of the cultural protection organizations can be preserved. (4) After mobilization, the technical construction department shall actively undertake cultural relics protection responsibility, and pay attention to whole-process supervisory control during construction and prepare a special construction scheme to make cultural relics under control during construction. (5) Construction activities with large machineries is not allowed, the mode of manual work coordinated with small machineries is adopted to prevent damage on culture relics. During the construction period, if highly intensified works (such as large-scaled mechanical operation, road surface breaking operation, and air pick operation) should be conducted, before their commencement, a report shall be submitted to a related competent department and they can only be conducted with the approval of the department and the verification of the work plan of related construction experts. During the operation, the technicians, supervisors and operators shall do a good job of their respective work and strict control shall be exercised. (6) Considering the sensitivity of culture relics protection organizations, it is suggested that key supervision work be carried out in construction areas where it involves culture relics protection organizations to implement various environmental protection measures so as to prevent damage on the culture relics caused by illegal, brutal construction activities as well as construction activities that violates regulation. (7) If encountering underground cultural relics during construction, the Construction Contractor shall suspend construction, protect the site and report to the authorities in accordance with the *Law of the People's Republic of China on the Protection of Cultural Relics*. (8) Moreover, after the Project is completed and accepted, relevant departments shall continue to monitor the operation of the Project and the suspension bridge over Dadu River in Xinmian, to ensure that the operation of the Project will not				

Link and elements	Potential impact/issue	Mitigation measures	Implementation responsibilities	Monitoring responsibilities	Monitoring indicators	Monitoring frequency
		affect the culture relics units.				
Ecological environment	All items	(1) Vegetation protection measures Try to collect and save mellow soil on surface of permanently occupied land and temporarily occupied farmland during construction. Cover mellow soil for vegetation restoration promptly after construction. Recover afforestation of temporarily occupied farmland and plant trees for places of temporary work sheds especially after completion of the Project. Select to plant fast-growing tree species and transplant proper trees for proper land from the same area in road greening, so as to ensure the ratio of living trees and the integration with nature and prevent plant invasion. As for two machilus trees belonging to construction of Jiancai South Road in reconstruction of Tianquan County, they have already been enclosed for protection by local forestry authorities. In construction, their roots shall be avoided in laying underground pipes and lines, and enhanced management shall be conducted during construction to prevent disturbance. In this way, there will be no impact on these trees. (2) Protective measures for aquatic life The general protection measures are as follows: practically strengthen the protection of water environment to avoid eutrophication in local waters along the project line and to minimize the impacts on living environment of aquatic life. Construction materials shall be stored at the places far away from water sources and other water bodies, where such materials are well sheltered against scouring of storm flows. For some construction materials stacked near the bridge location, open drains shall be excavated around the material stacking yard or retaining walls shall be provided there, so that such materials can be prevented from entering the waters along with the storm runoff to affect the water quality. Various materials shall be equipped with rain-proof and shelter facilities. Rationally arrange construction procedures and machinery; water drainage design and construction shall be in strict accordance with the road construction codes; construction personnel shall be well educated about ecological conservation. Ecological restoration	Contractor	Environmental supervision engineer and independent environmental management consultant	Filed supervision by the environmental supervision engineer; Compliance to the specifications	Daily

Link and elements	Potential impact/issue	Mitigation measures	Implementation responsibilities	Monitoring responsibilities	Monitoring indicators	Monitoring frequency
		shall be carried out after completion of the Project to minimize damages to vegetation and adverse impacts of water and soil loss on acquatic life.				
Atmospheric environment	All projects	(1)During the project worksite management, the principle of "Six Must" and "Six Prohibitions" of site management shall be put into effect. The "Six Must" and "Six Prohibitions" are: wet process operation must be carried out; enclosing operation must be carried out for the construction site; roads must be hardened; washing facilities must be set up; cleaning personnel must be allocated completely; the construction site must be cleaned regularly; it's prohibited for vehicles to leave with mud; it's prohibited for slag transportation vehicles to be loaded over the height of the trailer; it is prohibited to throw construction slag from high altitude; it is prohibited to mix concrete on site; it is prohibited for ponding to occur on site; it is prohibited to burn waste on site. These measures are to effectively control dust pollution on construction site. (2)Water sprinkling shall be performed in due time (except for rainy days) to the construction sites including road sections under construction and major transport roads, etc;The frequency of water sprinkling is determined according to the actual site conditions by site supervision personnel; (3)Powdered materials such as cement, lime, etc. shall be packaged in a canned or bagged manner, and are forbidden to be transported in bulk. During transportation, they are forbidden to be stained by fugitive dust and spilled during transportation. During storage, they shall be storied in a warehouse or covered by plastic tarpaulins; (4)There should be dust mat at the exit of construction site. It is required to wash the body and tires of transport vehicles going out the construction site. Soil, grit and stone are forbidden to be overloaded with the height not more than that of transport vehicle board, and shall be covered by tarpaulins. No spilling along the way during transportation; (5)When the wind speed is above level IV and can produce fugitive dust easily, the construction contractor is recommended to suspend the earth excavation and take such measures as	Contractor	Environmental supervision engineer and independent environmental management consultant	Filed supervision by the environmental supervision engineer; Compliance to the specifications	Daily

Link and elements	Potential impact/issue	Mitigation measures	Implementation responsibilities	Monitoring responsibilities	Monitoring indicators	Monitoring frequency
		covering the stacked materials and moistening so as to effectively reduce fugitive dust pollution; (6)Construction waste needs to be promptly removed and transported. For the construction waste that cannot be removed and transported for the moment, measures such as covering shall be taken. The vehicles for transporting sand, stones, cement, earth and other substances which are liable to produce dust must be well covered and no spilling or leakage is allowed. (7)Water sprinkling shall be performed regularly to temporary stack yard insdie the property line to reduce the impact of fugitive dust on surrounding environment. It is recommended to set up closed block higher than stacked materials around such stack yard, separate material areas from roads, and timely clean away scattered materials and wash roads to keep roads clean. (8)If road construction soil is piled for more than 48 hours, it shall be fully covered to prevent dust. (9)Construction site and batching plant shall be properly located on open ground enclosed with barriers and as far away from environmentally sensitive points such as residential area as possible. (10)Temporary spoils shall be used for backfill in time, subject to compaction treatment and covered with dustproof net to prevent secondary dust pollution.				
Water environment	All projects	(1)Aquatic environment protection training shall be carried out at the construction site and the camps. When the bridge lower structure is constructed, the construction should take place at the poor water phase as possible to reduce the impact on the lower stream water quality of the bridge. Meanwhile, construction management and engineering monitoring shall be strengthened by having close inspection on the construction machinery to prevent any oil leakage that will pollute the canal water. (2)Asphalt, oils, chemicals and other construction materials shall not be stored near any surface water bodies, which shall be temporarily covered up by canvas. (3)Excavated soil and rock shall not be piled up near any water bodies or on a slope adjacent to a river, otherwise they may be flushed into the surface water bodies. In construction at a	Contractor	Environmental supervision engineer and independent environmental management consultant	Filed supervision by the environmental supervision engineer; Compliance to the specifications	Daily

Link and elements	Potential impact/issue	Mitigation measures	Implementation responsibilities	Monitoring responsibilities	Monitoring indicators	Monitoring frequency
		temporary river section, a construction fence shall be provided to prevent temporarily stored excavated soil and rocks from falling into water. (4) In road construction, upon sedimentation and filtration, rinsing wastewater generated by the aggregate processing systems, concrete mixing systems and machineries is mostly recycled to clean the field areas and rinse gravel aggregate, and only a small part is discharged after meeting relevant standards. Petroleum rinsing wastewater from machineries are recycled after processing and prohibited to be discharged after treatment in compliance with the GB8978-1996 Class I (10mg/L) and the deoil rate over 90%. (5)In bridge works, it is necessary to adopted the cycling cast-in-situ pile construction method to recycle slurry and reduce discharge of slurry. After construction, slurry will be naturally sedimented and covered with soil. Excavated spoils will be delivered to a dump site for treatment. To avoid and minimize the suspended solid pollutants in the surface runoff at the in-water bridge pier construction site, an intercepting channel will be built at the pile foundation construction site to divert the SS polluted water to the emergency settling tank for sedimentation and discharge. Construction of pier peg foundation shall be carried out in strict according to the process for steel-casing cast-in-situ pile to reduce the production of suspended sediment in construction. Recycle the slurry for piling and drilling, and prevent overflows from entering into any surface water bodies. Residues of drilled piles can be filtered, collected and used as subgrade fills onshore. Construction machinery for bridge works shall be under proper control to prevent overflow, spillover, dropping and leakage. (6)The cofferdam technology is adopted for river bank works. Except that the river bed may be disturbed during construction of the cofferdam, all other construction procedures are carried out inside the cofferdam to basically ensure separation of construction activities and water bodies.				
Noise	All projects	(1) Arrange construction site in a proper and scientific way and	Contractor	Environmental	Filed supervision by	Daily

Link and elements	Potential impact/issue	Mitigation measures	Implementation responsibilities	Monitoring responsibilities	Monitoring indicators	Monitoring frequency
		concentrate fixed noise sources on construction site to minimize the impact of noises. (2) The Construction Contractor must select and use such construction machines and tools as conform to relevant national standards and the low-noise construction machinery or technology whenever possible, so as to reduce the noise source and decrease the intensity of noise source fundamentally. (3) Properly arrange construction time in accordance with *Emission Standard for Noise within the Boundaries of Construction Sites* (GB12523-2011) and prohibit operation of high-noise machineries at nighttime (22:00-6:00); during construction close to residential areas, construction time shall be adjusted accordingly or temporary noise reducing measures be taken and temporary sound barriers be provided such as using temporary wood sound insulating board or semi-underground construction. As for a construction site where continuous construction is necessary, the Construction Contractor shall contact with the environmental protection administration in time and apply for the permit for nighttime work. In addition, announcement of such construction activities shall be made to the public to obtain their support as much as possible. (4) The route and vehicle for construction and transportation, especially large transport vehicles, shall be arranged rationally. The route and schedule of transportation shall be determined reasonably according to regulations of relevant authorities. The side of road far from residential areas shall be selected during transportation. When transporting, loading and unloading the building materials, vehicles should be slowed down to 20km/h and not allowed to whistle around environmentally sensitive sites. (5) Low-noise construction equipment is preferred and shall be subject to regular maintenance and preservation; construction methods and site boundary shall be properly selected; during construction, sound insulating boards shall be placed on the side of high-noise machineries which is near the sensitive point to minimize its impact on environmentally sensitive points. (6) In order to exercise effect control over the impact of the		supervision engineer and independent environmental management consultant	the environmental supervision engineer; Compliance to the specifications	

Link and elements	Potential impact/issue	Mitigation measures	Implementation responsibilities	Monitoring responsibilities	Monitoring indicators	Monitoring frequency
		construction noise on the urban environment, in addition to the implementation of the related control measures, the environmental management shall be strengthened at the same time; the Construction Contractor shall initiatively accept the supervision and inspection carried out by the environmental protection departments, according to the national and local laws, orders, regulations, etc; when the following-up project is for public tendering, the noise reduction requirements shall be included in the tender documents; and when undergoing project contracting, the Employer shall incorporate the construction noise control into the contract and should appoint persons specifically in charge of the implementation of the noise reduction measures in the process of construction and engineering supervision. Construction operators and site constructors control the working time as per labor hygiene standard and perform self protection well such as wearing earplugs and helmets.				
Solid waste	All projects	(1) For solid wastes on site during construction period, the principle of "centralized collection, classified disposal and recycling" shall be followed. (2) Vehicles carrying construction and building waste must be capped with dust screens and be washed when they leave the muck loading yard, so as to prevent spilling and flying dust along the road; the vehicles must be emptied after they arrived at the muck unloading yard; the Construction Contractor shall carefully study the transport route of spoil and muck with the traffic authority, environmental authority and so on, to avoid such route passing through environmental sensitive spots such as centralized residential areas; the transport shall be carried out in the nighttime whenever possible. (3) During construction, spoils shall be reused where possible. For spoils which cannot be reused, the Employer has designated spoil ground at EIA stage. Therefore, during construction, spoils shall be transported and stockpiled strictly in compliance with the requirements. (4) During construction, small temporary refuse stockpile yards shall be provided on construction site; domestic refuses shall be	Contractor	Environmental supervision engineer and independent environmental management consultant	Filed supervision by the environmental supervision engineer; Compliance to the specifications	Daily

Link and elements	Potential impact/issue	Mitigation measures	Implementation responsibilities	Monitoring responsibilities	Monitoring indicators	Monitoring frequency
		sorted on worksite and handed over to the nearby urban sanitation department which sends them regularly to the urban refuse disposal yard. The maintenance and management of the refuse stockpile yards shall be strengthened, so as to avoid the disorder of randomly stacked garbage; Temporary stockpile yards for construction waste shall not be located in drinking water source protection zone or near the river. Additionally, they shall be sprayed regularly with sterilization and insecticide liquid to reduce the breeding of mosquitoes and bacteria. (5) In addition, desilting of flood discharge channels under Yingjing County Subproject will produce some sludge (1t) and garbage (2400m³) both of which shall be removed in parallel with excavation to the waste compression transfer station in Yingjing County for dehydration and compaction and then hauled to the landfill for disposal.				
Water and soil loss	Effect on conservation of water and soil in the area	Protective measures for top of the side slope shall be taken before excavation of the side slope in main works. Temporary drainage ditch must be provided around the excavated area and sand trap must be provided along the drainage ditch. The temporary drainage ditch shall be backfilled after use and be afforested. For embankment filling, temporary chutes shall be provided along the side slopes on both sides of the subgrade to make rainwater discharged along the chute to the outside of subgrade, so as to avoid scouring the side slopes. For masonry works in respect of excavation and backfilling of side slopes, the side slopes shall be protected with blocks immediately after the design stability is obtained, meanwhile, drainages systems shall be provided for the slope surfaces and toes, so that each section can be reinforced upon completion of construction. Measures such as slope protection by grids, building facing walls, and planting grass between the grids or cambers shall be taken for the side slopes of subgrade on the excavated and filled road sections. Grass and tree planting on the side slopes can effectively conserve water and soil, as well as beautify such road sections. According to the soil conditions, the combined planting patterns of arbores and shrubs shall be adopted for the protected land	Contractor	Environmental supervision engineer and independent environmental management consultant	Filed supervision by the environmental supervision engineer; Compliance to the specifications	Daily

Link and elements	Potential impact/issue	Mitigation measures	Implementation responsibilities	Monitoring responsibilities	Monitoring indicators	Monitoring frequency
		areas on both sides of the road, with a row of shrubs inserted after a row of tall and straight evergreen arbores are planted. Moreover, some fast-growing grasses shall be densely planted to avoid soil and water loss on the loose exposed surface within the protected land area in the early days of planting arbores and shrubs, so as to make them form an integrated ecological community system.				

3.3 Environmental protection measures and suggestions in operation period

Table 3-3 List of environmental impact and mitigation measures during operation stage

Link and elements	Potential impact/issue	Mitigation measures	Implementation responsibilities	Monitoring responsibilities	Monitoring indicators	Monitoring frequency
Ecological Environment	Landscape impact	1. The following environmental protection measures will be mainly taken during the operation period of road works: Maintain the landscaping works on both side of the road and regularly adjust border trees to ensure that the landscaping works achieve design effect.	Owner	Local environmental protection bureaus	Compliance to the specifications Environmental monitoring plan prepared	Upon completion
Atmospheric environment	Road impact	(1) Improving greening measures, optimizing greening tree varieties, greening structure and layer, improving the greening effect and reducing impact of gaseous pollutants on surrounding environment. (2) Enhance traffic management and limit running speed of vehicles to reduce accidents; arrange vehicle transport route properly; prohibit vehicles carrying hazardous goods from passing. (3) For fuel vehicles, quality of fuel shall be subject to high standard. High-quality fuel shall be used to reduce pollutant emission. The inspection system for car exhaust emission shall be implemented strictly. Vehicles having excessive emission of exhaust or transport excessive residues are not allowed to get on the road. (4) Establish teams specialized in road maintenance, repair and cleaning to keep the roads clean and running in a good condition; In rainless days, the	Owner	Local environmental protection bureaus	Compliance to the specifications Environmental monitoring plan prepared	Monthly

Link and elements	Potential impact/issue	**Mitigation measures**	Implementation responsibilities	Monitoring responsibilities	Monitoring indicators	Monitoring frequency
		sprinkler is operated to spray water and decrease the dust, while HPAM solution is used for the surface of loam to enhance the adhesion strength and water stability of loose ground and reduce the dust.				
Water environment	Road impact	A semi-division drainage system will established to collect rainwater in the preliminary period and then discharge the collected sewage to river channels after sedimentation.	Owner	Local environmental protection bureaus	Compliance to the specifications Environmental monitoring plan prepared	Monthly
	Domestic sewage from the refugee square	Permanent toilets will be provided for some refugee squares of the Project. Domestic sewage from these squares will be properly treated with the existing urban sewage pipe network (tank cars provided for toilets where there is no urban sewage pipe network) and sewage treatment plants according to Class A, Grade I of *Discharge Standard of Pollutants for Municipal Wastewater Treatment Plant* (GB18918-2002). Thus, the impact on the surface water environment is minor.	Owner	Local environmental protection bureaus	Compliance to the specifications Environmental monitoring plan prepared	Monthly
	Wastewater from purification plant works	During the operation period of Lianghekou Water Plant of Baoxing County, production wastewater is mainly composed of the discharged mud-bearing water from the sedimentation tank and the backwash wastewater from the filtration tank. The backwash wastewater is recycled through the recycling tank without being discharged. The upper clean layer of mud-bearing water is discharged as per relevant standard into an adjacent flood draining ditch. During the operation period of the water purification plant, the amount of domestic sewage will be about 1.2m^3/d, including main pollutants of COD, BOD_5, SS, ammonia nitrogen, etc. Domestic sewage of the purification plant is regularly transported to local treatment plant by sewage tankers for disposal.	Owner	Local environmental protection bureaus	Compliance to the specifications Environmental monitoring plan prepared	Monthly
Acoustic environment	Impact on road traffic	(1) Reasonable planning, architectural layout and control of land on both sides of road As the areas along the new road are poorly	Owner	Local environmental protection bureaus	Compliance to the specifications Environmental	Monthly

Link and elements	Potential impact/issue	**Mitigation measures**	Implementation responsibilities	Monitoring responsibilities	Monitoring indicators	Monitoring frequency
		developed, it is suggested that at the same time of rationally planning land functions along the road, architectural layout and soundproof be improved in construction works, especially in real estate development projects so as to ensure interior environment of sensitive buildings can satisfy the functional requirements. It is suggested that the row of houses beside the road be constructed as non-teaching or residential multi-story buildings having at least 3 floors, which can not only satisfy the shortage of urban land use, but isolate traffic noise for the buildings behind. (2) Strengthening greening Due to precious urban land resource, it is not likely to construct a wide green belt along the road. Thus, it is suggested that border trees be planted to mitigate the impact of noise on acoustic environment on both sides of the road in a combined and three-dimensional manner of landscaping. The real estate developer may provide a green belt of a certain width on the roadside to reduce noise, control dust and improve community landscape. (3) Reducing noise source radiation Vehicles entering the city should be controlled at the night, and sensitive road sections shall have restrictions on speed at night. Strengthen regulation on vehicle whistle by erecting signboards for “No Whistling” and “Slow Down” on either side of the school and hospital; strengthen urban road maintenance and management by repairing damaged pavement in a timely manner and limiting over-speed, over-weighted and oversized vehicles. (4) Sound insulating glass should be erected around some areas where mid- and long-term noise exceeds the limit and traffic control should be strengthened after the road is completed and put into operation to avoid out-of-limit noise due to traffic jam; vehicle			monitoring plan prepared	

Link and elements	Potential impact/issue	**Mitigation measures**	Implementation responsibilities	Monitoring responsibilities	Monitoring indicators	Monitoring frequency
		noise monitoring should be enhanced to control vehicles producing out-of-limit noise on the road.				
Solid waste	Road wastes	The waste will be collected manually on a regular basis and hauled to the landfill via a waste transfer station.	Owner	Local environmental protection bureaus	Visual inspection; Wastes handling records; Compliance to the specifications	Monthly
	Wastes from purification plant	Solid wastes in production area of water treatment plant under Baoxing County Subproject are drying sludge and office and domestic garbage. The subproject will produce drying sludge at a capacity of about 1.4t/d. There are about 18 persons engaged in production in the plant area, practicing three-shift a day. Through calculation taking the average domestic garbage in the office area of 0.5kg per person, the daily domestic garbage in the office area can be obtained as 3kg or so. Disposal measures: drying sludge will be transported to the landfill for disposal; office and domestic garbage shall be collected in a concentrated manner and disposed uniformly by local sanitary department.	Owner	Local environmental protection bureaus	Visual inspection Wastes handling records; Compliance to the specifications	Monthly
	Wastes from refugee square	The majority of solid wastes in the operation period of emergency refuge squares comes from the garbage left by the residents nearby and domestic garbage from the staff at the refuge square emergency command center; the domestic garbage shall be collected in a concentrated manner and handed over to local sanitation department for uniform disposal.	Owner	Local environmental protection bureaus	Visual inspection Wastes handling records; Compliance to the specifications	Monthly
Social environment	Effectiveness of complaints mechanism	A complaint mechanism will be set up, a complaint hotline will be provided, and it will be posted at main access of each works area. Each individual case will be recorded and a writing reply to solutions will be sent in 3 weeks.	Owner	Local environmental protection bureaus	/	/

4. Implementation Organizations of Environmental Management Plan

4.1 Environmental management and supervision organization

4.1.1 Management requirements for the Contractor

In the process of project construction, the Contractor and the Construction Contractor will play a key role in environmental management, pollution control, implementation of preventive measures and other aspects. Therefore, the Contractor is required to do the following:

(1) The Contractor must have related capabilities and financial resources to ensure effective execution of environmental management plan;

(2) All environmental impact mitigation measures during construction period shall be included in the bidding documents of the Contractor and eventually embraced by the Construction Contract as the contract requirements for the Contractor of the Project.

(3) The Contractor needs to provide 1 full-time environmental worker who will monitor and record the environmental activities in construction, offer environmental records to the Client or the environmental protection supervision organization once a week or as required for supervision and check.

(4) The Contractor and the environmental workers appointed by him, the Construction Supervisor and so on must receive the training in respect of environmental protection and management prior to commencement, thus they are qualified for their jobs.

(5) In the process of construction, the Contractor must keep communications and negotiations with the general public in the project area, and erect billboards at each construction unit to inform the public of the concrete construction activities and time. Moreover, he must provide the name and telephone of contact person, so as to receive the complaints and suggestions about the construction activities from the public.

4.1.2 Environmental management organization

4.1.2.1 Environmental management system and procedure

The environmental management system and procedure for the Project is presented in Table 4-1. Environmental management and its organization are shown in Fig. 4-1.

Table 4-1 Table of environmental management system and procedure

Project stage	Content of environmental protection	Implementation organization of environmental protection measures	Environmental protection and management department	Environmental protection and supervision department
Construction period	Implement environmental protection measures and handle environmental emergencies	The Construction Contractor	Environmental protection bureaus of each county/district and the Employer	The Supervisor, provincial and municipal environmental protection bureaus
Operation period	Implement environmental protection measures and environmental management	The Employer or Operation Management Organization	Environmental protection bureaus of each county/district	Provincial and municipal environmental protection bureaus

4.1.2.2 Organization of environmental management and responsibilities

1. Environmental protection and management organization

Environmental protection and management organizations and their responsibilities are

shown in Table 4-2.

Table 4-2 Organization of environmental management and responsibilities

Name	Responsibilities
Sichuan Urban Environment Project Office	Coordinate and manage the work of World Bank Loaned Lushan Earthquake Reconstruction and Risk Reduction Project and ensure that environmental protection meets the requirements of WB security policies.
Ya'an Project Office	Be responsible for all environmental management work, including effective execution of mitigation measures, supervision & monitoring, and making budget security and reporting to World Bank and the local environmental protection bureau; Ensure that measures in the environmental management plan can be included in the bidding documents and construction contract; Supervise and manage the Construction Contractor to implement pollution prevention and control measures, and promptly notify the Construction Contractor of any violations; Ensure that the contents of supervision and management executed by the environmental protection bureau can be incorporated into the bidding documents and the contract singed with the supervision engineer and supervision and participate in the monitoring of the works; Organize the training concerning environment for the contractors and environmental supervision engineer.
Each Subproject Office	Each Subproject Office will implement the infrastructure construction works financed by World Bank, including procurement, construction management, implementation of security guarantee policies and compliance, monitoring and reporting.
Environmental Protection Bureau of Ya'an City; Environmental Protection Bureau of each district/county	Instruct the Employer to implement national environmental protection laws and regulations and be responsible for approval; supervise the implementation of various environmental protection measures for the proposed project; take overall charge of the inspection and acceptance of environmental protection for the proposed project.
County/District Transport Bureau	Take charge of detailed work in supervision and management of environmental protection measures for the road subprojects under its jurisdiction in operation period.
County/District Water Resources Bureau	Take charge of detailed work in supervision and management of environmental protection measures for the river control subprojects under its jurisdiction in operation period.
County/District Environmental Protection Bureau	Take charge of detailed work in supervision and management of environmental protection measures for the World Bank Loaned Project under its jurisdiction in operation and construction periods.

4.1.2.3 Supervision organization

Environmental protection supervision organizations and their responsibilities are shown in Table 4-3.

Table 4-3 Environmental protection supervision organizations and their responsibilities

Name	Responsibilities	Remarks
Environmental Protection Bureau of Ya'an City	Be responsible for review and approval of EIA documents for the proposed project; supervision of the implementation of various environmental protection and management measures for the proposed project; inspection and acceptance of environmental protection for the proposed project.Carry out supervision and management of environmental protection work for the construction project; organize and coordinate relevant agencies to provide service for environmental protection work; supervise the	Environmental Protection Administration
Municipal environmental protection bureau		

Name	Responsibilities	Remarks
	implementation of EMP; take charge of completion acceptance of environmental protection facilities of the project; confirm environmental regulations and standards applicable to the project; instruct County/District Environmental Protection Bureau on environmental supervision and management in construction and operation periods; accept, investigate and coordinate the handling of public complaints about environment and supervise improvement of environmental protection facilities and measures.	
7 County/District Environmental Protection Bureaus	Accept work instructions from environmental protection department at a higher level, supervise the Employer's implementation of EMP and relevant environmental management regulations and standards; coordinate various departments to carry out environmental protection work; take charge of inspection, supervision and management of construction, completion and operation of environmental protection facilities under its jurisdiction; accept, investigate and coordinate the handling of public complaints about environment and supervise the improvement of environmental protection facilities and measures.	District Environmental Protection Bureaus: Mingshan District and Yucheng District; County Environmental Protection Bureaus: Baoxing, Lushan, Yingjing, Shimian and Tianquan counties;
External Environmental Monitoring Consultant	Environmental supervision in project preparation period includes: review provisions on environmental protection in the *Project Construction Organization Plan* prepared by the Construction Contractor; check whether the environmental protection system established by the Construction Contractor is reasonable; participate in the approval of the submitted *Unit Project Commencement Report*; conduct engineering supervision of construction of pollutant treatment works. Environmental supervision in construction period includes: prepare *Key Points of Environmental Protection Work* based on construction organization design for each lot; publicize environmental protection to the Construction Contractor; point out sensitive spots vulnerable to environmental pollution for the Construction Contractor; propose detailed environmental protection measures based on major pollutants in the construction process; review the *Scheme for Environmental Protection during Project Construction* submitted by the Construction Contractor; inspect whether the Construction Contractor's environmental protection system operates normally; check the implementation of environmental protection measures; supervise the construction of water and soil conservation measures. Environmental supervision in operation period includes: review the *Final Report on Environmental Protection during Project Construction* prepared by the Construction	At the next stage, determine External Monitoring Consultant through bidding.

Name	Responsibilities	Remarks
	Contractor; compile completion documents on environmental protection; carry out acceptance of environmental protection work for the project; prepare the *Final Report on Environmental Supervision*, etc.	

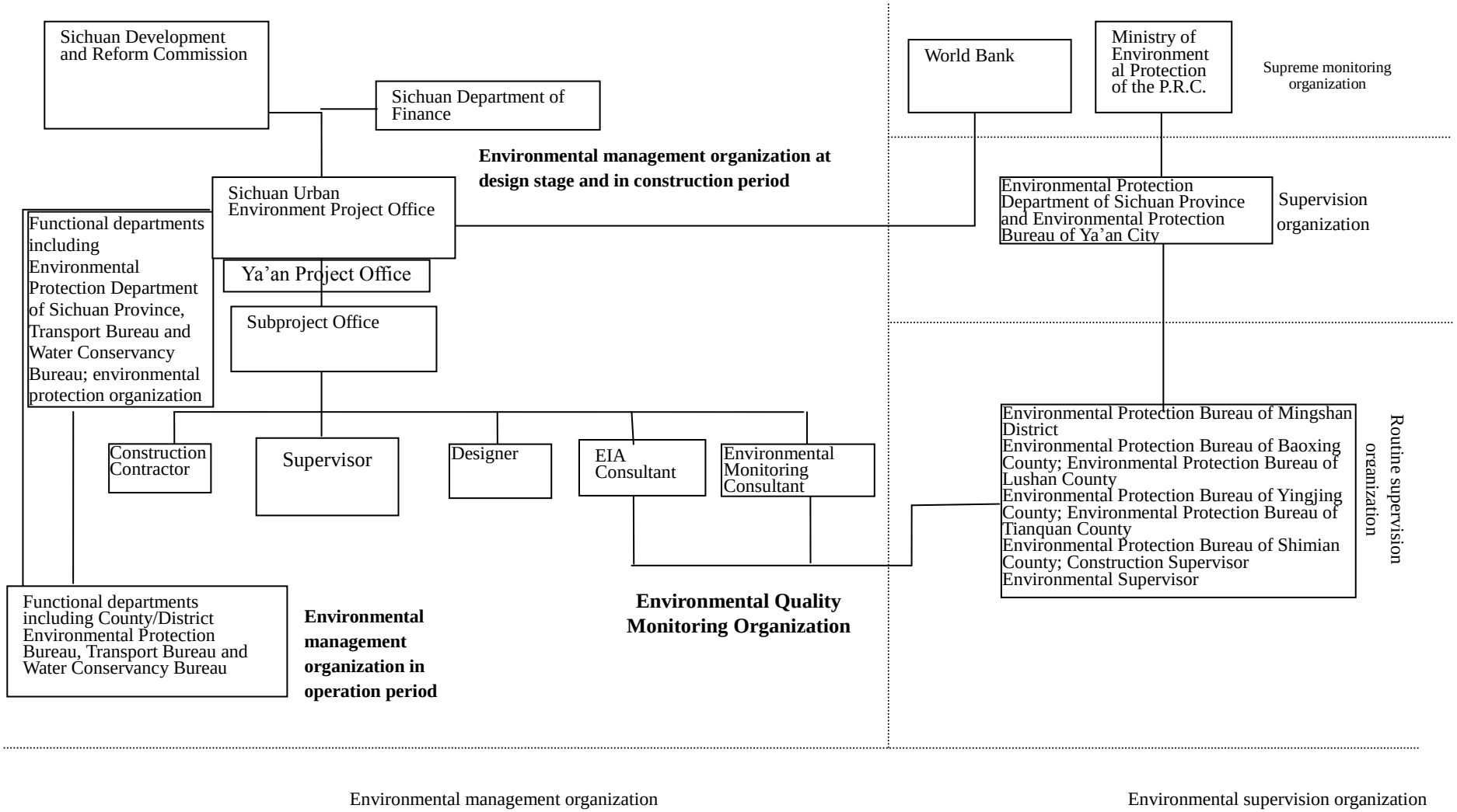

Fig. 4-1 Environmental management and supervision organization framework for World Bank Loaned Lushan Earthquake Reconstruction and Risk Reduction Project

4.1.3 Environmental management responsibilities

1. Construction period

Environmental management personnel shall make detailed environmental management plan based on the construction plan of the Project and shall check it and make necessary amendments on a monthly basis.

Also, they shall patrol the construction site to check the Construction Contractor's fulfillment of various environmental protection measures during construction period according to the plan; they shall be responsible for commissioning or arranging the monitoring work which must be done at fixed time and fixed location as planned; in each month, they shall report the check and monitoring results and on-site handling comments to the project leaders, report the environmental management inspection results at regular intervals, and propose targeted solutions to potential environmental problems found in such inspection.

The hotline workers shall be responsible for recording and sorting out the complaint calls, reporting the complaints to the environmental management personnel and explain the problem handling results to the public.

2. Operation period

(1) Give publicity to and organize the implementation of relevant main national environmental protection guidelines, policies, statutes and regulations;

(2) Fulfill various environmental management systems established by the superior competent authorities;

(3) Arrange the implementation of environmental protection measures during operation period put forward in EIA report and environmental management plan;

(4) Lead and organize environmental monitoring work during project operation period and create monitoring files;

(5) Registering the wastewater volume and water quality of all pollutant discharging units getting into the sewage pipe network system of the Project and supervising the operation conditions of sewage pretreatment facilities of such units shall be commissioned or turned over to Environmental Protection Bureau of Lushan County, according to the coordination between various functional departments of local governments.

(6) Annually report the environmental monitoring results and environmental management inspection results to Sichuan Urban Environment Project Office as required and propose targeted solutions to potential environmental problems found in the inspection.

4.2 Training and capacity building

The target group of environmental management training in the Project includes executive and technical staff of PMO, the Client, construction organization and supervision organization.

After the Construction Contractors and the Supervisors of the Project are determined, the Client shall be responsible for organizing the Environmental Protection Training Class for World Bank Loaned Lushan Earthquake Reconstruction and Risk Reduction Project, which will lasts 2-3 days before the commencement of the Project. The training may be conducted in any college, university, scientific research institute or other organizations in Chengdu City. It is required that the Client, all Construction Contractors and Supervisors respectively appoint at least one responsible engineering technical person and one environmental management person to participate in the training.

The training contents involve:

(1) National and Sichuan Provincial laws and regulations, documents and requirements in respect of environmental protection, water & soil conservation and so on in the

management of construction project;

(2) Environmental protection measures proposed in the design of the Project and environmental protection requirements during construction and operation periods;

(3) Environmental protection guidelines during construction and operation periods of the Project and other contents.

Responsible environmental protection designers from Environmental Protection Department of Sichuan Province, Municipal Environmental Protection Bureau and China Railway Eryuan Engineering Group Co., Ltd. and associated experts of the EIA Consultant may be invited to give instruction to the training class.

5. Environmental Supervision and Monitoring Plan

5.1 Objective, scope and stage

Environmental supervision is an important means to ensure effective implementation of EMP. Objectives of environmental supervision include: perform the obligation of environmental supervision to provide service to the project in an independent, just, scientific and effective way; implement all environmental supervision and management; ensure the project complies with China's laws, regulations and policies, WB technical standards and specifications, approved design documents, bidding documents, supervision and construction contracts as well as all requirements of environmental protection and management with regard to design, construction and operation.

Under the Contract, each Supervisor shall at least appoint one professional Environmental Supervision Engineer to carry out supervision and management of the Contractor's work in environmental protection by stages.

The scope of environmental supervision and management covers the project construction area and densely populated area of the project. It covers the whole process of construction including Construction preparation stage, construction stage and completion stage.

5.2 Content of environmental management

1. Environmental supervision prior to construction:

Prior to construction, Environmental Supervision Engineer shall ensure:

Evaluation of pollution prevention and control mechanism: review of treatment and disposal measures for sewage, refuse and solid wastes from construction, including selection of technology and feasibility.

Review of the Contractor's plan for construction land use to ensure it includes the measures below:

a) Measures for passable roads;
b) Measures to minimize interference and other damages.

Review of provisions on environmental protection in the construction contract: According to contract provisions, the Contractor shall meet all requirements for environmental protection. During construction, the Contractor shall carry out supervision, inspection and testing to minimize pollution in the construction process.

2. Environmental supervision in the construction period

Environmental Supervision Engineer shall carry out site supervision and management by stages, e.g. whether construction is in compliance with provisions on environmental protection and whether changes have been made without permission by the provisions. He shall, through monitoring, check whether operations during construction meet the requirements for environmental protection and whether the project meets the standard for environmental protection and ensure effective implementation of these measures. Main content:

Management of transport of surplus materials and traffic & transportation; supervision of the Contractor's construction plans for access roads to communities or businesses and measures for pedestrian safety;

Supervision and management of soil conservation measures and minimization of water pollution during construction; the measures include:

a) Soil conservation;
b) Spoil disposal;
c) Implementation of temporary and permanent measures for erosion control;
d) Implementation of measures for reducing sedimentation (sedimentation tank and mud and sand enclosure);

e) Ensure the designed measures for runoff control are applied where appropriate;
f) Normal operation of all sewage treatment facilities.

Supervision and management of production and domestic sewage treatment: inspect the progress of treatment and disposal of production and domestic sewage source and waste water, check treatment procedures and final disposal site and check and supervise whether the treatment measures comply with approved discharge standards.

Environmental supervision and management of air pollution: air pollution in the project area is caused primarily by vehicle exhaust and dusts in the construction process. Ensure the Contractor strictly implements dust control measures.

Environmental supervision and management of noise: noise reduction measures shall be implemented in accordance with engineering parameters and allowable noise values.

Environmental supervision and management of solid wastes: disposal of solid wastes must meet local requirements for disposal of solid wastes; effective cleaning measures shall be taken to keep construction site clean and tidy. Environmental Supervision Engineer will also supervise the spoil transport process which is the responsibility of building waste transport organization.

Environmental supervision and management of landscaping plan: vegetation protection measures, especially protection of trees and implementation of transplant measures in addition to implementation of the landscaping plan.

Environmental supervision and management of safety and health: ensure adequate safety and health measures in compliance with relevant codes and regulations are in place.

3. Supervision at the completion stage

Environmental Supervision Engineer shall carry out supervision and management of environmental recovery and the operation of all pollution prevention and control equipment, including:

(1) Supervision and management of the as-built documents;
(2) Organization of initial inspection;
(3) Assistance with WB Guang'an Project Office's organization of completion acceptance;

Preparation of the final report on environmental supervision and management of the project

4. Environmental management in operation period

Organization and implementation of environmental monitoring work in the operation period

5.3 Monitoring plan

5.3.1 Monitoring during construction period

Table 5-1 Summery of monitoring plan for water environment in construction period

S/N	Subproject name	Construction period			Operation period		
		Monitoring point	Monitoring item	Monitoring frequency	Monitoring point	Monitoring item	Monitoring frequency
1	Baoxing County Subproject	5 monitoring sections of Baoxing River and Donghe River, upstream and downstream of the Project and Shanmugou intake	Fecal coliform, pH, ammonia nitrogen, CODcr, petroleum and SS	Once in low and high flow periods respectively	1 monitoring section of Shanmugou intake	Fecal coliform, pH, ammonia nitrogen, volatile phenol, CODcr, BOD5, petroleum	Once in low and high flow periods respectively

						and SS	
2	Lushan County Subproject	6 monitoring sections of Luxigou, Xichuan River, Lushan River and upstream and downstream of the Project area	pH, ammonia nitrogen, CODcr, petroleum and SS	Once in low and high flow periods respectively			
3	Mingshan District Subproject	4 monitoring sections of Mingshan River, Huaixi River, and upstream and downstream of the Project area	pH, ammonia nitrogen, CODcr, petroleum and SS	Once in low and high flow periods respectively			
4	Yingjing County Subproject	4 monitoring sections of Yinghe River, Jinghe River, and upstream and downstream of the Project area	pH, ammonia nitrogen, CODcr, petroleum and SS	Once in low and high flow periods respectively	/	/	/
5	Shimian County Subproject	4 monitoring sections of Nanya River and Dadu River	pH, ammonia nitrogen, CODcr, petroleum and SS	Once in low and high flow periods respectively	/	/	/
6	Yucheng District Subproject	4 sections of Qingyi River and Longxi River	pH, ammonia nitrogen, CODcr, petroleum and SS	Once in low and high flow periods respectively	/	/	/
7	Tianquan County Subproject	2 monitoring sections of upstream and downstream of Tianquan River	pH, ammonia nitrogen, CODcr, petroleum and SS	Once in low and high flow periods respectively	/	/	/

Table 5-2 Summery of monitoring plan for atmospheric environment in construction period

S/N	Subproject name	Construction period			Operation period		
		Monitoring point	Monitoring item	Monitoring frequency	Monitoring point	Monitoring item	Monitoring frequency
1	Baoxing County Subproject	Air monitoring points for construction site, major schools near the project and densely populated area	PM_{10}	Monitored once each year in construction peak period	Major schools, densely populated areas, etc.	PM_{10}, NO_2 and SO_2	Once every year
2	Lushan County Subproject	Air monitoring points for construction site, major schools near the project and densely populated area	PM_{10}	Monitored once each year in construction peak period	Major schools, densely populated areas, etc.	PM_{10}, NO_2 and SO_2	Once every year

3	Mingshan District Subproject	Air monitoring points for construction site, major schools near the project and densely populated area	PM_{10}	Monitored once each year in construction peak period	Major schools, densely populated areas, etc.	PM_{10}, NO_2 and SO_2	Once every year
4	Yingjing County Subproject	Air monitoring points for construction site, major schools near the project and densely populated area	PM_{10}	Monitored once each year in construction peak period	Major schools, densely populated areas, etc.	PM_{10}, NO_2 and SO_2	Once every year
5	Shimian County Subproject	Air monitoring points for construction site, major schools near the project and densely populated area	PM_{10}	Monitored twice every year, each time for 3 days, sampled during construction	Major schools, densely populated areas, etc.	PM_{10}, NO_2 and SO_2	Once every year
6	Yucheng District Subproject	Air monitoring points for construction site, major schools near the project and densely populated area	PM_{10}	Monitored twice every year, each time for 3 days, sampled during construction	Major schools, densely populated areas, etc.	PM_{10}, NO_2 and SO_2	Once every year
7	Tianquan County Subproject	Air monitoring points for construction site, major schools near the project and densely populated area	PM_{10}	Monitored once each year in construction peak period	Major schools, densely populated areas, etc.	PM_{10}, NO_2 and SO_2	Once every year

Table 5-3 Summery of monitoring plan for acoustic environment in construction period

S/N	Subproject name	Construction period			Executed by	Administered by
		Monitoring point	Monitoring item	Monitoring frequency		
1	Baoxing County Subproject	Noise monitoring points for construction site, major schools near the project and densely populated area	Equivalent sound level A	Twice each year in construction peak period, each time for 2 days in both daytime and nighttime	Entrusted environmental supervision station	Subproject County/District Environmental Protection Bureau
2	Lushan County Subproject	Noise monitoring points for construction site, major schools near the project and densely populated area	Equivalent sound level A	Twice each year in construction peak period, each time for 2 days in both daytime and nighttime		
3	Mingshan District	Noise monitoring points for construction	Equivalent sound level	Twice each year in construction peak		

	Subproject	site, major schools near the project and densely populated area	A	period, each time for 2 days in both daytime and nighttime		
4	Yingjing County Subproject	Noise monitoring points for construction site, major schools near the project and densely populated area	Equivalent sound level A	Twice each year in construction peak period, each time for 2 days in both daytime and nighttime		
5	Shimian County Subproject	Noise monitoring points for construction site, major schools near the project and densely populated area	Equivalent sound level A	Twice each year in construction peak period, each time for 2 days in both daytime and nighttime		
6	Yucheng District Subproject	Noise monitoring points for construction site, major schools near the project and densely populated area	Equivalent sound level A	Twice each year in construction peak period, each time for 2 days in both daytime and nighttime		
7	Tianquan County Subproject	Noise monitoring points for construction site, major schools near the project and densely populated area	Equivalent sound level A	Twice each year in construction peak period, each time for 2 days in both daytime and nighttime		

5.3.2 Monitoring in operation period

Table 5-6 Summery of monitoring plan for acoustic environment in operation period

S/N	Subproject name	Operation Period			Executed by	Administered by
		Monitoring point	Monitoring item	Monitoring frequency		
1	Baoxing County Subproject	Major schools, densely populated areas, etc.	Equivalent sound level A	Once half a year, each time for 2 consecutive days	Entrusted environmental supervision station	Subproject County/District Environmental Protection Bureau
2	Lushan County Subproject	Major schools, densely populated areas, etc.	Equivalent sound level A	Once half a year, each time for 2 consecutive days		
3	Mingshan District Subproject	Major schools, densely populated areas, etc.	Equivalent sound level A	Once half a year, each time for 2 consecutive days		
4	Yingjing County Subproject	Major schools, densely populated areas, etc.	Equivalent sound level A	Once half a year, each time for 2 consecutive days		
5	Shimian County Subproject	Major schools, densely populated areas, etc.	Equivalent sound level A	Once half a year, each time for 2 consecutive days		
6	Yucheng District Subproject	Major schools, densely populated areas, etc.	Equivalent sound level A	Once half a year, each time for 2 consecutive days		
7	Tianquan County Subproject	Major schools, densely populated areas, etc.	Equivalent sound level A	Once half a year, each time for 2 consecutive days		

5.4 Management system

5.4.1 Record

For the sake of effective operation of environmental management system, the Client must organize and establish a sound record system and keep the records of the following:

(1) Requirements of laws and regulations;
(2) Project related reviews and replies;
(3) Environmental factors and associated environmental impacts;
(4) Training;
(5) Inspection, check and maintenance activities;
(6) Monitoring data;
(7) Problems in environmental management and protection;
(8) Effectiveness of mitigation measures;
(9) Information of relevant works.

In addition, the aforementioned various records must be subject to necessary control, including such links as identification, collection, cataloging, filing, storage, management, maintenance, inquiry, storage life and handling of records.

5.4.2 Report

In the project implementation process, Sichuan Urban Environment Project Office, the Client, the Contractor and the Monitoring Organization shall record the project progress, fulfillment of environmental management plan (EMP), environmental quality monitoring results and so on and report them to relevant departments promptly. The details include:

(1) The Monitoring Organization and the Contractor keep detailed records of the EMP fulfillment and report to the Client and Project Office in time.
(2) Sichuan Urban Environment Project Office has to finish the project progress reports (such as semiannual report and annual report) on time according to the requirements of World Bank and submit them to World Bank. The reports mainly contain the following:
    1) Implementation of environmental protection measures, environmental management and training plan in EMP;
    2) Project progress, such as the length of road that has been built and the length of pipe network that has been laid for drainage works;
    3) Whether or not there are complaints from the public. If there are, the main contents of complaints, solutions and public satisfaction index shall be recorded;
    4) Execution plan of EMP for the next year

6.0 Information Publicity and Public Participation

6.1 Public participation

Public consultation and compliant mechanism is a two-way communication between the Client and the general public, an important mechanism to eliminate the risks of the Project and reduce social impacts, as well as an important means to make the Project information open and transparent and realize public participation. One set of highly transparent and simple & feasible public consultation and compliant mechanism shall be established to handle the problems objectively, justly and efficiently so as to ensure smooth implementation of the Project.

Public interview and opinion survey is one important means to communicate with surrounding people during the construction period. The main respondents are mainly affected people around the Project. The people around the Project shall be interviewed and surveyed within 1-2 months before the Project completion to know whether environmental impact is caused during the construction period.

Public participation is widely conducted during preparation of *Environmental Impact Assessment* (EIA), so people's concerns are expressed in EIA/*Environmental Management Plan*. To minimize the impact, communication with persons affected by the Project will continue at the whole stages of the Project. The purpose of communication is to provide one two-way information channel, through which, implementation of the Project and *Environmental Management Plan* can be promoted to affected people so that feedback from these people on constructed project impacts can be timely sent to the Contractor and the Client.

At the Project implementation stage, the Contractor shall disclose relevant project content, main environmental problems and mitigation measures and release such information as per contact way of the Project construction site.

6.2 Complaint and Grievance Mechanism

Complaint and grievance mechanism functions a bidirectional communication between the Owner and the public, an important mechanism for reducing risk and social impact of the Project, and an important manner for information disclosure and public consultation. The PMO shall establish a high-transparency, simple and easy complaint collection and handling procedure to objectively, fairly and efficiently handle the public's complaint and ensure smooth implementation of social management plan.

The complaint and grievance subjects are the population subject to resettlement and land acquisition impact in the project area, other pollution, as well as the construction workers, etc.

Complaint and grievance content must be directly or indirectly associated with the Project.

Complaint and grievance objects show diversification, and mainly mean local grass-roots government organizations, higher level government organizations, PMO and judicial offices, etc.

Complaint and grievance manners are oral or written. Oral complaint and grievance refers to that the grievant reflects the problems or difficulties to the PMO, village community, other government department or relevant staff in verbal manner. Written complaint and grievance refers to that the grievant exhibits written application to relevant competent organization or department, indicating basic information of the grievant, matters, reasons, expected solutions or other opinions and recommendations, etc.

6.2.1 Collection manner

(1) Report from the village committee or township/neighborhood office, including complaints, progress, measures and existed problems;

(2) The construction unit must periodically report the construction conditions, problems found, mainly the impact of construction on the public to the Owner.

(3) The construction unit shall paste the bulletin at the construction site and campsite, indicating project overview, construction period, requirements of civilized construction, tel. of contact person for environmental protection complaint, etc. for the resident to appeal.

(4) Coordination information on environmental protection complaint found during patrol at the construction site by the Owner;

(5) Information fed back by the external monitoring organizations;

(6) Letter and visit of the affected person;

(7) Information fed back by the workstation dispatched by the Owner;

(8) Special problems fed back by the environmental protection department during inspection;

(9) Special internal monitoring investigation.

6.2.2 Procedures

- Stage 1

  The grievant proposes verbal or written grievance to the Village Committee or township & sub-district resettlement office. In case of verbal complaint, the Village Committee or sub-district resettlement office must make a written record and give a clear reply within two weeks. In case of major problems, instruction shall be obtained from the resettlement office at the higher level, and the resettlement management department at the higher level must try to give a reply within two weeks.

- Stage 2

  If the grievant does not satisfy the reply of Stage 1, he can complain to the PMO within one month after receiving the reply, and the PMO shall make a decision within three weeks.

- Stage 3

  If the grievant still does not satisfy the reply of Stage 3, he can apply for a suit to the People's Court within 15 days after receiving the reply from PMO.

6.2.3 Handling principles

The handling is made according to the principle of listening to the public's appeal on environmental protection during construction and operation of the Project, asking for their opinion and repeated negotiation with patience, and the handling opinions are to be given objectively and fairly according to national regulations, principles and standard in the EIA report. The grievance subject to handling incompetence must be reported to the resettlement department at the higher level, and the assistance shall be provided for investigation.

In the event that the organization fails to give a reply at the previous stage, the grievant is entitled to appeal.

6.2.4 Replay content and manner

1 Content

- Description
- Investigation results

- Relevant national regulations, RAP principle and standard
- Handling opinion and basis
- The grievant has the right to complain to the resettlement department at the higher level and sue in civil court, and the legal costs are to be paid by the Owner.

2 Manner

- The reply for the grievance on individual phenomenon is directly send to the grievant in written.
- The reply for the grievance reflected by more persons is to be informed to the community through Villager Meeting or issuance of document.

No matter what manner is used, the data on the reply must be sent to the resettlement department of the grievant.

6.2.5 Recording, tracking and feedback

The competent grass-roots organization shall record and manage the data on complaining and handling results, and report to the PMO monthly in written. The PMO shall periodically check the registration.

6.3 Specific method of public participation

Table 6.3-1 List of public participation methods for subprojects in World Bank Loaned Lushan Earthquake Reconstruction and Risk Reduction Project

S/N	Project name	Public participation methods used	Organization	Main participant	Date	Place	Remarks
1	World Bank Loaned Lushan Earthquake Reconstruction and Risk Reduction Project	Questionnaire Notice posting Conversazione of public survey	The Client and EIA Consultant	Affected persons in the project area	At EIA stage	Districts/ counties where subprojects are located	According to the survey, 100% respondents support construction of the Project, and no respondent shows objection to construction of the Project. Therefore, the construction of the Project wins absolute support from local people.
2		Public consultation and compliant	Client	Affected persons in the project area	Completion of early-stage project preparation work	Districts/ counties where subprojects are located	At project implementation stage, set public consultation and compliant points and establish regular public consultation and complaint mechanism at subproject locations.
3		Interview and survey	The Client and External Environmental Monitoring Consultant	Affected persons in the project area	Within 1-2 months before finish of project construction	Districts/ counties where subprojects are located	The residents around the Project shall be interviewed and surveyed within 1-2 months before the Project completion to know whether environmental impact is caused during the construction period.

7.0 Environmental Protection Training

7.1 Environmental protection technology and skills training

1. On-the-job training of environmental management personnel

The purpose of on-the-job training of environmental management personnel is to strengthen environmental management during construction period and operation period to ensure environmental monitoring quality and practical and effective environmental management so as to improve quality of the whole works. On-the-job training can make environmental management personnel possibly distinguish main environmental problems at construction stage and know more problems and deficiencies existing during environmental management so as to report the situation to the engineering environmental protection division (department) to adopt necessary control measures as quickly as possible. During construction, the Project management organization shall invite environmental protection experts or environmental management personnel with similar management experience to the site to explain possible environmental problems and solutions.

2. Training of persons responsible for construction and construction personnel of various works

Prior to commencement of the Project, the successful responsible person undertaking the Project construction and construction personnel shall receive systematic training on professional environment knowledge to avoid environmental disruption caused by misoperation. The purpose of training person responsible for contract is to define environmental protection responsibilities to be fulfilled by the Construction Contractor, while the purpose of training construction personnel is to strengthen correct operation methods of construction during construction to reduce unnecessary environmental disruption. The training can make the person responsible for works know his environmental protection responsibilities to be fulfilled and possible consequences that may occur in case of environmental disruption, and make construction personnel intuitively understand the degree and methods of environmentally-sensitive point protection. According to actual conditions of the Project, construction personnel training lasts for one week.

3. During the Project operation, the Project management organization shall conduct environmental protection knowledge training for employees so that they can identify possible environmental problems on their posts and take necessary measures. Each employee shall have environmental protection concept.

7.2 Training method and training cost

Table 7-1 Environmental protection training program for Baoxing County Subproject

S/N	Training object	Training content	Organizer	Number of trainees	Training time	Place	Budget (10,000 yuan)
1	The Client and relevant staff	Learn environmental protection and environmental management knowledge comprehensively, and know the content of environmental impact assessment	Sichuan Urban Environment Project Office and External Environmental Monitoring Consultant	3	1-2 days (at the same time of signing the contract upon the Project bidding)	Chengdu	1.0

S/N	Training object	Training content	Organizer	Number of trainees	Training time	Place	Budget (10,000 yuan)
		report and environmental management plan for the Project.					
2	The Supervisor's main principal and engineering environmental monitoring personnel	Environmental monitoring knowledge and content of environmental impact assessment report and environmental management plan for the Project as well as content of environmental protection design documents corresponding to the Project	Sichuan Urban Environment Project Office, the Client and External Environmental Monitoring Consultant	2		Chengdu	
	The Contractor's main technical principal and person responsible for construction	Environmental protection and environmental management knowledge	The Client and External Environmental Monitoring Consultant	3		Chengdu	
3	Construction personnel	The Project environmental protection knowledge and specific requirements	The Client and External Environmental Monitoring Consultant	20	Continuous training at the Project implementation stage	Baoxing	1.0
Total			/	/	/	/	2.0

Table 7-2 Environmental protection training program for Lushan County Subproject

S/N	Training object	Training content	Organizer	Number of trainees	Training time	Place	Budget (10,000 yuan)
1	The Client and relevant staff	Learn environmental protection and environmental management knowledge comprehensively, and know the content of environmental impact assessment report and environmental management plan for the Project.	Sichuan Urban Environment Project Office and External Environmental Monitoring Consultant	3	1-2 days (at the same time of signing the contract upon the Project bidding)	Chengdu	1.0
2	The	Environmental	Sichuan Urban	2		Chengdu	

	Supervisor's main principal and engineering environmental monitoring personnel	monitoring knowledge and content of environmental impact assessment report and environmental management plan for the Project as well as content of environmental protection design documents corresponding to the Project	Environment Project Office, the Client and External Environmental Monitoring Consultant				
	The Contractor's main technical principal and person responsible for construction	Environmental protection and environmental management knowledge	The Client and External Environmental Monitoring Consultant	3		Chengdu	
3	Construction personnel	The Project environmental protection knowledge and specific requirements	The Client and External Environmental Monitoring Consultant	20	Continuous training at the Project implementation stage	Lushan	1.0
Total			/	/	/	/	2.0

Table 7-3 Environmental protection training program for Mingshan District Subproject

S/N	Training object	Training content	Organizer	Number of trainees	Training time	Place	Budget (10,000 yuan)
1	The Client and relevant staff	Learn environmental protection and environmental management knowledge comprehensively, and know the content of environmental impact assessment report and environmental management plan for the Project.	Sichuan Urban Environment Project Office and External Environmental Monitoring Consultant	3	1-2 days (at the same time of signing the contract upon the Project bidding)	Chengdu	1.0
2	The Supervisor's main principal and engineering environmental monitoring personnel	Environmental monitoring knowledge and content of environmental impact assessment report and environmental management plan	Sichuan Urban Environment Project Office, the Client and External Environmental Monitoring Consultant	2		Chengdu	

S/N	Training object	Training content	Organizer	Number of trainees	Training time	Place	Budget (10,000 yuan)
		for the Project as well as content of environmental protection design documents corresponding to the Project					
	The Contractor's main technical principal and person responsible for construction	Environmental protection and environmental management knowledge	The Client and External Environmental Monitoring Consultant	3		Chengdu	
3	Construction personnel	The Project environmental protection knowledge and specific requirements	The Client and External Environmental Monitoring Consultant	20	Continuous training at the Project implementation stage	Mingshan	1.0
Total			/	/	/	/	2.0

Table 7-4 Environmental protection training program for Yingjing County Subproject

S/N	Training object	Training content	Organizer	Number of trainees	Training time	Place	Budget (10,000 yuan)
1	The Client and relevant staff	Learn environmental protection and environmental management knowledge comprehensively, and know the content of environmental impact assessment report and environmental management plan for the Project.	Sichuan Urban Environment Project Office and External Environmental Monitoring Consultant	3	1-2 days (at the same time of signing the contract upon the Project bidding)	Chengdu	1.0
2	The Supervisor's main principal and engineering environmental monitoring personnel	Environmental monitoring knowledge and content of environmental impact assessment report and environmental management plan for the Project as well as content of environmental protection design documents	Sichuan Urban Environment Project Office, the Client and External Environmental Monitoring Consultant	2		Chengdu	

		corresponding to the Project					
	The Contractor's main technical principal and person responsible for construction	Environmental protection and environmental management knowledge	The Client and External Environmental Monitoring Consultant	3		Chengdu	
3	Construction personnel	The Project environmental protection knowledge and specific requirements	The Client and External Environmental Monitoring Consultant	20	Continuous training at the Project implementation stage	Yingjing	1.0
Total			/	/	/	/	2.0

Table 7-5 Environmental protection training program for Shimian County Subproject

S/N	Training object	Training content	Organizer	Number of trainees	Training time	Place	Budget (10,000 yuan)
1	The Client and relevant staff	Learn environmental protection and environmental management knowledge comprehensively, and know the content of environmental impact assessment report and environmental management plan for the Project.	Sichuan Urban Environment Project Office and External Environmental Monitoring Consultant	3	1-2 days (at the same time of signing the contract upon the Project bidding)	Chengdu	1.0
2	The Supervisor's main principal and engineering environmental monitoring personnel	Environmental monitoring knowledge and content of environmental impact assessment report and environmental management plan for the Project as well as content of environmental protection design documents corresponding to the Project	Sichuan Urban Environment Project Office, the Client and External Environmental Monitoring Consultant	2		Chengdu	
	The Contractor's main technical principal and person responsible	Environmental protection and environmental management knowledge	The Client and External Environmental Monitoring Consultant	3		Chengdu	

S/N	Training object	Training content	Organizer	Number of trainees	Training time	Place	Budget (10,000 yuan)
	for construction						
3	Construction personnel	The Project environmental protection knowledge and specific requirements	The Client and External Environmental Monitoring Consultant	20	Continuous training at the Project implementation stage	Shimian	1.0
Total			/	/	/	/	2.0

Table 7-6 Environmental protection training program for Yucheng District Subproject

S/N	Training object	Training content	Organizer	Number of trainees	Training time	Place	Budget (10,000 yuan)
1	The Client and relevant staff	Learn environmental protection and environmental management knowledge comprehensively, and know the content of environmental impact assessment report and environmental management plan for the Project.	Sichuan Urban Environment Project Office and External Environmental Monitoring Consultant	3	1-2 days (at the same time of signing the contract upon the Project bidding)	Chengdu	1.0
2	The Supervisor's main principal and engineering environmental monitoring personnel	Environmental monitoring knowledge and content of environmental impact assessment report and environmental management plan for the Project as well as content of environmental protection design documents corresponding to the Project	Sichuan Urban Environment Project Office, the Client and External Environmental Monitoring Consultant	2		Chengdu	
	The Contractor's main technical principal and person responsible for construction	Environmental protection and environmental management knowledge	The Client and External Environmental Monitoring Consultant	3		Chengdu	
3	Construction personnel	The Project environmental protection	The Client and External Environmental	20	Continuous training at the Project	Yucheng	1.0

		knowledge and specific requirements	Monitoring Consultant		implementation stage		
Total			/	/	/	/	2.0

Table 7-7 Environmental protection training program for Tianquan County Subproject

S/N	Training object	Training content	Organizer	Number of trainees	Training time	Place	Budget (10,000 yuan)
1	The Client and relevant staff	Learn environmental protection and environmental management knowledge comprehensively, and know the content of environmental impact assessment report and environmental management plan for the Project.	Sichuan Urban Environment Project Office and External Environmental Monitoring Consultant	3	1-2 days (at the same time of signing the contract upon the Project bidding)	Chengdu	1.0
2	The Supervisor's main principal and engineering environmental monitoring personnel	Environmental monitoring knowledge and content of environmental impact assessment report and environmental management plan for the Project as well as content of environmental protection design documents corresponding to the Project	Sichuan Urban Environment Project Office, the Client and External Environmental Monitoring Consultant	2		Chengdu	
	The Contractor's main technical principal and person responsible for construction	Environmental protection and environmental management knowledge	The Client and External Environmental Monitoring Consultant	3		Chengdu	
3	Construction personnel	The Project environmental protection knowledge and specific requirements	The Client and External Environmental Monitoring Consultant	20	Continuous training at the Project implementation stage	Tianquan	1.0
Total			/	/	/	/	2.0

8.0 Investment in Environmental Protection

The implementation of *Environmental Management Plan* during construction & operation period has been budgeted, as shown in Table 8-1. The general budget of environmental investment includes environmental mitigation measures, environmental protection monitoring, engineering management and main works, as well as investment in slowing down or eliminating negative impact on environment. It should be noted that many mitigation measures are of managerial and practical nature, and its budget is included in overall contract and will not be specified. See the table below for environmental protection works and investment estimate of various subprojects:

Table 8-1 Summary of environmental protection measures and estimates for subprojects

S/N	Subproject name	Category	Item and construction content	Treatment measures	Investment (10,000 yuan)
1	Baoxing County Subproject	Water pollution control	Water for cooling and washing of construction machinery, for cleaning construction site, for cleaning building materials, for concrete placement & curing and for rinsing	Up-to-standard discharging upon sedimentation and filtering and comprehensive utilization of some parts	12
			Domestic sewage generated by construction personnel	Using existing treatment facilities in rented local house for treatment	3
			Water plant works	Transporting sewage by tank car	7
		Ambient air pollution control	Fuel machinery transportation vehicle and construction dust	Dust reducing by watering, arranging construction time & sequence reasonably and green belt	10.5
		Noise prevention measures	Construction machinery transportation vehicle	Traffic control measures, and using sound insulation facilities and greenbelts in high-noise work area	38
			Road and water plant works	Providing “no horn” signs and speed reducer, reserved noise cost, equipment shock-absorbing, sound-insulation	36
		Solid waste	Constructional garbage	Domestic garbage shall be collected at a designated place, and will be disposed uniformly with a small amount of construction wastes by local sanitary department.	38.5
			Solid wastes in production area of water purification plant are drying sludge and office and domestic garbage	Drying sludge will be transported to the landfill for disposal; office and domestic garbage shall be collected in a concentrated manner and disposed uniformly by local sanitary depart.	
		Soil and water conservation and ecological recovery	Temporary spoil yard works	Soil and water conservation measures and dust reducing by watering	43
			Construction excavation and permanent & temporary land occupation	Compensation and recovery	38
			Recovery and reconstruction of construction site and disposal yard	Vegetation recovery	35

S/N	Subproject name	Category	Item and construction content	Treatment measures	Investment (10,000 yuan)
		Environmental management and supervisory control	Construction period	Implement construction environmental supervision system, adopt contract constraint mechanism, incorporate relevant environmental protection measures into production quality management systems and acceptance index systems at various stages, strengthen specially-designated personnel supervision of construction dust, noise, water and soil loss control measures, etc. and promote laws and regulations on environmental protection.	55
		Environmental monitoring cost	Operation period	Ambient air and traffic noise monitoring	30
		Ecological measures	Road and water platn works	Greening	5
		Subtotal			351
2	Lushan County Subproject	Ecological environment	Water and soil loss control	Cover temporary disposal stacking yard with dustproof cloth	179
			Road works and emergency refuge square	Greening	12
		Noise	Construction machinery noise	Arrange construction time reasonably and strengthen management	6.5
			Traffic noise	Strengthen traffic control and set “no horn” and speed limit signs	10
		Water pollutant	Water for cooling and washing of construction machinery, for cleaning construction site, for cleaning building materials, for concrete placement & curing and for rinsing	Up-to-standard discharging upon sedimentation and filtering and comprehensive utilization of some parts	8
			Domestic sewage and fecal sewage	Used as farmyard manure	2
		Atmospheric pollutant	Fuel machinery transportation vehicle and construction dust	Using tarpaulin as construction enclosure, dust reducing by watering, arranging construction time and sequence reasonably, greenbelt and sludge & odor prevention	20
		Solid wastes	Demolition garbage and constructional garbage	Demolition garbage shall be cleaned and transported timely; domestic garbage shall be collected at a designated place, and will be disposed uniformly with a small amount of construction wastes by local sanitary department.	12
			Garbage generated during operation period	Set categorized garbage collecting bins and treat garbage uniformly by the sanitary department.	7
		Environmental management and supervisory	Construction period	Implement construction environmental supervision system, adopt contract constraint mechanism,	20

S/N	Subproject name	Category	Item and construction content	Treatment measures	Investment (10,000 yuan)
		control		incorporate relevant environmental protection measures into production quality management systems and acceptance index systems at various stages, strengthen specially-designated personnel supervision of construction dust, noise, water and soil loss control measures, etc. and promote laws and regulations on environmental protection.	
		Environmental monitoring	Construction & operation period	Area ambient noise and air quality	65
		Subtotal			341.5
3	Mingshan District Subproject	Ecological environment	Water and soil loss control	Cover temporary disposal stacking yard with dustproof cloth	8
			Vegetation recovery	Reclamation or complementarily planting trees and flowers	5
		Noise	Construction machinery noise	Arrange construction time reasonably and strengthen management	6.5
			Traffic noise	Strengthen traffic control and set “no horn” and speed limit signs	10
		Water pollutant	Water for cooling and washing of construction machinery, for cleaning construction site, for cleaning building materials, for concrete placement & curing and for rinsing	Up-to-standard discharging upon sedimentation and filtering and comprehensive utilization of some parts	6
			Domestic sewage generated by construction personnel	Using existing treatment facilities in rented local house for treatment	2
		Atmospheric pollutant	Fuel machinery transportation vehicle and construction dust	Dust reducing by watering, arranging construction time & sequence reasonably and green belt	18
		Solid wastes	Demolition garbage and constructional garbage	Demolition garbage shall be cleaned and transported timely; domestic garbage shall be collected at a designated place, and will be disposed uniformly with a small amount of construction wastes by local sanitary department.	12
			Garbage generated during operation period	Set categorized garbage collecting bins and treat garbage uniformly by the sanitary department.	4
		Environmental management and supervisory control	Construction period	Implement construction environmental supervision system, adopt contract constraint mechanism, incorporate relevant environmental protection measures into production quality management systems and acceptance index systems at various stages, strengthen specially-designated personnel supervision of construction dust,	20

S/N	Subproject name	Category	Item and construction content	Treatment measures	Investment (10,000 yuan)
				noise, water and soil loss control measures, etc. and promote laws and regulations on environmental protection.	
		Environmental monitoring	Construction & operation period	Area ambient noise, air quality and emergency surface water monitoring	65
		Subtotal			156.5
4	Yingjing County Subproject	Ecological environment	Water and soil loss control	Cover temporary disposal stacking yard with dustproof cloth	8
			Vegetation recovery	Reclamation or complementarily planting trees and flowers	5
		Noise Water pollutant	Construction machinery noise	Arrange construction time reasonably and strengthen management	6.5
			Traffic noise	Strengthen traffic control and set “no horn” and speed limit signs	10
			Water for cooling and washing of construction machinery, for cleaning construction site, for cleaning building materials, for concrete placement & curing and for rinsing	Up-to-standard discharging upon sedimentation and filtering and comprehensive utilization of some parts	6
			Domestic sewage generated by construction personnel	Using existing treatment facilities in rented local house for treatment	2
		Atmospheric pollutant Solid wastes	Fuel machinery transportation vehicle and construction dust	Using tarpaulin as construction enclosure, dust reducing by watering, arranging construction time and sequence reasonably, greenbelt and sludge & odor prevention	21.5
			Demolition garbage and constructional garbage	Demolition garbage shall be cleaned and transported timely; domestic garbage shall be collected at a designated place, and will be disposed uniformly with a small amount of construction wastes by local sanitary department.	12
			Garbage generated during operation period	Set categorized garbage collecting bins and treat garbage uniformly by the sanitary department.	4.5
		Environmental management and supervisory control	Construction period	Implement construction environmental supervision system, adopt contract constraint mechanism, incorporate relevant environmental protection measures into production quality management systems and acceptance index systems at various stages, strengthen specially-designated personnel supervision of construction dust, noise, water and soil loss control measures, etc. and promote laws and regulations on environmental protection.	20
		Environmental	Construction &	Area ambient noise, air quality and	65

S/N	Subproject name	Category	Item and construction content	Treatment measures	Investment (10,000 yuan)
		monitoring	operation period	emergency surface water monitoring	
		Subtotal			160.5
5	Shimian County Subproject	Ecological environment	Water and soil loss control	Cover temporary disposal stacking yard with dustproof cloth	211.8
			Vegetation recovery	Reclamation or complementarily planting trees and flowers	
		Noise	Construction machinery noise	Arrange construction time reasonably and strengthen management	5.5
			Traffic noise	Strengthen traffic control and set “no horn” and speed limit signs	18
		Water pollutant	Water for cooling and washing of construction machinery, for cleaning construction site, for cleaning building materials, for concrete placement & curing and for rinsing	Up-to-standard discharging upon sedimentation and filtering and comprehensive utilization of some parts	3
			Domestic sewage generated by construction personnel	Using existing treatment facilities in rented local house for treatment	3
			Operation period	Transporting sewage by tank car, regular maintenance of water supply and drainage pipe network	3
		Atmospheric pollutant	Fuel machinery transportation vehicle and construction dust	Dust reducing by watering, arranging construction time & sequence reasonably and green belt	39
		Solid wastes	Demolition garbage, constructional garbage and boring mud form bridge pile	Demolition garbage shall be cleaned and transported timely; domestic garbage shall be collected at a designated place, and will be disposed uniformly with a small amount of construction wastes by local sanitary department.	48
			Garbage generated during operation period	Set categorized garbage collecting bins and treat garbage uniformly by the sanitary department.	5
		Environmental management and supervisory control	Construction period	Implement construction environmental supervision system, adopt contract constraint mechanism, incorporate relevant environmental protection measures into production quality management systems and acceptance index systems at various stages, strengthen specially-designated personnel supervision of construction dust, noise, water and soil loss control measures, etc. and promote laws and regulations on environmental protection.	40
		Environmental monitoring	Construction & operation period	Area ambient noise, air quality and emergency surface water monitoring	25
		Subtotal			401.3
6	Yucheng District	Water pollution control	Construction wastewater, rinsing	Comprehensive utilization upon sedimentation and filtering and	1.5

S/N	Subproject name	Category	Item and construction content	Treatment measures	Investment (10,000 yuan)
	Subproject		wastewater, curing wastewater and domestic sewage	treating domestic sewage by surrounding existing facilities	
			Road and water during operation period	Discharging via rainwater pipe network and regular cleaning	3.0
		Ambient air pollution control	Transportation vehicle and construction dust during construction period	Dust reducing by watering, covering transportation vehicles and arranging construction time and sequence reasonably	6.0
			Vehicle exhaust during operation period	Strengthen management and greening on both sides, and prohibiting vehicles with excessive emission of tail gas from driving on the road	3.0
		Noise prevention measures	Machinery transportation vehicle during construction period	Arrange construction time reasonably and inspect construction equipment regularly	5.0
			Traffic noise during operation period	Strengthening management and regular monitoring	3.0
		Solid wastes	Waste earth-stonework and domestic garbage generated during construction period	Domestic garbage shall be collected at a designated place, while waste earth-stonework shall be transported to the designated disposal yard in Ya'an City	4.8
			Domestic garbage generated during operation period and garbage along the road	Domestic garbage shall be treated by the local sanitary department and road along the line shall be cleaned overtime by the curing team	4.5
		Environmental management and monitoring	Construction & operation period	Conduct environmental management and monitoring work	65.0
		Total			95.8
7	Tianquan County Subproject	Water and soil conservation	Construction period	Temporary protection measures	680.6
		Noise control	Construction period	1.8m high colored steel plate	141.77
		Ambient air protection	Construction period	Sprinkling water and providing tarpaulin for construction site and roads	10.0
			Operation period	Road cleaning	0.3
		Solid waste management	Construction period	Transportation of construction waste and provision of garbage can or garbage bin	4.48
			Operation period	Road garbage clearance	0.3
		Environmental monitoring	Construction & operation period	Air & noise environmental monitoring	24.0
		Environmental protection acceptance			25.0
		Total			887.05

Attached Figures

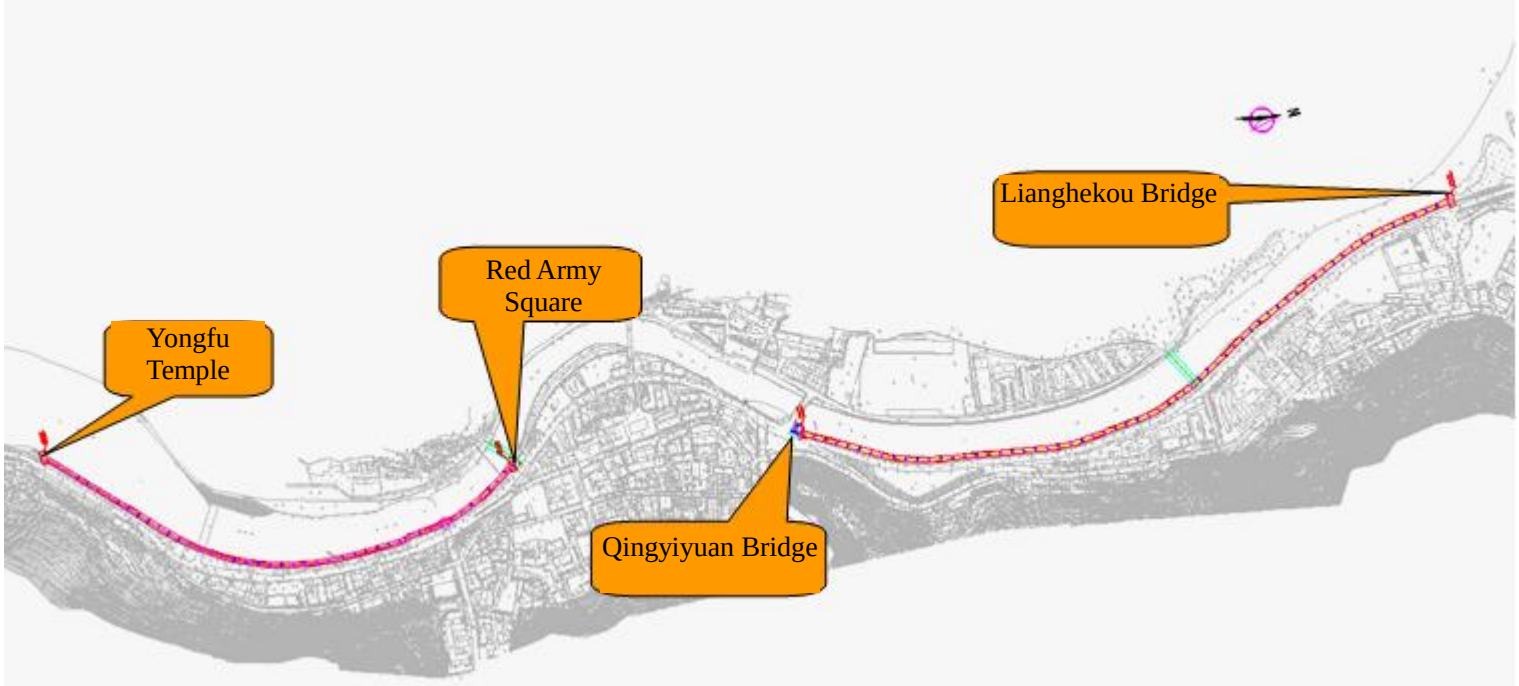

Fig. 1-1 General layout of emergency refuge passage along Yanjiang Road in Baoxing County

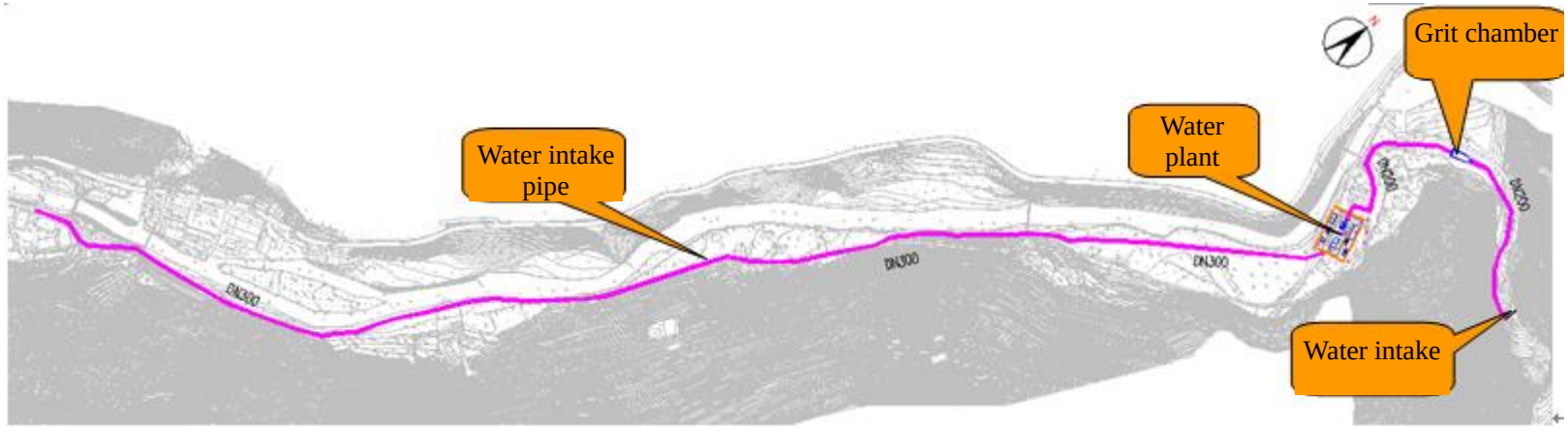

Fig. 1-2 General layout plan of Lianghekou Water Plant in Baoxing County

Fig. 1-3 General layout plan of Zhongling Road North in Baoxing County

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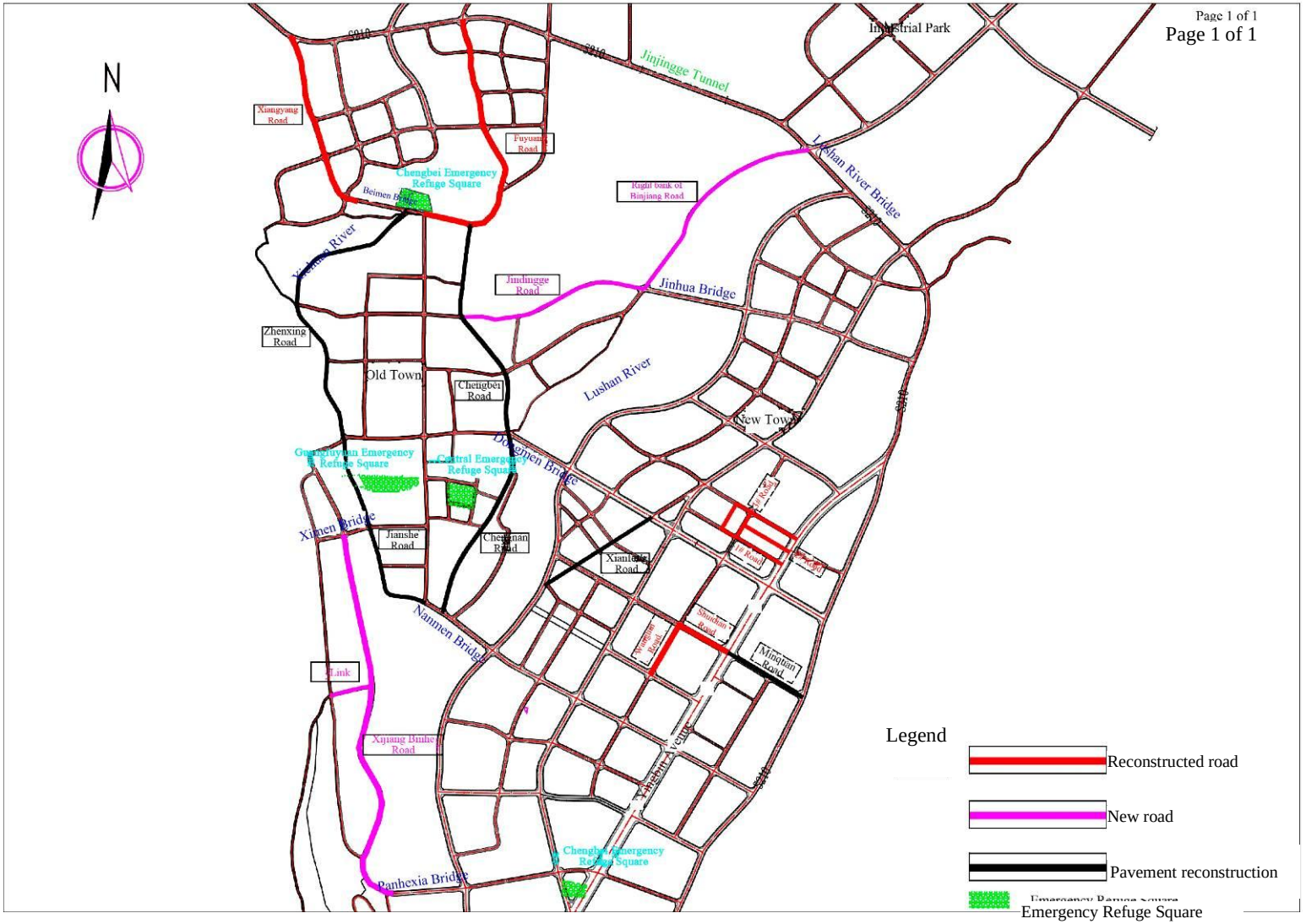

Fig. 2 General layout plan of Lushan County

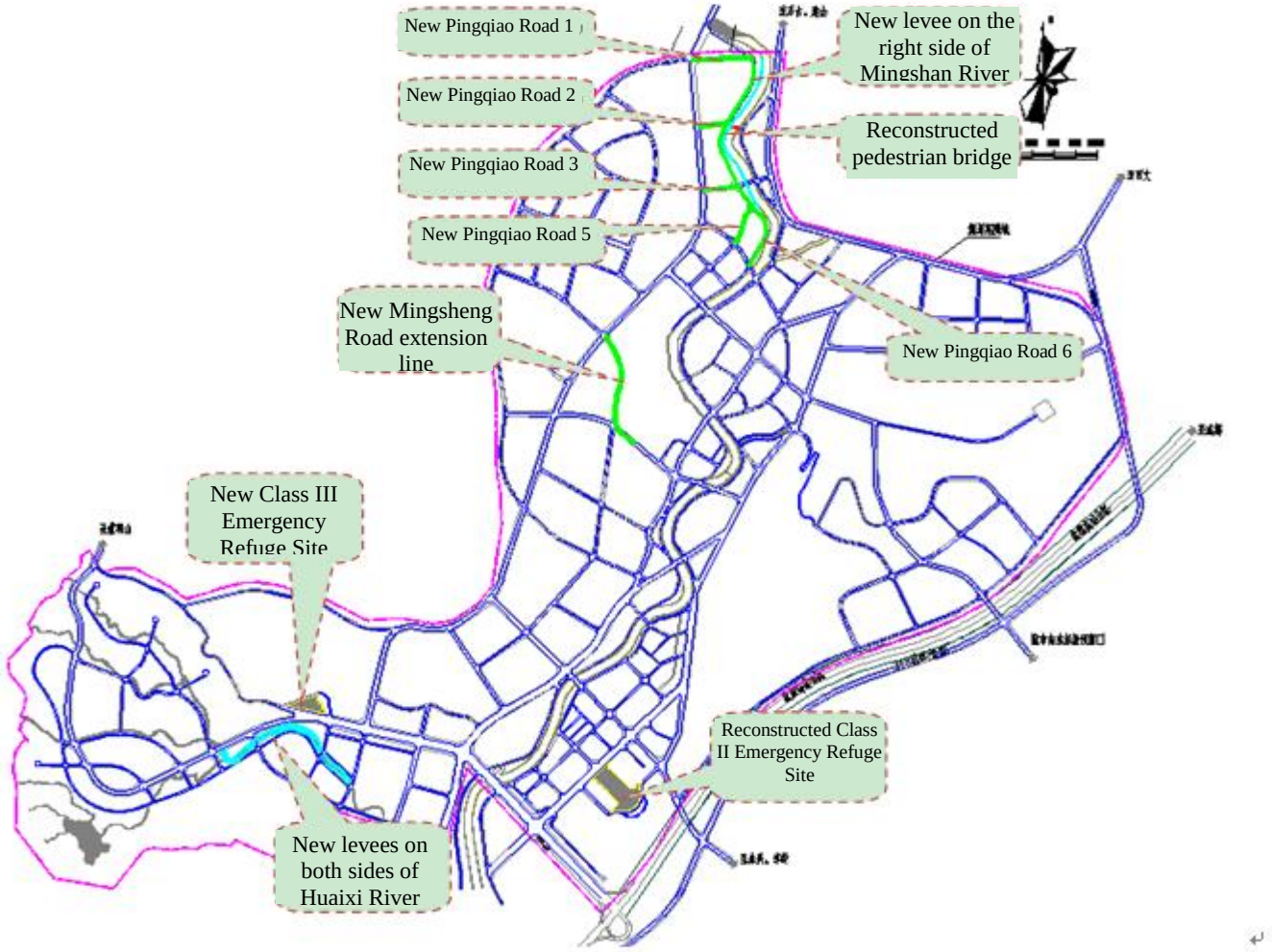

Fig. 3 General plane layout of Mingshan District

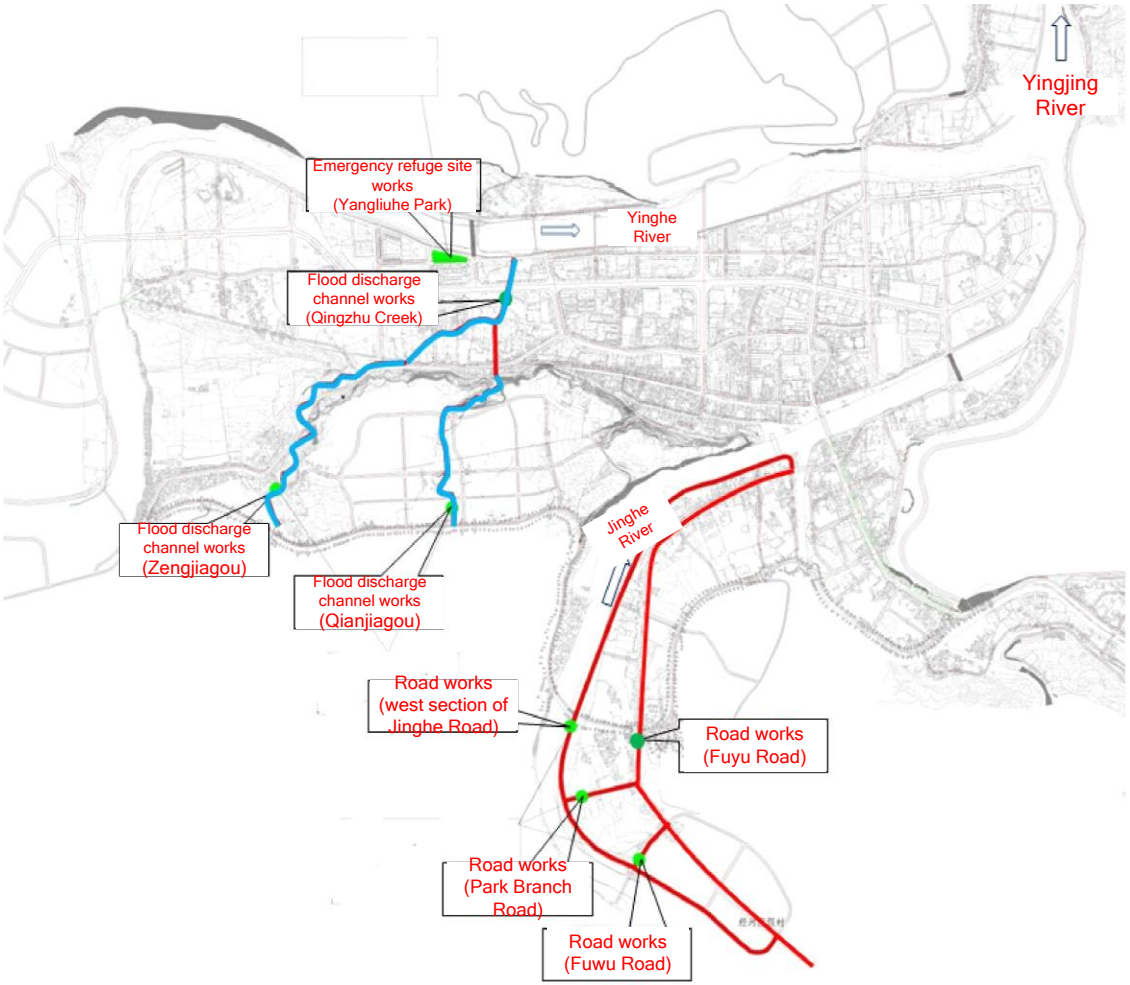

Fig. 4 General layout plan of Yingjing County

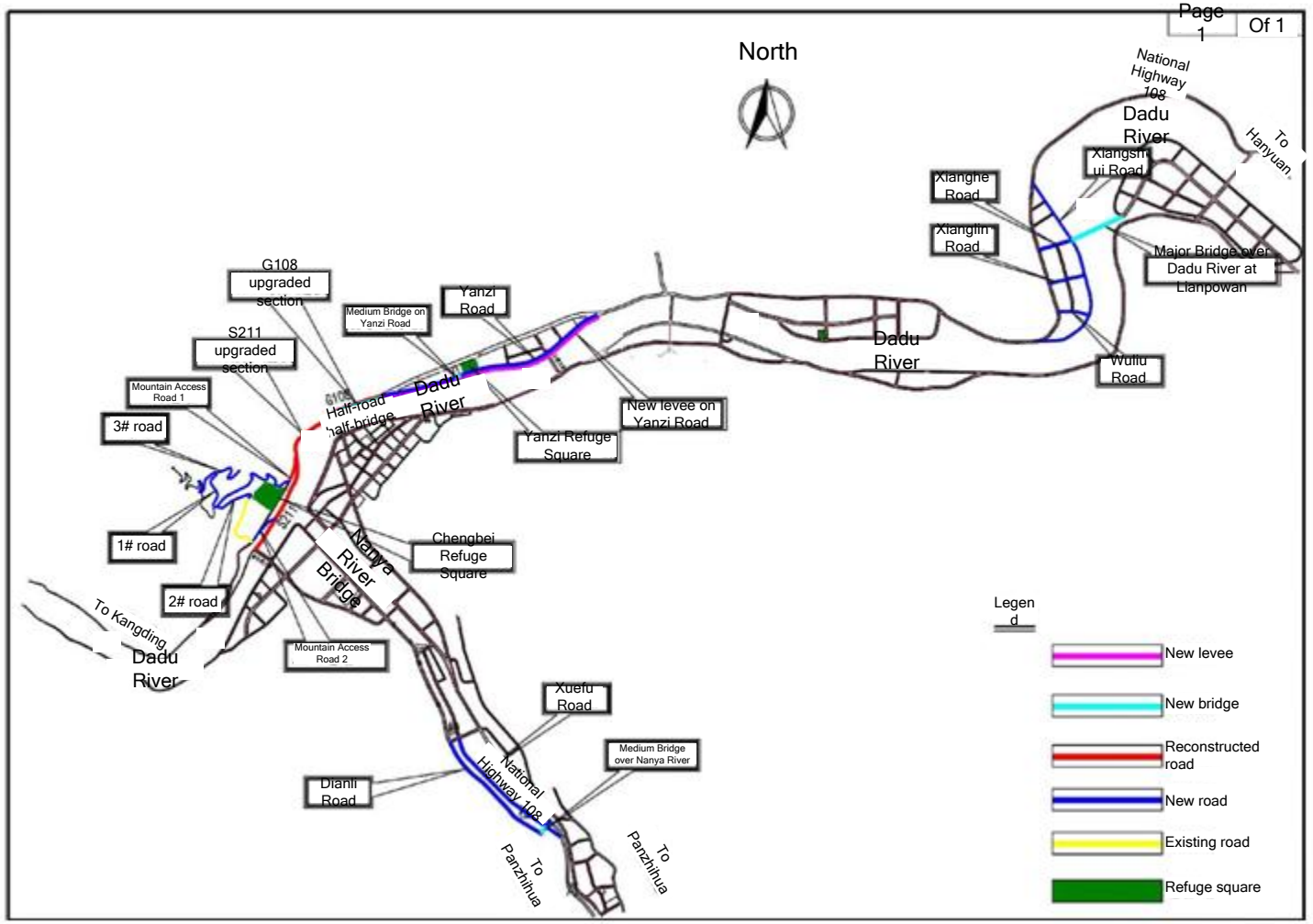

Fig. 5 General layout plan of Shimian County

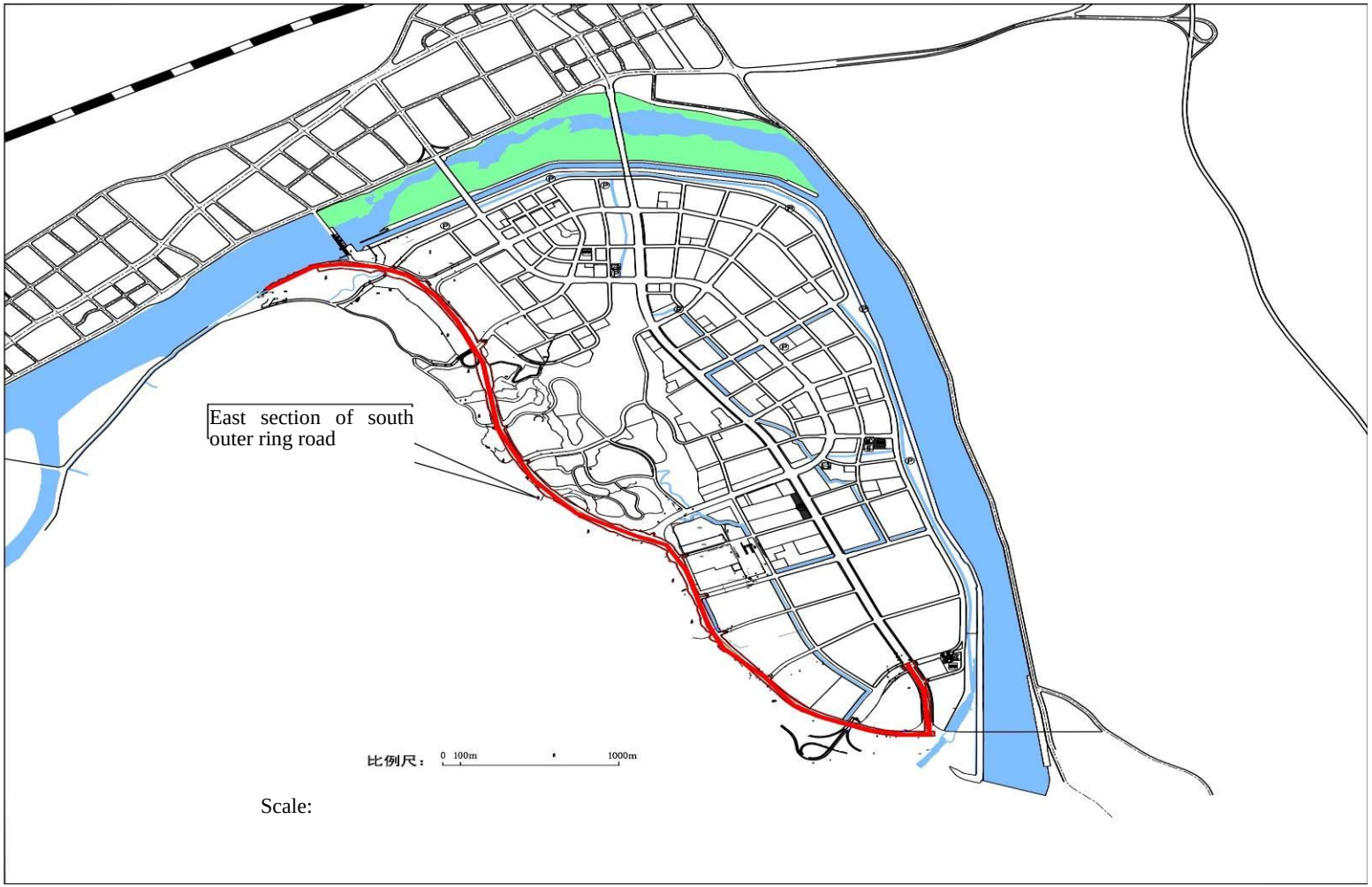

Fig. 6 General layout plan of roads in Yucheng District

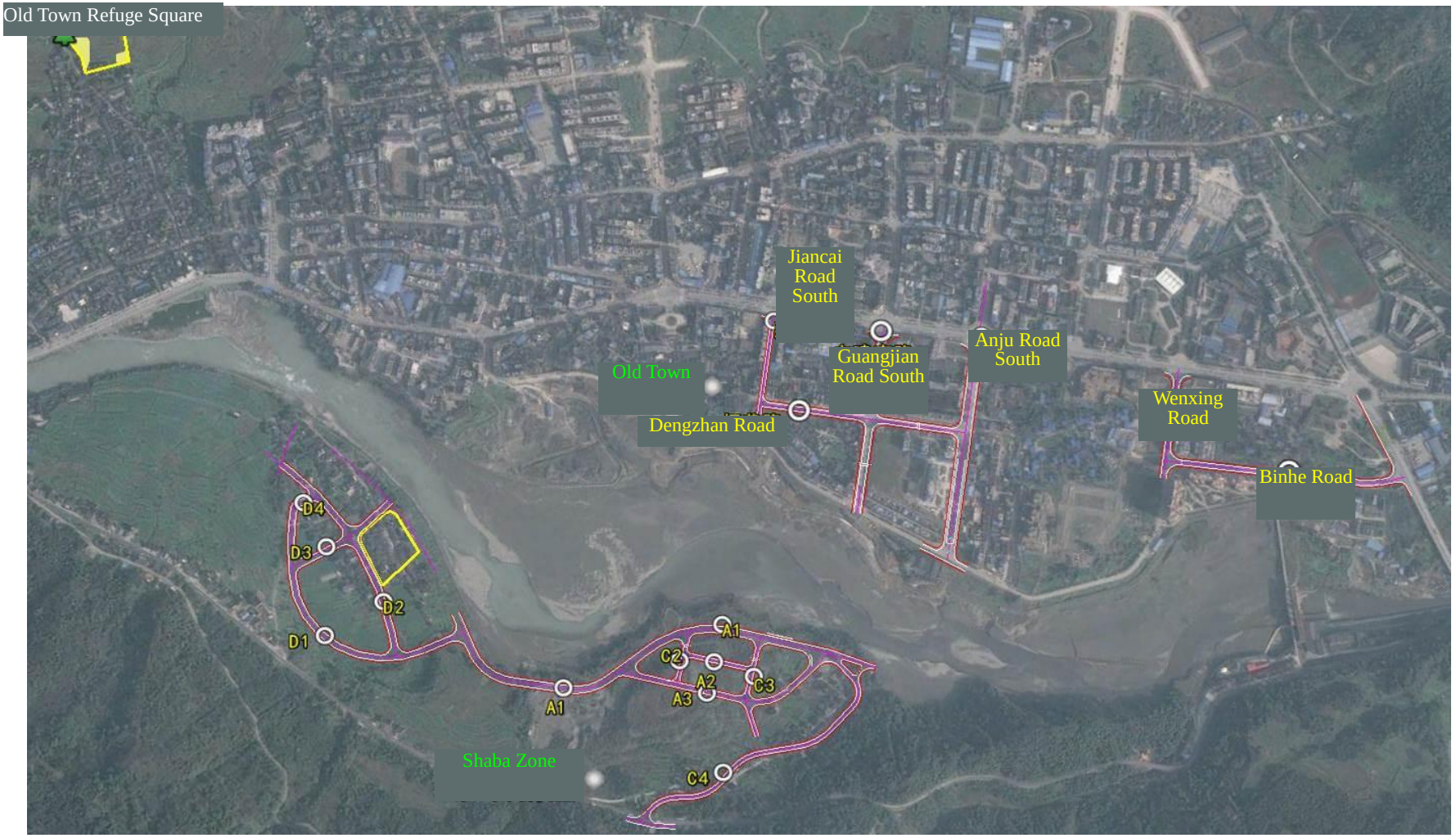

Fig. 7 General layout plan of refuge site in Tianquan Count

Attached Tables

Table 1 Summary of environmental impacts and mitigation measures for Baoxing County

Project stage	Impacted factors	Environmental impacts	Mitigation measures	Remarks
Before construction	Environmental impacts related to construction site	Route selection	Road and pipeline works are constructed according to the planning of the cities or towns where they are located. There is no line comparison and selection.	Relatively minor impact
		Site selection	Field reconnaissance is carried out by technical personnel of various disciplines for multiple times. The site of water treatment plant is determined in Shamoshu of Shunjiang Village. Crop compensation is used as a mitigation measure for land acquisition.	Relatively minor impact
	Selection of other schemes having relatively great impact to the environment	Layout scheme of water transport and distribution pipe networks	The water supply pipe network is laid in a sectionalized manner along the roads, so as to meet the water demand of residents.	Relatively minor impact
Construction period	Water	Sewage from construction site and workers' domestic utilization	During construction, a small amount of domestic sewage produced by workers will be discharged after treatment through the existing environment sanitation facilities around the side. The waste water generated through the sand and stone mixing process will not be discharged outside but recycled for use after settlement.	Relatively minor impact
		Impacts of rainy season	Excavation works during the rainy season shall be avoided as far as possible, and proper retaining and shielding works shall be carried out.	Relatively minor impact
	Atmosphere	Construction and transport dust	Construction dust produced during earthwork excavation, transportation and concrete mixing shall be sprayed with water for dust suppression, and the pavement waste soil shall be removed promptly. Premixed asphalt is used for road paving.	Relatively minor impact
	Noise	Noise from construction machinery and transport vehicles	Proper layout is adopted for equipment and works of high noise level during construction, and fencing is used to keep the noise energy within the standard limits. Construction during 22:00 - 6:00 is prohibit; low noise equipment are used, and maintenance efforts for construction machineries is enhanced; for the newly built road sections involving main sensitive points such as nursing homes and health centers, influence from construction noise shall be reduced. The EIA requires providing temporary sound barriers within the scope of construction	Relatively minor impact

Project stage	Impacted factors	Environmental impacts	Mitigation measures	Remarks
			to prevent construction noise from effecting school teaching activities.	
	Solid waste	Waste on construction site	Domestic wastes produced by the project construction personnel are collected before being dumped to waste disposal yard in a periodical manner.	Relatively minor impact
		Vast spoil from early construction stage	After in-site deployment and dispatching, the remaining spoil are transported to the waste disposal yard in Shunjiang Village of Muping township or Xinchang Village of Lingguan township for stacking.	Relatively minor impact
	Ecology	Vegetation reduction	The newly added part of the project covers a small area, and construction process has minor impact on vegetation.	Relatively minor impact
		Water and soil loss	Local water and soil loss may be caused by permanent and temporary land occupation of the Project.	Relatively minor impact
	Society	Traffic congestion or block	The project will primarily use the existing roads in the region to ensure the personnel's access to the project region.	Relatively minor impact
	Environmental risk	Construction involving Baoxing stream	Take corresponding measures to prohibit discharging of pollutants to the river.	Relatively minor impact
Operation Period	Water	Impact to receiving water body from surface runoff	Slight	Relatively minor impact
	Gas	Road dust	The dust pollution will be significantly reduced after implementation of the project.	Relatively minor impact
		Vehicle exhaust	Strict implementation of the provisions specified by the national standards regarding automobile exhaust emission by reducing the emissions of vehicle exhaust pollutants.	Relatively minor impact
	Noise	Running noise from pumps and mechanical equipment	Proper layout, soundproofing windows and doors and vibration attenuation	Relatively minor impact
		Traffic noise	The project scope includes reconstruction of one road. Management in enhanced and reserved noise control cost is applied for noise control.	Relatively minor impact
	Ecology	Greening impact	The greening rate on both sides of the roads is improved.	Positive impact
	Environmental risk	Traffic accident	Road traffic management is enhanced to prevent accident.	Relatively minor impact

Table 2 List of Environmental Impacts and Mitigation Measures for Lushan County Subproject

Project stage	Impacted factors	Environmental impacts	Mitigation measures	Remarks
Before construction	Environmental impacts related to construction site	Route selection	Road and pipeline works are constructed according to the planning of the cities or towns where they are located. There is no line comparison and selection.	Relatively minor impact
		Square site selection	The site of the emergency refuge square shall be selected based on the planning of Lushan County, and relevant comparison and selection scheme shall be proposed.	Relatively minor impact
	Selection of other schemes having relatively great impact to the environment	Layout scheme of water transport and distribution pipe networks	The water supply pipe network is laid in a sectionalized manner along the roads, so as to meet the water demand of residents.	Relatively minor impact
Construction period	Water	Sewage from construction site and workers' domestic utilization	During construction, a small amount of domestic sewage produced by workers will be discharged after treatment through the existing environment sanitation facilities around the side. The waste water generated through the sand and stone mixing process will not be discharged outside but recycled for use after settlement.	Relatively minor impact
		Impacts of rainy season	Excavation works during the rainy season shall be avoided as far as possible, and proper retaining and shielding works shall be carried out.	Relatively minor impact
	Atmosphere	Construction and transport dust	Construction dust produced during earthwork excavation, transportation and concrete mixing shall be sprayed with water for dust suppression, and the pavement waste soil shall be removed promptly. Premixed asphalt is used for road paving.	Relatively minor impact
	Noise	Noise from construction machinery and transport vehicles	Proper layout is adopted for equipment and works of high noise level during construction, and fencing is used to keep the noise energy under the standard limits. Construction during 22:00 - 6:00 is prohibit; low noise equipment are used, and maintenance efforts for construction machineries is enhanced; for the newly built road sections involving main sensitive points such as nursing homes and health centers, influence from construction noise shall be reduced. The EIA requires providing temporary sound barriers within the scope of construction to prevent construction noise from effecting school teaching activities.	Relatively minor impact
	Solid waste	Waste on construction site	Domestic waste produced by the project construction personnel are collected before being dumped to waste disposal yard in a periodical manner.	Relatively minor impact
		Vast spoil from early construction stage	It is transferred and dispatched within the area.	Relatively minor impact
	Ecological environment	Vegetation reduction	The Project has small newly-increased floor area, thus the project construction has little influence to vegetation.	Relatively minor impact
		Water and soil	Local water and soil loss may be caused by	Relatively

		loss	permanent and temporary land occupation of the Project.	minor impact
	Society	Environmental impacts from land occupation and demolition	Compensate as per resettlement plan, no great influence will be generated.	Relatively minor impact
		Traffic congestion or block	The project will primarily use the existing roads in the region to ensure the personnel's access to the project region.	Relatively minor impact
	Environmental risk	Rivers and water bodies involved in construction	Take corresponding measures to prohibit discharging of pollutants to the river.	Relatively minor impact
Operation period	Water	Impact to receiving water body from surface runoff	Slight	Relatively minor impact
	Gas	Road dust	The dust pollution will be significantly reduced after implementation of the project	Relatively minor impact
		Vehicle exhaust	Strictly implement the national automobile exhaust emission standard to reduce the emissions of automobile exhaust pollutants.	Relatively minor impact
	Noise	Running noise from pumps and mechanical equipment	Proper layout, soundproofing windows and doors and vibration attenuation	Relatively minor impact
		Traffic noise	Management strengthening and reserved noise control cost measures shall be taken for the roadway of the Project to control noise.	Relatively minor impact
	Ecological environment	Greening impact	The greening rate on both sides of the roads are improved.	Positive impact
	Environmental risk	Traffic accident	Strengthen road traffic management to avoid accident. Set accident reservoirs on both ends of the bridge.	Relatively minor impact

Table 3 List of Environmental Impacts and Mitigation Measures for Mingshan District Subproject

Project stage	Impacted factors	Environmental impacts	Mitigation measures	Remarks
Before construction	Environmental impacts related to construction site	Route selection	Road, bridge and river embankment works are constructed according to the planning of the cities or towns where they are located. Route comparison and selection is only carried out for the extension line of Minsheng Road.	Relatively minor impact
	Selection of other schemes having relatively great impact to the environment	Layout scheme of water transport and distribution pipe networks	Laying along the road.	Relatively minor impact
Construction period	Water	Sewage from construction site and workers' domestic utilization	During construction, a small amount of domestic sewage produced by workers will be discharged after treatment through the toilets around the site. The waste water generated through the sand and stone mixing process will not be discharged outside but recycled for use after settlement.	Relatively minor impact
		Impacts of rainy season	Excavation works during the rainy season shall be avoided as far as possible, and	Relatively minor impact

			proper retaining and shielding works shall be carried out.	
	Atmosphere	Construction and transport dust	Construction dust produced during earthwork excavation, transportation and concrete mixing shall be sprayed with water for dust suppression, and the pavement waste soil shall be removed promptly. Premixed asphalt is used for road paving.	Relatively minor impact
	Noise	Noise from construction machinery and transport vehicles	Proper layout is adopted for equipment and works of high noise level during construction, and fencing is used to keep the noise energy under the standard limits. Construction during 22:00 - 6:00 is prohibit; low noise equipment are used, and maintenance effort for construction machineries is enhanced.	Relatively minor impact
	Solid waste	Waste on construction site	Domestic waste produced by the project construction personnel are collected before being dumped to waste disposal yard in a periodical manner.	Relatively minor impact
		Vast spoil from early construction stage	The spoil is trucked to the storage yard in Wulikou.	Relatively minor impact
	Ecological environment	Vegetation reduction	The Project has small newly-increased floor area, thus the project construction has little influence to vegetation.	Relatively minor impact
		Water and soil loss	Local water and soil loss may be caused by permanent and temporary land occupation of the Project.	Relatively minor impact
	Society	Environmental impacts from land occupation and demolition	Compensate as per resettlement plan, no great influence will be generated.	/
		Traffic congestion or block	The project will primarily use the existing roads in the region to ensure the personnel's access to the project region.	Relatively minor impact
Operation period	Water	Impact to receiving water body from surface runoff	Slight	
	Gas	Road dust	A small amount of dust will occur after project implementation.	Relatively minor impact
		Vehicle exhaust	Strictly implement the national automobile exhaust emission standard to reduce the emissions of automobile exhaust pollutants.	Relatively minor impact
	Noise	Traffic noise	Management strengthening and reserved noise control cost measures shall be taken to control noise.	Relatively minor impact
	Ecological environment	Greening impact	Improve greening rate.	Relatively minor impact
	Environmental risk	Traffic accident	Strengthen road traffic management to avoid accident.	Relatively minor impact

Table 4 List of Environmental Impacts and Mitigation Measures for Yingjing County Subproject

Project stage	Impacted factors	Environmental impacts	Mitigation measures	Remarks
Before construction	Environmental impacts related to construction site	Route selection	Road and pipeline works are constructed according to the planning of the cities or towns where they are located. There is no line comparison and selection.	Relatively minor impact
	Selection of other schemes having relatively great impact to the environment	Layout scheme of water transport and distribution pipe networks	The water supply pipe network is laid in a sectionalized manner along the roads, so as to meet the water demand of residents.	Relatively minor impact
Construction period	Water	Sewage from construction site and workers' domestic utilization	During construction, a small amount of domestic sewage produced by workers will be discharged after treatment through the existing environment sanitation facilities around the side. The waste water generated through the sand and stone mixing process will not be discharged outside but recycled for use after settlement.	Relatively minor impact
		Impacts of rainy season	It is not allowed to excavate sludge in rainy seasons.	Relatively minor impact
	Atmosphere	Construction and transport dust	Watering for dust suppression is carried out against the dust produced during earth-rock excavation, transportation and concrete mixing; waste soil on the roads shall be removed immediately.	Relatively minor impact
	Noise	Noise from construction machinery and transport vehicles	The equipment and operations of high noise level are properly arranged during construction, with fencing used. Construction during 22:00 - 6:00 is prohibit; low noise equipment are used, and maintenance effort for construction machineries is enhanced;	Relatively minor impact
	Solid wastes	Waste on construction site	Domestic waste produced by the project construction personnel is collected before being dumped to waste disposal yard in a periodical manner.	Relatively minor impact
		Vast spoil from early construction stage	It is transferred and dispatched within the area. The spoil is hauled to the storage yard in Liuhe Village.	Relatively minor impact
		Sludge in flood discharge channel	It is hauled to the waste compression transfer station in Xingjing County for dehydration and compaction and then hauled to the household garbage landfill for disposal.	Relatively important impacts
	Ecological environment	Vegetation reduction	No additional land is available for the Project, thus the project construction has little influence to vegetation.	Relatively minor impact
		Water and soil loss	Local water and soil loss may be caused by permanent and temporary land occupation of the Project.	Relatively minor impact
	Society	Environmental impacts from land occupation and demolition	Compensate as per resettlement plan, no great influence will be generated.	Relatively minor impact

		Traffic congestion or block	The project will primarily use the existing roads in the region to ensure the personnel's access to the project region.	Relatively minor impact
	Environmental risk	Crossing rivers and railways	None.	

Table 5 List of Environmental Impacts and Mitigation Measures for Shimian County Subproject

Environmental impacts		Mitigation measures	Executed by	Administered by
I. Design stage				
1	Scheme rationality	● Comprehensively consider such factors as topography, water body function and urban function division; select a proper project scheme; plan project construction and environmental protection as a whole to ensure coordination between social development and environmental protection.	Designer	The Employer
2	Soil erosion	● During design, comprehensively consider excavation and backfilling, plan to plant tree and grow grass in the construction area and construct retaining wall, intercepting ditch, mortar rubble and the like to prevent soil erosion.	Designer	
3	Air pollution	● When select the construction site and stone stockyard, consider the influences of dust and other matters to the environmentally sensitive areas (such as residential area).	Designer	
4	Noise	● For sensitive sites with out-of-limit noise levels, noise-reduction measures shall be designed depending on actual noise levels, including sound-proof wall and tall green trees, to minimize the impacts of traffic noise during the short and medium terms of operation period.	Designer	
5	Cultural relics and historic sites	● During the pre-construction period, provide publicity and education, especially legal education on the construction workers and management personnel to make them have the awareness of protecting cultural relics. ● Set cultural relics protection measures during the construction period to avoid damage and loss of cultural relics. ● Prior to commencement, the Investor, the Management Company and the Construction Contractor shall sign a contract for cultural relics protection with the competent department to ensure that the protection responsibilities are assigned to the personnel related project construction and establish & complete cultural relics protection responsibility system.	Cultural relics department	
6	Social interference	● Set a separation at properly road section to reduce impacts on the residents' life.	Designer	
7	Land requisition, demolition and resettlement	● Partially relocate one enterprise and dismantle a small amount of municipal infrastructures to try to not affect normal operation of enterprises and municipal infrastructures.	Land requisition and demolition team of the Project	
8	Landscape protection	● Carry out research carefully, prepare greening design, reduce the impacts on natural landscape and strengthen regional aesthetic sense.	Designer	
II. Construction period				
1	Dust and air pollution	● In dry seasons, periodical water sprinkling shall be conducted at the construction site and on access roads to reduce flying dust. ● Piled-up materials and stockyards shall be largely arranged away from residential areas and covered up or wetted by sprinkling water to prevent dust pollution. ● Trucks transporting building materials shall be covered up	Contractor	

Environmental impacts		Mitigation measures	Executed by	Administered by
		with canvas, etc. to reduce leakage and spillage. ● Mixing equipment shall be well sealed and installed with dust collectors. Operators shall be well protected when working.		
2	Soil erosion, water pollution	● After the construction of the subgrade and auxiliary municipal infrastructures is completed, the construction site shall be recovered as soon as possible and the "three simultaneous" system shall be well implemented. ● Temporary stacking soil within the construction red line shall be backfilled immediately to prevent water and soil loss. ● Prevent the mud and stone from entering the river and disturbing the body of the water. ● When constructing permanent water supply and drainage system, joints shall be reserved for water supply and drainage systems specified in the town planning. ● Adopt advanced bridge construction process to prevent water body from contamination. ● During the construction period, the domestic sewage can be treated by the existent sewage treatment systems in town, and the industrial wastewater can be recycled after sedimentation (by oil removal). ● Construction materials like pitch, oils and chemicals can not be stacked next to water wells and rivers for civil use. They shall be stored away from the river and be temporarily covered with canvas, through which they will not be washed to the water body during stormy weather.	Contractor	Relevant authorities and supervision departments
3	Noise	● Noise standards of industrial enterprises shall be strictly implemented to protect road construction personnel from any injury caused by noise. Workers working close to intensive sound sources shall wear earplugs and helmet with limited working hours. ● Construction works with high noise shall prevent to be conducted at night (22:00 - 6:00). ● In order to ensure a low-noise level, the maintenance and repair of machines and vehicles shall be reinforced. ● For constructions conducted next to sensitive sites, in order to ensure that the normal life, study and rest of adjacent neighbors or students will not be impacted by the construction noise, preventative measures like temporary acoustic barriers shall be appropriately adopted.	Contractor	
4	Ecological resources preservation	● During the construction, for any excavation and leveling works conducted in areas that may occur rainwater surface runoffs, temporary soil settling basins shall be arranged to intercept mud and sand. After the laying of the road culvert pipes is completed, bulldoze the soil settling basin. ● Temporary land occupation shall largely be reduced (there is no temporary land occupation in the Project, and the construction red line shall be strictly controlled). ● Roads shall be built simultaneously with the constructions of sidewalk greening, slope protection and drainage ditch, and they shall be delivered for acceptance as a whole. ● Reinforce the environment protection education of workers.	Contractor	
5	Landscape protection	● Sidewalk greening, protective greening of river embankment and refuge square greening. ● Relevant management shall be conducted as per the landscaping design, with coordination of the surroundings.	Contractor	
6	Historic	● The construction operation zone shall be strictly within the	Contractor	

Environmental impacts		Mitigation measures	Executed by	Administered by
	preservation	red line area, and no activities that may cause any damage or negative effect on the cultural protection units shall be allowed to be carried out outside the area. Then the completeness and functionality of the cultural protection units can be preserved. ● After mobilization, the technical construction department shall actively undertake cultural relics protection responsibility, and pay attention to whole-process supervisory control during the construction and prepare a special construction scheme to make cultural relics under control during construction. ● Construction activities with large machineries is not allowed, the mode of manual work coordinated with small machineries is adopted to prevent damage on culture relics. During the construction period, if highly intensified works (such as large-scaled mechanical operation, road surface breaking operation, blasting operation and air pick operation) should be conducted, before their commencement, a report shall be submitted to a related competent department and they can only be conducted with the approval of the department and the verification of the work plan of related construction experts. During the operation, the technicians, supervisors and operators shall do a good job of their respective work and strict control shall be exercised. ● Considering the sensitivity of culture relics protection units, it is suggested that key supervision work be carried out for constructions involving culture relics protection units to implement various environmental protection measures so as to prevent damage on the culture relics caused by illegal, brutal construction activities as well as construction activities that violates regulation. ● Upon any discovery of cultural relics during the construction, the earth excavation works shall be immediately stopped and such discovery shall be reported to the department of cultural relics. Any construction works shall not be resumed until the department of cultural relics has finished proper treatments. Before competent authorities complete the cultural relics identification and arrange necessary protection measures, no excavation works shall be conducted.		
7	Construction camp	● Reinforce the construction management of construction access and the environmental protection education of construction personnel. ● The domestic sewage water produced by the construction camp shall be treated by the existent local environmental protection facilities and then be applied for agricultural utilization. The wastewater produced by construction machineries shall be recycled after proper treatment. ● Dustbins and sanitary treatment facilities shall be arranged at construction camp. ● The water body shall be prevented from contamination caused by domestic sewage and solid wastes.	Contractor	
8	Construction safety	● In order to ensure the construction safety, safety signs shall be arranged in the construction areas during the construction period. ● Duty posts shall be arranged at the construction road sections to dredge traffic and ensure the pedestrian safety. ● During the construction period, in order to reduce the accident rate, effective safety and warning measures shall be taken. When conducting the blasting operation, relevant	Contractor	

Environmental impacts		Mitigation measures	Executed by	Administered by
		operational signs shall be specified and the protection works shall be reinforced. Thorough inspections shall be conducted before the blasting operation. In order to prevent the occurrence of any possible traffic jams and casualties, no blasting operation shall be allowed during the busy period. ● Well conduct the health protection works for construction personnel, such as disease prevention during the construction period.		
9	Transportation management	● The routes for building material transportation shall be carefully selected, in which the long-distance transport shall be avoided. The impact of the transportation on the current traffic facilities shall largely be reduced, and the dust and noise pollution shall be decreased too. ● Consultation shall be made with the traffic control and public security authorities for the guidance on traffic arrangement. Measures shall be taken to prevent traffic jam and poor transportation efficiency during construction. ● Proper plans for transportation of building materials shall be made to avoid rush hours of existing roads.	Contractor	
10	Vibration supervision	● When conducting strong vibration constructions (like pier compaction or vibratory road roller operation) or blasting operation next to the residential areas, the buildings next to the construction sites shall be supervised to avoid the occurrence of accidents. ● For residential houses that will largely be impacted by the construction vibration, necessary remedies shall be conducted.	Contractor	
11	Construction supervision	● The environmental supervision during the construction period shall be conducted as per the approved environmental impact statement and the construction drawing design of the environmental engineering.	Supervisor	
III. Operation period				
1	Local planning	● New sensitive buildings like schools, hospitals, nursing homes and residential areas should not be built within the protective areas of roads. ● For construction lands used for health and fitness entertainments, new structures shall be arranged largely away from roads. At the same time, the architectural layout that is sensitive to the environment shall be optimized to reduce the impact of the traffic noise to the environmental sensitive sites.	Local government	Operation and management units
2	Noise	● Sound insulation measures shall be provided for areas with noise over-limit. ● Traffic control shall be enhanced. Excessively loud old vehicles shall not get on the road or enter the city. ● According to the supervision results, the sensitive sites with noise over-limit shall be provided with ventilated sound proof windows or other appropriate noise-reduction measures to reduce the noise impact.	Traffic Management Department	
3	Air pollution	● The inspection system for car emission shall be implemented strictly. Vehicles having excessive emission of tail gas are not allowed to get on the road.	Traffic Management Department	
4	Vehicle management	● Vehicles shall be well repaired and maintained to ensure a good technical state. ● The inspection for noise and emission of vehicles shall be enhanced. Any vehicles that can not meet relevant noise and emission standards shall not be issued with plates. The Vehicle Inspection Department shall forbid old vehicles, which are of low speed, high noise and large oil consumption, to get on the	Public Security and Traffic Management Department	

Environmental impacts		Mitigation measures	Executed by	Administered by
		road for operation. ● Relevant educations shall be reinforced for citizens, through which they shall learn about the matters of atmospheric and noise pollutions and relevant laws and regulations.		
5	Leakage management for hazardous goods	● The three certificates issued by the Public Security Department shall be obtained for transportation of hazardous goods, which are the permit for transportation, driver's license and security certificate. ● For vehicles used for the transportation of highly hazardous goods, the road management division must be noticed in advance before the transportation of such vehicles. Theses vehicles shall pass through the transportation safety inspection and provided with obvious hazardous product signs. The transportation routes of vehicles carrying hazardous chemicals shall be specified by the Public Security Management Department and Public Security Fire Department, and such vehicles must park in the specified sites. ● In case of accidental spillage of hazardous materials, it is required to follow the emergency plan, notify the authorities and take emergency measures. Meanwhile, a monitoring group will be formed to deal with such accident. ● During the transportation of hazardous goods, the management center shall strictly monitor the transportation to solve any occurred accidents in time, and nip those accidents in the bud. Meanwhile, variable message boards shall be used at the same time to warn the drivers about the bad weather or dangerous road conditions that may cause traffic accidents, and in case of the said conditions, active risk prevention measures like running speed restriction or local road section blocking shall be conducted in advance. ● If there is an accident, driver or supercargo shall immediately report the case to the security authorities and state all important relevant details. For emergency like leakage of oils, hazardous chemicals and poisonous and harmful matters, the involved road section shall be blocked off and the emergency plan shall be conducted to dispose the leakage accident. ● Upon the receipt of the reported case, the Traffic Management Department shall immediately report the accident to the office department of the local government and launch the emergency plans.	Public Security, Traffic Management Department, Environmental Protection Department and Fire Department	
6	contamination of water quality	● The domestic sewage produced by the emergency center of refuge square shall be treated by the sewage treatment facilities in town and discharged as per relevant standards. ● Pavements and refuge squares shall be cleaned regularly, thus to reduce the water body contamination caused by the surface runoff.	Environmental sanitation management station	
7	Solid waste pollution	● Pavements and refuge squares shall be cleaned regularly, domestic garbage shall be regularly collected by the environmental sanitation systems in town, and be delivered to the municipal solid waste landfill in Shimian County.	Environmental sanitation management station	

Table 6 List of Environmental Impacts and Mitigation Measures for Yucheng District Subproject

Project stage	Impacted factors	Environmental impacts	Mitigation measures	Remarks
Construction period	Water	Sewage from construction site and workers' domestic utilization	During construction, the small amount of domestic sewage produced by workers will be discharged after treatment through the existing environment sanitation facilities around the site. The waste water generated through the sand and stone mixing process will not be discharged outside but recycled for use after settlement.	Relatively minor impact.
		Impacts of rainy season	Excavation works during the rainy season shall be avoided as far as possible, and proper retaining and shielding works shall be carried out.	Relatively minor impact.
	Atmosphere	Construction and transport dust	Construction dusts produced during processes like earthwork excavation, transportation and concrete mixing shall be sprayed with water for dust suppression, and the waste soil shall be removed promptly from the pavement surface. Premixed asphalt is used for road paving.	Relatively minor impact.
	Noise	Noise from construction machinery and transport vehicles	Proper layout is adopted for equipment and works of high noise level during construction, and fencing is used to keep the noise within the standard limits. Construction during 22:00 - 6:00 is prohibited; low noise equipment are used, and maintenance effort for construction machineries is enhanced; For new-built road sections involving sensitive sites, in order to reduce the impact of construction noise, it is specified in the environmental assessment that temporary acoustic barriers shall be arranged within such construction areas, so that to reduce the adverse impacts of construction noise on these sensitive sites.	Relatively minor impact.
	Solid waste	Waste on construction site	Domestic waste produced by the project construction personnel will be regularly collected before being dumped to waste disposal yard.	Relatively minor impact.
		Spoil from early construction stage	Delivered to the specified sites for stacking.	Relatively minor impact.
	Ecological environment	Vegetation reduction	The Project has small newly-increased floor area, thus the project construction has little influence to vegetation.	Relatively minor impact.
		Water and soil loss	Local water and soil loss may be caused by permanent and temporary land occupation of the Project.	Relatively minor impact.
	Society	Environmental impacts from land occupation and demolition	With compensation works conducted as per resettlement plan, no great influence will be generated.	Relatively minor impact.
		Traffic congestion or block	The Project will primarily use the existing roads in the region to ensure the personnel's access to the project region.	Relatively minor impact.

Table 7 List of environmental impacts and mitigation measures for Tianquan County Subproject

Project stage	Impacted factors	Environmental impacts	Mitigation measures	Remarks
Before construction	Environmental impacts related to construction site	Route selection	To be carried out as per the local urban planning; no route comparison.	The planning is with good conformance and positive impacts and can promote urban planning development.
		Square site selection		
	Selection of other schemes having relatively great impact to the environment	Layout scheme for integrated pipeline	Pipe network to be laid along the road and to be constructed section by section to meet daily life demands of residents.	
Construction period	Water	Domestic sewage generated by construction personnel	Construction personnel shall rent surrounding houses, instead of building camps. Domestic sewage shall be drained along existing sewage facilities.	Relatively minor impact
		Construction of mud laden water with high turbidity	Commercial concrete shall be adopted for construction and no mixing plant shall be built in the site. Management shall be enhanced in the construction site and construction drainage water shall be subject to sedimentation and recycled, instead of being drained casually.	With great impacts; those can be effectively mitigated by taking measures.
		Impacts of rainy season	Excavation works during the rainy season shall be avoided as far as possible, and proper retaining and shielding works shall be carried out.	With great impacts; those can be effectively mitigated by taking measures.
	Atmosphere	Construction and transport dust	For earthwork excavation during construction and dust generated during transportation, shielding works can be carried out, watering can be used to suppress dust and waste soil on the road shall be removed immediately.	With great impacts; those can be effectively mitigated by taking measures.
		Asphalt fume	Commercial asphalt and pitch paver shall be adopted for road pavement and mixing in the site shall be avoided.	With great impacts; those can be effectively mitigated by taking measures.
	Noise	Noise from construction machinery and transport vehicles	Low noise equipment shall be adopted and maintenance of construction equipment shall be enhanced. High noise equipment and operations shall be reasonably arranged during construction. Besides, shields and fences shall be used and construction is prohibited at night.	With great impacts; those can be effectively mitigated by taking measures.
	Solid waste	Waste on construction site	Construction personnel shall rent surrounding houses, instead of building camps. The domestic wastes shall be disposed with existing gathering facilities and shall be intensively disposed by urban sanitation departments.	Relatively minor impact
		Spoil from early construction stage	Those shall be disposed by the spoil disposal area specified by the urban and rural environment comprehensive management office.	Relatively minor impact
	Ecological environment	Vegetation reduction	The Project has small newly-increased floor area, thus the project construction has little	Relatively minor impact

			influence to vegetation.	
		Protection of old trees	As for two machilus trees belonging to construction of Jiancai South Road in reconstruction of Tianquan County, they have already been enclosed for protection by local forestry authorities. In construction, their roots shall be avoided in laying underground pipes and lines, and enhanced management shall be conducted during construction to prevent disturbance. In this way, there will be no impact on these trees.	Relatively minor impact
		Water and soil loss	No temporary land occupation is involved in the works and water and soil loss caused by excavation shall be covered by temporary shields.	Relatively minor impact
	Society	Environmental impacts from land occupation and demolition	With compensation works conducted as per resettlement plan, no great influence will be generated.	Relatively minor impact
		Traffic congestion or block	The Employer and the traffic management department shall work together to prepare traffic reconciliation measures and plan to facilitate orderly management.	With great impacts; those can be effectively mitigated by taking measures.
Operation Period	Water	Impact on receiving water body from surface runoff	After the completion of works, rainwater and sewage pipe network shall be fully used to effectively collect and reasonably dispose the wastewater within the affected area so as to reduce impact resulted from contaminants entering surface water.	Positive impact
	Gas	Road dust	After the completion of works, road and traffic conditions shall be improved to reduce dust.	Positive impact
		Vehicle exhaust	After the completion of works, road and traffic conditions shall be improved to reduce vehicle exhaust.	Positive impact
	Noise	Traffic noise	After the completion of works, road and traffic conditions shall be improved to reduce impact of noise.	Positive impact
	Ecological environment	Greening impact	Greening and landscaping conditions at both sides of the road shall be improved.	Positive impact