

**Guangxi Hezhou Urban Water Infrastructure &  
Environment Improvement Project**

**Environmental & Social  
Management Plan**

World Bank Financed Guangxi Hezhou Urban Water Infrastructure &  
Environment Improvement Project Management Office  
Guangxi Zhengze Environmental Protection Technology Co., Ltd.  
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# CONTENT

<b>1. Project background and overview .....</b>	<b>- 1 -</b>
<b>2. Legal and regulatory framework.....</b>	<b>- 11 -</b>
2.1 PRC national laws and regulations and sector regulations on environmental protection.....	- 11 -
2.2 Technical guidelines and specifications of EIA.....	- 12 -
2.3 Environmental quality and pollutant discharge standards .....	- 12 -
2.4 WB safeguard policies and guidelines .....	- 16 -
<b>3. Environment and Social Management System.....</b>	<b>- 19 -</b>
3.1 Environment management agency .....	- 20 -
3.2 Responsibilities and contents of environment management .....	- 21 -
3.3 Environmental protection supervision plan .....	- 24 -
<b>4. Environmental and social impacts and mitigation measures.....</b>	<b>- 25 -</b>
<b>5. Environmental monitoring plan.....</b>	<b>- 180 -</b>
5.1 Objectives of environmental monitoring.....	- 180 -
5.2 Environment monitoring agency.....	- 180 -
5.3 Environmental monitoring plan and budget.....	- 180 -
<b>6. Capacity development and training .....</b>	<b>- 196 -</b>
6.1 Capacity development and training requirements.....	- 196 -
6.2 Contents and cost estimate of capacity development and training.....	- 196 -
<b>7. Reporting mechanism.....</b>	<b>- 202 -</b>
7.1 Information exchange.....	- 202 -
7.2 Record mechanism.....	- 202 -
7.3 Reporting mechanism .....	- 202 -
<b>8. Grievance redress mechanism.....</b>	<b>- 204 -</b>
<b>9. Investment estimation for environmental protection .....</b>	<b>- 206 -</b>

## **Annexes**

Annex I : Environmental Codes of Practice for Dike Construction in World Bank Financed Hezhou Urban Water Infrastructure and Environment Improvement Project

Annex II : Environmental Codes of Practice for Small Waterworks Construction in World Bank Financed Hezhou Urban Water Infrastructure and Environment Improvement Project

Annex III : Environmental Codes of Practice for Road & Pipeline Construction in World Bank Financed Hezhou Urban Water Infrastructure and Environment Improvement Project

Annex IV: Physical Cultural Resources Management Plan of World Bank Financed Hezhou Urban Water Infrastructure and Environment Improvement Project

Annex Table V : Checklist of Environmental Mitigation Measures for World Bank Financed Guangxi Hezhou Urban Water Infrastructure and Environment Improvement Project

## **1. Project background and overview**

A prefecture-level city established in Year 2002 with Hezhou Prefecture and Wuzhou Prefecture as its predecessors, Hezhou Municipality administers two districts of Babu District and Pinggui Administration District and three counties of Zhongshan County, Fuchuan Yao Autonomous County and Zhaoping County, with a total population of 2.35 million. Hezhou Municipality is located in east longitude  $111^{\circ} 25' \sim 112^{\circ} 03'$  and north latitude  $23^{\circ}39' \sim 25^{\circ} 09'$  and covers a total area of 11,855km<sup>2</sup>. Hezhou Municipality is located at the border area of Hunan Province, Guangdong Province and GZAR, known as the “Three-Province Thoroughfare” and “Backyard of Guangdong, Hong Kong and Macao”.

Hezhou boasts of rich reserves of ecological resources, but also has the problem of vulnerable eco-environment. Firstly, the flood control and drainage infrastructure in the urban area of Hezhou is very weak in contrast to the frequent flood events. Secondly, municipal infrastructure construction is slow and the living environment needs further improvement. Thirdly, some inner rivers are slow in terms of water flow and deteriorated in terms of water quality.

In order to promote the flood control capacity of He River and the drainage capacity and integrated utilization of water resources in the project area and improve the ecological environment and municipal infrastructure of Hezhou Municipality to support integrated development of the city, Hezhou Municipal Government decided to apply for a loan from the World Bank for implementation of the WB Loan Guangxi Hezhou Urban Water Infrastructure and Environment Improvement Project

The objectives of the Project are improving flood management, reducing wastewater pollution and strengthening water resource planning in Hezhou. The Project comprises of three components as follows:

### **Component 1: He River Flood Risk Resilience Improvement**

This component aims at reducing the flood risks of He River urban section. The main contents include (1) upgrading (or demolishing) several small hydro-power stations to improve the flood discharging capacity; (2) widening some sections in the main watercourse of He River in the urban area to improve the flood discharging capacity and developing a green waterfront corridor; and (3) rehabilitating and connecting the main watercourse to Mawei River to divert upstream flood in the northern urban area to the downstream, and developing a green waterfront corridor to improve the flood discharging capacity and reducing the flood risk in downtown area.

### **Component 2: Urban Drainage and Wastewater Management Improvement**

The purpose of this component is to rehabilitate and connect the urban water bodies including inner rivers and lakes to improve the flood storage capacity, regulate the drainage and reduce flood risk, and improve the drainage capacity of tributaries and channels; to improve the urban water environment, especially at dry seasons, by developing wastewater collection and treatment facilities; and developing a “green circle and green corridor” by rehabilitating the water ways in the urban area. The main

contents include (1) rehabilitating inner rivers and developing green waterfront corridors to divert the local floods; (2) developing storm water pipelines and pumping stations at selected areas; and (3) developing Jiangnan WWTP and main sewers.

### **Component 3: Institutional Strengthening, Capacity Building and Project Management**

This component will mainly improve the management capacity in Hezhou Municipality.

#### **Subcomponent 3.1: Institutional strengthening**

Integrated water management: Technical Assistance will be provided to streamline the management of the water affairs of the Hezhou Municipality. The details include: 1) to set up a mechanism for integrating the water sector master planning and coordinating multiple water-administrative government institutions to improve the consistency and efficiency of the water management in the city and 2) to further optimize the operation of the dams in the region towards an integrated water resources management. A flood risk early warning and management system will also be developed and training will be provided to protect vulnerable people (aged, children, and disabled) from floods.

Strengthening the institutional capacities in hydraulic, environmental and ecological monitoring, including: 1) strengthening capacity of Hezhou Environment Protection Bureau (HEPB) by constructing water quality monitoring stations and ecological monitoring station, providing equipment and data processing systems and training of HEPB staff; and 2) Strengthening the capacity of the Project Implementation Units (PIUs), i.e. Hezhou Municipal Water Resources Bureau (HWRB) by constructing hydraulic station and training of staff.

Training and Study Tours. Trainings, workshop and study tours will be conducted to enhance the capacity of the official of the institutions involved in the water management of Hezhou Municipality.

#### **Subcomponent 3.2: Project management and supervision.**

This subcomponent will provide institutional support to the PMO by: i) engaging a consulting firm to assist in finalizing the preliminary design, bidding documents, and final engineering designs; ii) advising construction supervisors in contract management; iii) preparing semi-annual project progress reports, mid-term review, and implementation completion report.

Table 1-1 shows the specific contents of the various subcomponents. Figure 1-1 is the schematic diagram of the various subcomponents.

**Table 1-1: Summary of Project Activities for  
Guangxi Hezhou Urban Water Infrastructure and Environment Improvement Project**

<b>No.</b>	<b>Project activities</b>	<b>Description</b>	<b>Implementation schedule</b>	<b>Cost estimate 00,000 RMB</b>
<b>1</b>	<b>Flood risk control</b>			<b>67729.63</b>
A-1	He River Integrated Rehabilitation (Huangshi Hydropower Station – Guangming Bridge)	Rehabilitation of He River Huangshi Hydropower Station – Guangming Bridge section involves a total length of 12.66 km. The channel width between the dikes on both sides ranges from 120m to 150 m. There will be a 20.25 km long new dike including 18.85 km long earth dike and 1.4 km long flood retaining dike. The design water level of floods with a recurrence period of 50 years ranges from 107.4 m to 111.36 m. He Riverbed elevation is between 103.1 m and 98.47 m. He Riverbed slope is 0.0366%.	2019 and 2020	23515.46
A-2	He River Integrated Rehabilitation (Guangming Bridge --- Lingfeng Bridge)	Rehabilitation of He River Guangming Bridge --- Lingfeng Bridge section involves a total length of 2.1 km. The channel width between the dikes on both sides ranges from 120m to 135 m. There will be a 2.4 km long new dike including 1.2 km long earth dike, 0.2 km long mobile gate dike and 1.0 km long flood retaining wall plus glass baffle dike. The design water level of floods with a recurrence period of 50 years ranges from 106.04 m to 107.4 m. He Riverbed elevation is between 96.25 m and 98.47 m. He Riverbed slope is 0.106%. Babu Bridge has significant back water effect and, therefore, it is planned to replace the 2 spans on the right side of He River with a new beam bridge to meet the flood control needs. After span increase, the bridge will be 35.5 m long and 8 m wide. The design elevation of He Riverbed beneath the bridge is 102.5 m, and the elevation of the bridge surface is between 108.75 m and 106.2 m.	2019 and 2020	17321.87
A-3	He River Integrated Rehabilitation (Lingfeng Bridge – Xiadao)	Rehabilitation of He River Lingfeng Bridge – Xiadao Hydropower Station section involves a total length of 6.9 km. The channel width between the dikes on both sides is between 120 and 186 m. A new flood dike in a total length of 5.98 km will be constructed, including a	2019 and 2020	6692.30

**Table 1-1: Summary of Project Activities for  
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<b>No.</b>	<b>Project activities</b>	<b>Description</b>	<b>Implementation schedule</b>	<b>Cost estimate 00,000 RMB</b>
	Hydropower Station)	2.3 km long road dike section, a 1.0 km long flood retaining dike and a 2.68km long earth dike. The design water level of floods with a recurrence period of 50 years is between 103.12 m and 106.04 m. He Riverbed elevation is between 93.69 m and 96.25 m. He Riverbed slope is 0.037%.		
A-4	East Trunk Canal Integrated Rehabilitation and Mawei River Connection	<p>The East Trunk Canal connects with the planned Bodailing Road in the upstream and the Xitiankou Diversion Canal in the downstream. The flood control standard is for floods with a recurrence period of 20 years. The total length of the works is 9.88 km. He Riverbed width is between 1.66 and 8 m and the opening is between 6.6 and 23.88 m. The design elevation of He Riverbed is between 118.64 m and 123.54 m. The design slope of He Riverbed is between 0.013% and 0.086%. The design water level is between 125.04 m and 119.47 m. The total dredging volume is 4610 m<sup>3</sup>. The canal dike elevation will be based on existing dike with moderate modification. The elevation of the left bank dike is between 130.72 m and 119.77 m. The elevation of the right bank dike is between 131.62 m and 119.77m.</p> <p>The East Trunk Canal diversion canal connects with East Trunk Canal in the upstream and the Mawei River in the downstream. The total length of the works is 2.69 km. He Riverbed width is 6 m and the opening is between 11.22 and 12 m. The design elevation of He Riverbed is between 107.00 m and 118.64 m. The design slope of He Riverbed is between 0.28% and 0.42%. The design water level is between 119.47 m and 109.50 m. The dike elevation is between 119.77 m and 109.80 m.</p>	2023 and 2024	12743.21
A-5	Xiadao	Xiadao Hydropower Station has an installed capacity of 6000kw with 3	2019 and 2020	305.10



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No.	Project activities	Description	Implementation schedule	Cost estimate 00,000 RMB
	Hydropower Station Integrated Rehabilitation	Nos. 2000 kw generator units. The average annual power generation capacity is 15.39 million kwh. The power station is a dam-type hydropower station with weir-top elevation of 96.13 m for the dam and 96.95 m for the hydraulic flap gates. Average single-hole width is 11 m for the 6-hole side and 28.7 m for the 3-hole side. The width of the center pier is 1.8 m. After comprehensive alternative comparison, the recommended alternative is to keep the existing structures and upgrade the external building surface of the plant, and to upgrade the upstream dike by increasing the dike top elevation by 0 to 1.0 m within 4 km length to ensure upstream flood safety. In addition it is recommended to integrate the operational scheduling of Xiadao Hydropower Station into the triple-prevention system (flood prevention, drought prevention and gale prevention system)of Hezhou..		
A-6	Fanglin Hydropower Station Integrated Rehabilitation	Fanglin Hydropower Station has an installed capacity of 525kw and 2 Nos. 100kW generator units, 1 No. 200kW generator unit and 1 No. 125kW generator unit. Hejiang Power Station has an installed capacity of 1000 KW for 5 No. 200kW generator units.The two hydropower stations share the same impounding dam and are dike-type hydropower station with a crest elevation of 102.72m, a base elevation of 97.71m. 33 sluice gates distributed in 11 spans will be arranged, with a maximum dike height of 4.26m and a dike section length of 225. According to the reconsturction program of Fanglin / Hejiang Hydropower Stations, these hydropower stations shall be buy-back hydropower stations and the existing sluice gates and intermediate sluice piers will be demilished and Fanglin Bridge will be retained. Rhe facade of the power plant buildings will be rehabilitated. 4 new centrifugal irrigation pumps with a unit capacity of 324m <sup>3</sup> / h, a lift of	2018 and 2019	1631.30

**Table 1-1: Summary of Project Activities for  
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<b>No.</b>	<b>Project activities</b>	<b>Description</b>	<b>Implementation schedule</b>	<b>Cost estimate 00,000 RMB</b>
		30m, and a motor power of 55 kW will be built. Due to water resistance, it is necessary to increase the height of a 4.4km long dike upstream of Fangling Bridge by 0 to 0.8m.		
A-7	Huangshi Hydropower Station Integrated Rehabilitation	Huangshi Hydropower Station is a run-off dam hydropower station with a total installed capacity of 1000kW and 5 Nos. 200 KW generator units. The designed annual power generation capacity is 4.7 million KWh. The dam type is a 100m long masonry gravity dam with a crest elevation of 109.00 m and a maximum dam height of 4.0m. The existing fixed dam with safety risks will be demolished and replaced with an adjustable hydraulic lifting dam, which will be designed into a continuous hydraulic lift dam with 13 holes and a single-hole-width of 7 m. The size of the new dam is $n \times B \times H = 13 \text{ m} \times 7 \text{ m} \times 4.5 \text{ m}$ . The water gate height is 4.5 m and the discharge channel width is 91 m. The water gate is composed of the upper deck, the gate chamber, the stilling basin and the Haiman section, with length of 6 m, 10 m, 10 m and 8.5 m, respectively.	2020	2008.01
A-8	He River (Huangshi Hydropower Station - Xiadao Hydropower Station) Dredging Works	Removal of silt, sandbank, sediment, garbage, weeds, debris, and construction waste such as brick and stone in the channel or on the bank. The dredging section is from GL6 + 100 to GL7 + 700 and from GL11 + 300 to GL13 + 300 with total length of approximately 3.6 km, a total dredging volume of approximately 332,500 m <sup>3</sup> (including 156,900m <sup>3</sup> of sediment and 175,600 m <sup>3</sup> of sand or stone).	2018 and 2019	2512.38
<b>2</b>	<b>Urban drainage improvement</b>			<b>106966.54</b>
B-1	Huangansi Drainage Canal Pump Station	Huangansi Drainage Canal is used only for local flood discharge. The design flow of the pumping station is 6.0 m <sup>3</sup> /s.	2018 and 2019	1095.00

**Table 1-1: Summary of Project Activities for  
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<b>No.</b>	<b>Project activities</b>	<b>Description</b>	<b>Implementation schedule</b>	<b>Cost estimate 00,000 RMB</b>
B-2	Shizigang Drainage Canal Pump Station	Shizigang Drainage Canal is used to transfer the storm water from the catchment upstream of Huangansi. The design flow of the pumping station is 36 m <sup>3</sup> /s.	2018 and 2019	8145.00
B-3	Lining River Rehabilitation	The rehabilitation works will follow the planned river alignment with a total length of 6 km (4.38 km for Lining River and 1.62 km for Guangming Canal). The flood control standard for floods with a recurrence period of 20 years will be followed. The Lining River has a riverbed width ranging from 6 m to 8 m and an opening width of 10 m to 15 m. The design bottom elevation is between 102 m and 104 m. The design slope is 0.3%. The design water level is between 125.58 m and 119.47 m. The design dike top elevation on the left side is between 127.79 m and 119.77m and right side between 127.79 m and 120.07 m. The works for Guangming Channel is 1.62 km. The channel bottom width is between 6 m and 8 m and the opening width is between 10 m and 15 m. Its function is to transfer the supplement water from East No.5 Branch Canal to Jintai Lake instead of being a drainage canal. The design bottom elevation is between 102 m and 104 m and design slope is 0.3%.	2022	8380.20
B-4	Changlong River Rehabilitation	The rehabilitation works will follow the planned river alignment with a total length of 4.90 km. The flood control standard for floods with a recurrence period of 20 years will be followed. The Riverbed width is between 6 m and 8 m, and the opening width is between 10 m and 15 m. The design bottom elevation is between 102 m and 104 m. The design slope is 0.3%. The design water level is between 125.58 m and 119.47 m. The design dike top elevation on the left side is between 127.79 m and 119.77m and right side between 127.79 m and 120.07 m. The water replenishing channel of Changlong River upstream of	2022	9659.84

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No.	Project activities	Description	Implementation schedule	Cost estimate 00,000 RMB
		Xiufeng Lake is 0.69 km long. Its function is to replenish water from Huangtian Canal to Xiufeng Lake and is not a drainage canal. The design bottom elevation is between 102 m and 104 m and the design slope is 0.3%.		
B-5	Huangtian Branch Canal Rehabilitation	The rehabilitation works will follow the planned river alignment with a total length of 6.20 km. The flood control standard for floods with a recurrence period of 20 years will be followed. The Riverbed width is between 2 m and 10 m, and the opening width is between 7.5 m and 25 m. The design bottom elevation is between 102 m and 104 m. The design slope is between 0.067 and 0.3%. The design water level is between 105.4 m and 119.37 m. The design dike top elevation on the left side is between 105.7 m and 119.77 m and right side between 105.7 m and 119.77 m. The dredging volume for Huangtian Canal is 7440 m <sup>3</sup> . Huangtian Branch Canal has interceptors along the canal to intercept the dry season sewage from Huangtian Township. The DN400 interceptor has a length of approximately 600 m.	2021	2811.91
B-6	Guposhan Drainage Canal Rehabilitation	The rehabilitation works will follow the planned river alignment with a total length of 3.93 km. The flood control standard for floods with a recurrence period of 20 years will be followed. The Riverbed width is between 1 m and 1.9 m, and the opening width is between 2.6 m and 4 m. The design bottom elevation is between 103 m and 111.57 m. The design slope is 0.21%. The design water level is between 112.55 m and 105.22 m. The design dike top elevation on the left side is between 112.85 m and 105.52 m and right side between 112.85 m and 105.52 m. The dredging volume for Guposhan Drainage Canal is 3540 m <sup>3</sup> . As the intercepting facilities, DN 400 interceptors with a length of approximately 50m are installed at the end of Guposhan Drainage	2021	1476.42

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<b>No.</b>	<b>Project activities</b>	<b>Description</b>	<b>Implementation schedule</b>	<b>Cost estimate 00,000 RMB</b>
		Canal or where it enters Shizigang Drainage Canal.		
B-7	East No. 5 Branch Canal Rehabilitation	The rehabilitation works will follow the planned river alignment. The East No.5 Branch Canal was used mainly for irrigation. After the Project it will serve for various functions including irrigation, drainage and landscaping. The canal alignment is adjusted and planned to be rerouted at Zhanqian Avenue and enters He River directly with a total length of 8.39 km. The flood control standard for floods with a recurrence period of 20 years will be followed. He Riverbed width is between 6 m and 8 m, and the opening width is between 10 m and 15 m. The design bottom elevation is between 102 m and 104 m. The design slope is 0.3%. The design water level is between 125.58 m and 119.47 m. The design dike top elevation is between 127.79 m and 119.77 m on the left side and between 127.79 m and 120.07 m on the right side.	2023 and 2024	6822.45
<b>3</b>	<b>Water quality improvement</b>			<b>33879.65</b>
C-1	Huangansi Drainage Canal Rehabilitation	The length of the rehabilitation works is 1.23 km. The flood control standard for floods with a recurrence period of 20 years will be followed. The main canal is 1.5 deep and 8 to 10 m wide. The design slope is 0.15%. The design bottom elevation is between 102.41 m and 100.70 m. The design dike top elevation is between 106.60 m and 102.80 m. The design discharge flow is 7.6 m <sup>3</sup> /s (and the maximum discharge capacity is 20 m <sup>3</sup> /s). The design water level is between 103.66 m and 101.95 m. The dredging volume is 8800 m <sup>3</sup> . The interceptor is DN400-500 and approximately 1900 m long.	2018 and 2019	1997.94

**Table 1-1: Summary of Project Activities for  
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<b>No.</b>	<b>Project activities</b>	<b>Description</b>	<b>Implementation schedule</b>	<b>Cost estimate 00,000 RMB</b>
C-2	Shizigang Drainage Canal Rehabilitation	The length of the rehabilitation works is 3.72 km. The flood control standard for floods with a recurrence period of 20 years will be followed. The main canal is 21 to 32 m wide. The design slope is 0.09% to 1%. The design bottom elevation is between 103.00 m and 98.9 m. The design dike top elevation is between 105.36 m and 105.80 m. The design discharge flow is 104.4 m <sup>3</sup> /s. The design water level is between 105.33 m and 103.89 m. The dredging volume is 3300 m <sup>3</sup> . The interceptor is DN500-600 and approximately 6000 m long.	2018 and 2019	12342.70
C-3	Jiangnan WWTP and associated pipeline networks	1 No. WWTP (Jiangnan WWTP) with a treatment capacity of 15000 m <sup>3</sup> /day. The main structures include: fine screen, aeration grit chamber (integrated with fine screen), A2/O micro-aeration oxidation ditch, distribution well, sedimentation tank, high-efficiency sedimentation tank, drum filter, buffer tank, gravity condensing tank, sludge storage tank, dewatering room, blower room, contact reactor tank, drainage pumping house, etc. The associated pipeline network includes: 5.384 km new sewage pipeline (including 3.084km long DN500-DN1350 gravity flow pipeline with and 2.3 km long DN 600 pressurized flow pipeline), and 1.165 km long DN500 new pre-buried sewage pipeline.  Construction of a new road, namely Binjiangnan Road in a length of 5.56km and the associated facilities for storm water, sewage, power, telecommunication, lighting, landscaping and traffic management, etc.	2018 and 2019	21099.99
<b>4</b>	<b>Ecological landscaping improvement</b>			<b>11640.71</b>
D-2	Center axial green corridor	Rehabilitation of Lining River and Changlong River focuses on greening and afforestation. The deep water and shallow shoals will be	2021	11640.71

**Table 1-1: Summary of Project Activities for  
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<b>No.</b>	<b>Project activities</b>	<b>Description</b>	<b>Implementation schedule</b>	<b>Cost estimate 00,000 RMB</b>
	development	utilized closely linked to the theme of riverside waterfront ecology to develop a riverside eco-park to deliver waterfront experience mainly in the form of gentle eco-slope. Within He River channel limited by the boundary of municipal roads and built areas, a waterfront greenbelt comprising of shallow water aquatic plants will be built with a greening area of 6.46 ha, a pavement area of 0.3 ha, a garden path area of 7.4 ha and pavilions and structures with a total area of 600 m <sup>2</sup> .		
<b>5</b>	<b>Technical assistance</b>			<b>5483.58</b>
E-1	River governor system + Internet intelligent management and control system	Development of an urban early warning management system, improvement of main watercourse hydrological monitoring stations; development of branch channel hydrological monitoring stations.	2019 -2024	874.51
E-2	He River Watershed water environment monitoring, early and integrated management system	Development of automatic water quality monitoring stations for main watercourse and branch channels; construction of Municipal Environmental Monitoring Station as a part of the national standardization project; development of automatic water environment monitoring and early warning platform	2018 and 2019	4609.07

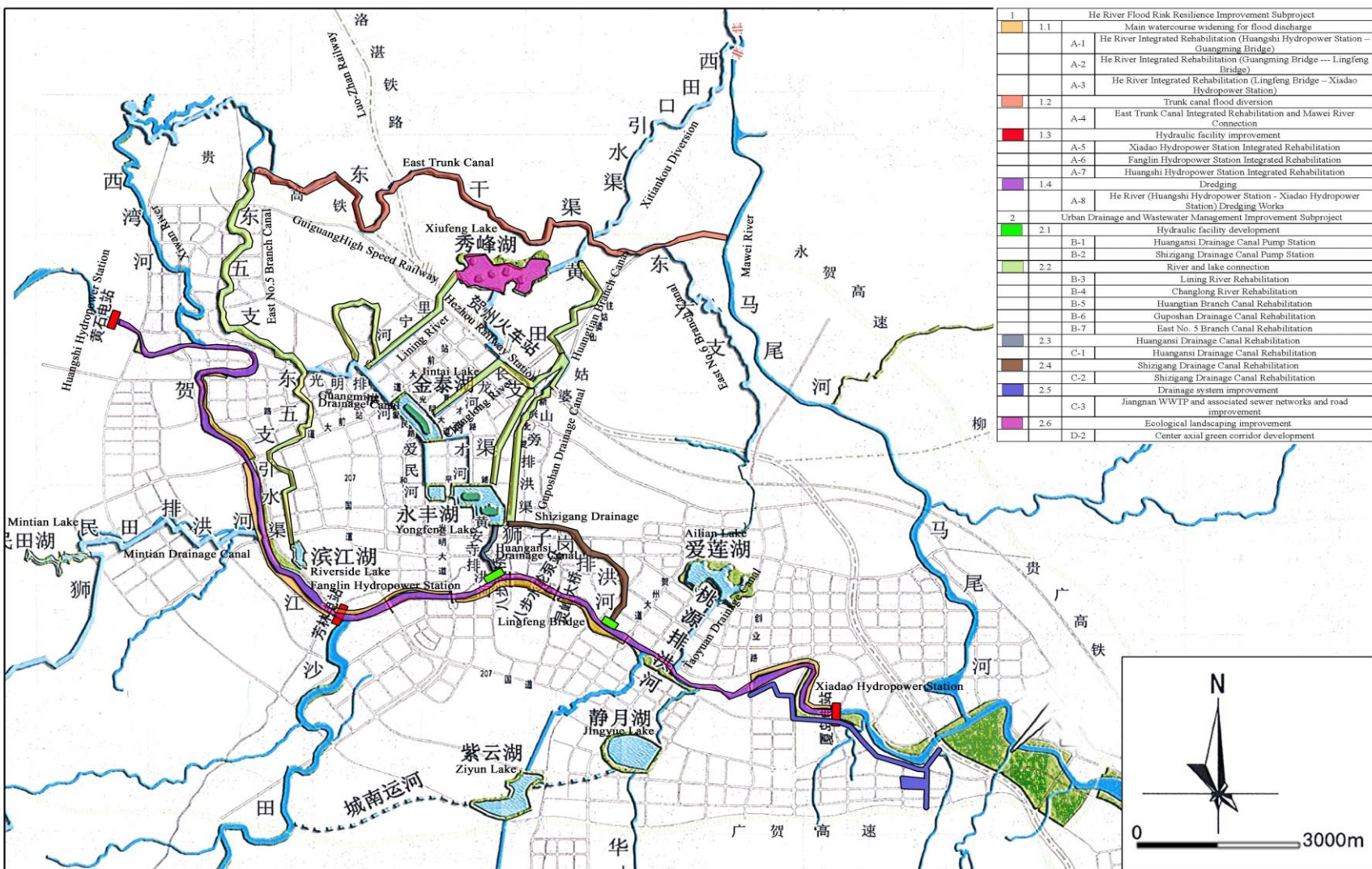


Figure 1-1: Layout Map of Subprojects



## **2. Legal and regulatory framework**

This report is prepared based on the requirements of the Law of the People's Republic of China on Environmental Impact Assessment, the Management Regulations on Environment Protection of Construction Projects, and the Notice on Strengthening Management of Environmental Impact Assessment of Construction Projects Utilizing Loans from International Financial Institutions as well as WB Safeguard Policies. The EIA process is carried out not only in accordance with relevant laws and regulations, policies and standards of China, but also the relevant policies of the World Bank.

### **2.1 PRC national laws and regulations and sector regulations on environmental protection and social issues**

- (1) Environmental Protection Law of the People's Republic of China (amended in Year 2014);
- (2) Law of the People's Republic of China on Environmental Impact Assessment (amended in Year 2016);
- (3) Law of the People's Republic of China on Prevention and Control of Air Pollution (amended in Year 2015);
- (4) Law of the People's Republic of China on Prevention and Control of Water Pollution (amended in Year 2008);
- (5) Law of the People's Republic of China on Prevention and Control of Noise Pollution (amended in Year 1997);
- (6) Law of the People's Republic of China on Prevention and Control of Environmental Pollution of Solid Wastes (amended in Year 2016);
- (7) Water and Soil Conservation Law of the Peoples Republic of China (amended in Year 2011);
- (8) Flood Control Law of the People's Republic of China (amended in Year 2015);
- (9) Interim Methods for Public Participation in Environmental Impact Assessment (SEPA Huanfa Circular No. 2006[28], Feb. 14, 2006);
- (10) Methods for Public Participation in Environmental Protection (MoEP Decree No. (2015)35);
- (11) Notice on Strengthening Management of Environmental Impact Assessment of Construction Projects Utilizing Loans from International Financial Institutions (Huanjian Circular No. [1993]324);
- (12) Notice by the National Development and Reform Commission on Further Strengthening Management of Projects Utilizing Loans from International Financial Institutions (NDRC Foreign Investment Circular No. [2008]1269);
- (13) Management Catalogue of EIA Categories of Construction Projects (Sept. 1, 2017);
- (14) Notice by the State Council on Printing and Issuing the Action Plan on Prevention and Control of Water Pollution (State Council Circular No. [2015]17).
- (15) Law of the People's Republic of China on Protection of Minors (Oct. 26, 2012);
- (16) Stipulations on Prohibition of Use of Child Labour (Issued in 1991 by the State Council);
- (17) Law of the People's Republic of China on Protection of Women's Rights and Interests (Aug. 28, 3005);
- (18) Labor Law of the People's Republic of China (Aug. 27, 2009).

## 2.2 Technical guidelines and specifications of EIA

- (1) Technical Guidelines on Environmental Impact Assessment – General (HJ2.1-2016)
- (2) Technical Guidelines on Environmental Impact Assessment - Surface Water Environment (HJ / T2.3-93)
- (3) Technical Guidelines on Environmental Impact Assessment - Atmospheric Environment (HJ2.2-2008)
- (4) Technical Guidelines on Environmental Impact Assessment - Sound Environment (HJ2.4-2009)
- (5) Technical Guidelines on Environmental Impact Assessment - Ecological Impact (HJ19-2011)
- (6) Technical Specifications on Soil and Water Conservation in Development and Construction Project (GB50433-2008)

## 2.3 Environmental quality and pollutant discharge standards

Based on the features and nature of the Project, a comparative analysis will be carried out in the EIA process of the Project on the PRC national standards on environmental quality and pollutant discharge and the pollutant control standards and requirements included in General Guidelines on Environment, Health and Safety issued by the World Bank Group and the more stringent ones will be used as the basis for execution of the monitoring and assessment activities.

- (1) Ambient Air Quality Standard (GB3095-2012);
- (2) Surface Water Environmental Quality Standard (GB3838-2002);
- (3) Sound Environmental Quality Standard (GB3096-2008);
- (4) Soil Environmental Quality Standard (GB15618-1995);
- (5) Integrated Air Pollutant Emission Standard (GB16297-1996);
- (6) Odor Pollutants Discharge Standard (GB14554-93);
- (7) Integrated Wastewater Discharge Standard (GB8978-1996);
- (8) Pollutant Discharge Standards for Municipal Wastewater Treatment Plants (GB18918-2002)
- (9) Environmental Noise Emission Standards for Construction Sites (GB12523-2011);
- (10) Environmental Noise Emission Standards for Industrial Enterprises Boundary (GB12348-2008);
- (11) World Bank Group's General Guidelines on Environment, Health and Safety;
- (12) World Bank Group's Guidelines on Water and Sanitation, Health and Safety.

Excerptions of the standard limits specified in the environment quality standards applicable to the EIA of the Project are included in Table 2-1 to Table 2-3.

**Table 2-1: Standard values of surface water environment quality standard**  
(excerptoin) Unit:(mg/L)

Item	Class III Limits		Class IV Limits	
NH <sub>3</sub> -N≤	1.0	Target water body: He River	1.5	Target water bodies: East Trunk Canal, Lining River, Changlong River, Huangtian
TP	0.2		0.3	
TN	1.0		1.5	

SS	30		60	Branch Canal, Guoposhan Drainage Canal, East No. 5 Branch Canal, Huangansi Drainage Canal, Shizigang Drainage Canal
DO $\geq$	5		3	
COD $\leq$	20		30	
Permanganate Index $\leq$	6		10	
BOD <sub>5</sub> $\leq$	4		6	
Fecal coliforms	10000		20000	

**Table 2-2: Standard values of ambient air environment quality standard  
(excerption)**

Unit: (mg/m<sup>3</sup>)

Assessment factor	Time of valuation	Class II limits
Total Suspended Solids (TSP)	Annual Average	0.20
	Daily Average	0.30
Inhalable Particulate Matter (PM <sub>10</sub> )	Annual Average	0.10
	Daily Average	0.15
Sulfur Dioxide (SO <sub>2</sub> )	Annual Average	0.06
	Daily Average	0.15
	Hourly Average	0.50
Nitrogen Dioxide (NO <sub>2</sub> )	Annual Average	0.08
	Daily Average	0.12
	Hourly Average	0.24

**Table 2-3: Standard values of Acoustic environment quality standard  
(excerption)**

Unit: dB(A)

Class	Daytime	Nighttime
Class 2	60	50

According to the project characteristics and discharge of pollutants, construction wastewater discharge, domestic wastewater discharge from the construction worker and wastewater discharge from sludge dewatering of Subproject 1 – Flood Control and Subproject 2 – Urban Drainage Improvement should meet Class I standard of Integrated Wastewater Discharge Standard (GB 8978 -1996). Exhaust gas from construction sites, river dredging sites and sludge dewatering sites should meet Integrated Emission Standard of Air Pollutants Discharge Standard (GB16297-1996) and the unorganized discharge limits of Odor Pollutants Discharge Standard (GB14554-93). The construction site noise should meet the requirements of Environmental Noise Emission Standards for Construction Sites (GB12523-2011). The limits of these standards are shown in Table 2-4 to Table 2-7.

**Table 2-4 Integrated Wastewater Discharge Standard**

Unit: mg/L, except pH

Indicators	pH	SS	COD	BOD <sub>5</sub>	NH <sub>3</sub> -N	Phosphate	Oil	Anionic Surfactants
Limits	6~9	70	100	20	15	0.5	5	5

**Table 2-5 Integrated Emission Standard of Air Pollutants Discharge  
Standard (Excerpt)**

Unit: mg/m<sup>3</sup>

Indicators	TSP
Class	Unorganized discharge
Limits	5

**Table 2-6 Odor Pollutants Discharge Standard (Excerpt)**

Unit: (mg/m<sup>3</sup>)

Indicator	NH <sub>3</sub>	Odor	H <sub>2</sub> S
Class	2		
Limits	1.5	20	0.06

**Table 2-7 Environmental Noise Emission Standards for Construction Sites  
(Excerpt)**

Unit: dB (A)

Standard	Item	Limits
<i>Environmental Noise Emission Standards for Construction Sites</i> (GB12523-2011)	Daytime [dB (A) ]	70
	Nighttime [dB (A) ]	55

During the project operation stage, the treated effluent and odor emitted by Jiangnan Wastewater Treatment Plant should meet Class 1A effluent discharge standard and odor emission standard of *Pollutant Discharge Standards for Municipal Wastewater Treatment Plants* (GB18918-2002). The noise from the wastewater treatment plant and drainage pumping stations should comply with Class 2 standards of *Environmental Noise Emission Standards for Industrial Enterprises Boundary* (GB12348-2008). The wastewater discharge from the associated project – Hezhou Municipal Solid Waste Landfill should meet the Class 2 standard of *Pollution Control Standard of Domestic Solid Waste Landfill Site*. The discharge standards that the project should meet during the operation stage are shown in Table 2-8 to 2-11.

**Table 2-8 Municipal Wastewater Treatment Plant Pollutants Discharge Standards (Wastewater)**

Unit: mg/L, except pH

Indicator s	pH	SS	COD	BOD <sub>5</sub>	NH <sub>3</sub> -N	TP	TN	Animal and vegetable oil
Limits	6~9	10	50	10	5 (8)	0.5	15	1

**Table 2-9 Municipal Wastewater Treatment Plant Pollutants Discharge Standards (Exhaust gas)**

Unit: mg/m<sup>3</sup>

Item	NH <sub>3</sub>	H <sub>2</sub> S	Odor concentration (dimensionless)
Limits	1.5	0.06	20

**Table 2-10 Environmental Noise Emission Standards for Industrial Enterprises Boundary (Excerpt)**

Unit: dB(A)

Class	Daytime	Nighttime
Class 2	60	50

**Table 2-11 Pollution Control Standard of Domestic Solid Waste Landfill Site (Wastewater)**

Unit: mg/L, except pH

Indicator s	Chroma	COD	BOD <sub>5</sub>	SS	TN	NH <sub>3</sub> -N	TP
Limits	40	100	30	30	40	25	3
Indicator s	Fecal Coliform	Hg	Cd	Cr	Cr <sup>6+</sup>	As	Pb
Limits	10000 no./L	0.001	0.01	0.1	0.05	0.1	0.1

## **2.4 WB safeguard policies and guidelines**

The correlation of the Project and the WB's safeguards policy / procedure is analyzed.

The results are shown in Table 2-12 below.

**Table 2-12: Correlation Analysis of the Project and the WB Safeguard Policies**

S/N	Safeguard Policies	Triggered ?	Explanation
1	Environmental Assessment OP/BP 4.01	Yes	<p>The project is designed to assist Hezhou Municipality to address its existing challenges on environmental protection and flood control. The proposed investments include river rehabilitation and dredging, improvement of drainage system (pumping stations), construction of sewage interceptor, WWTP and associated pipelines and roads, and strengthening of water and ecological environment monitoring capacity. Based on the characteristics and scope of the Project, it is anticipated that the Project will involve the following environmental impacts:</p> <p>(1) The construction activities in the downtown area of Hezhou Municipality will generate certain environmental and social impacts, especially to the nearby residents and historical and heritage buildings on Xiyue Street.</p> <p>(2) Dredging of He River and its tributaries will generate environmental and social impacts. In the EIA process, the sludge nature and dredging quantity have been assessed and methods for dredging, sludge transportation, treatment and disposal are designed to minimize the impacts on local environment and residents.</p> <p>(3) The construction works under the Project (river rehabilitation, pumping station and wastewater treatment plant) will involve land acquisition and resettlement and thus significant social impacts.</p> <p>(4) The Project and the other development activities already implemented, to be implemented and reasonably foreseeable on the urban section of He River will have accumulative impacts on flood control and water environment, which, according to analysis, are primarily positive impacts.</p> <p>Therefore, the Project triggers World Bank OP4.01 and is identified as Category A Project.</p>
2	Natural Habitats OP/BP 4.04	Yes	<p>The policy is triggered because the construction and operation of proposed WB-financed investments will have impacts on natural habitats including aquatic and terrestrial ecosystem along He River and its tributaries. As</p>

**Table 2-12: Correlation Analysis of the Project and the WB Safeguard Policies**

<b>S/N</b>	<b>Safeguard Policies</b>	<b>Triggered ?</b>	<b>Explanation</b>
			per the requirements of OP4.04, survey on aquatic and terrestrial ecosystem were conducted in the project-affected area and no critical/sensitive natural habitat has been identified. The project-related ecological impacts will be generally positive, and the anticipated adverse impacts are short-term, temporary and site-specific. The project has been developed in an environmentally sustainable way considering the protection of local species and biodiversity, and the specific mitigation measures were incorporated into the ESMP and ECOPs to ensure the potential adverse impacts were sufficiently addressed during construction and operation.
<b>3</b>	Forests OP/BP 4.36	No	The project will not finance activities that involve significant conversion or degradation of critical forest or related critical habitat defined under the policy. This policy will not be triggered.
<b>4</b>	Pest Management OP 4.09	No	The proposed project will neither procure pesticides nor result in increased use of pesticides. This policy will not be triggered.
<b>5</b>	Physical Cultural Resources OP/BP 4.11	Yes	The EA process confirms that the river rehabilitation subprojects of He River main watercourse rehabilitation (Guangming Bridge - Lingfeng Bridge section), Huang'ansi Flood Discharge Pumpstation and Discharge Canal Rehabilitation will have indirect impacts on some ancient buildings on the nearby historical and cultural street of Xiyue Street in the construction stage. In particular, a 120m-long downstream section of Huang'ansi Channel is part of this provincial-level protected historic quarter. A PCR management plan has been developed as part of the ESMP and mitigation measures have been developed to avoid, minimize and compensate the project-related impacts. In addition, the RAP survey also found that the subproject of central green corridor will affect 53 new tombs of rural household and might generate impacts on local sacrificial customs. All the compensation and relocation measures for those tombs have been formally planned and developed in the RAP based on detailed survey and extensive consultation.
<b>6</b>	Indigenous Peoples	No	The Project is located in Hezhou Municipality of GZAR. According to the investigation, there are no ethnic



**Table 2-12: Correlation Analysis of the Project and the WB Safeguard Policies**

<b>S/N</b>	<b>Safeguard Policies</b>	<b>Triggered ?</b>	<b>Explanation</b>
	OP/BP 4.10		minorities in the project areas. Therefore, the project will not affect the ethnic minorities. Details will be further investigated during the project preparation.
<b>7</b>	Involuntary Resettlement OP/BP 4.12	Yes	Project components, including watercourse widening of He River and its tributaries for flood discharge, river and lake connection, Jiangnan WWTP, will involve extensive occupation of land and also private house demolition. Therefore, in the project design, the impact of land acquisition has been minimized. The Project triggers OP4.12 and a Resettlement Plan has thus been prepared.
<b>8</b>	Safety of Dams OP/BP 4.37	Yes	It has been found during environmental screening that there are two dams upstream of the proposed WB-financed Project. However, there are three small hydroelectric stations involved in the Project for rehabilitation. This policy is therefore triggered considering their direct impacts on the safety of proposed interventions. The Borrower has arranged one independent dam specialist to: 1) Inspect and evaluate the safety status of existing dams identified as relevant; 2) Review and evaluate the owner's operation and maintenance procedures; and 3) Provide a written report of findings and recommendations for any remedial work or safety-related measures.
<b>9</b>	Projects on International Waterways OP/BP 7.50	No	This Project involves no international waterways. The policy is not applicable and no action is required.
<b>10</b>	Projects in Disputed Areas OP/BP 7.60	No	All the project areas are in Guangxi and no disputed areas are involved.

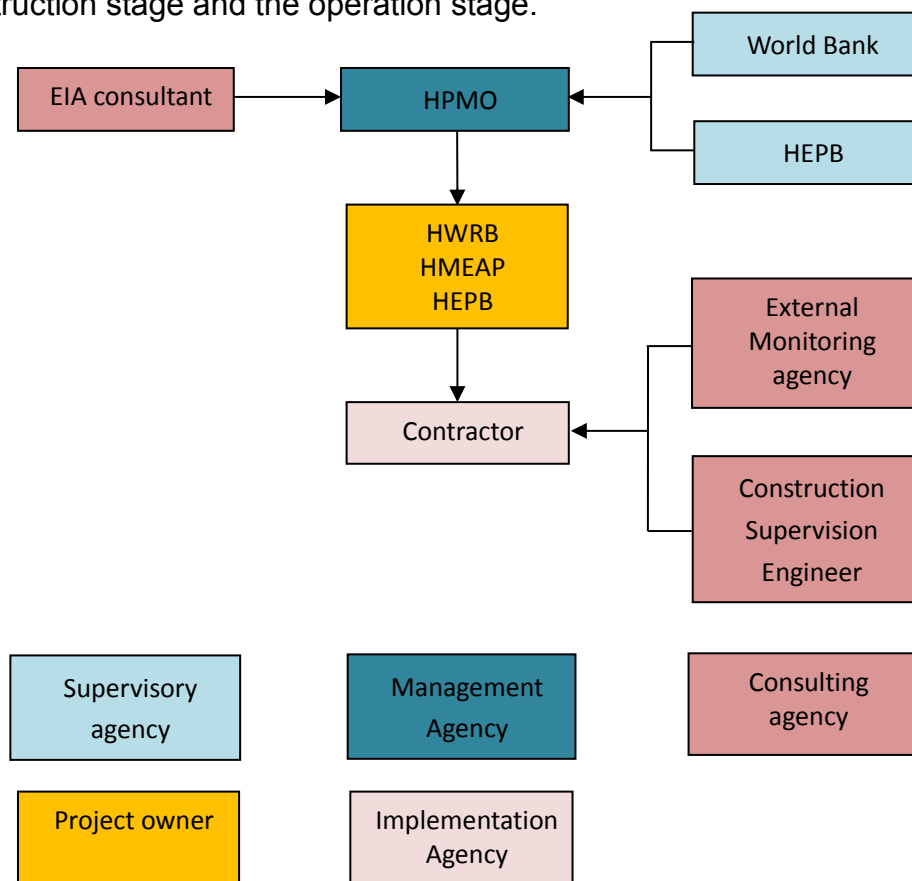
### **3. Environment and Social Management System**

Hezhou Municipal Environmental Protection Bureau is responsible for the review and approval of the various subprojects of the Project according to the administrative authority stipulated in the Law of the People's Republic of China on Environmental Protection and the Regulations on Environmental Protection Management of Construction Projects. As the environment management agency of the Project, Hezhou Municipal Environmental Protection Bureau is mainly responsible for proposing

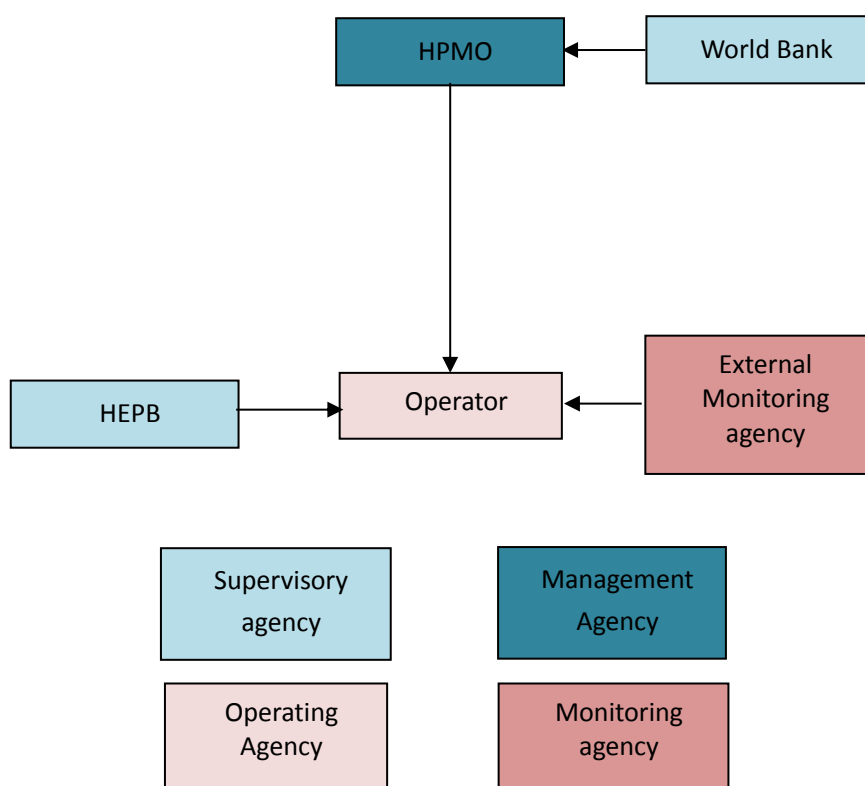
environmental protection requirements based on the contents of the EIA Report of the Project, coordinating the environment management work of the various departments and organizing the “three-simultaneousness” acceptance of the environmental protection facilities. The World Bank Loan Project Management Office is responsible for managing the implementation of the entire Project while the Project owner is responsible for implementing the various specific activities under the general administration framework of the Project as well as the leadership of Hezhou Municipal Government. In order to assure smooth implementation of the environment management activities of the Project, a number of full-time or part-time environment management personnel are assigned in the PMO, the Project owner, the Contractor and the Operator to implement the Environmental & Social Management Plan.

### 3.1 Environment management agency

As the environment management activities of the Project in the construction stage are significantly different from those in the operation stage and such activities are either short-term or long-term in terms of their deadlines, the Contractor and the Operator should set up separate organizations to take the responsibility for different stages. As the construction stage ends, the management organization of the construction stage will be cancelled while that of the operation stage will start to operate, with a certain overlapping period allowed based on the progress of the specific management activities. See Figure 3-1 and Figure 3-2 for the environment management agencies in the construction stage and the operation stage.



**Figure 3-1: Schematic Diagram of the Environment Management Agencies in the Construction Stage of the Project**



**Figure 3-2: Schematic Diagram of the Environment Management Agencies in the Operation Stage of the Project**

### 3.2 Responsibilities and contents of environment management

The contents of environment management in the construction stage are remarkably different from those in the operation stage of the Project and the ESMP is implemented by different responsible departments. Table 3-1 shows the contents and staffing of each environment management agency for environment management work in different stages.

**Table 3-1: Contents of Environment Management in Different Stages**

Stage	Project stakeholders	Key Contents of Environment Management	Staffing
Design and preparation	PMO	Contacting and coordinating with the competent government department of environment management for implementation of the environment management matters;	2
	Project owner	1. Responsible for a series of environmental protection management work in the design and preparation stage of the Project; 2. Securing the fund needed for the environmental protection work;	3

**Table 3-1: Contents of Environment Management in Different Stages**

Stage	Project stakeholders	Key Contents of Environment Management	Staffing
		3. Responsible for coordinating with the competent government department of environment management for implementation of the environment management matters; 4. Recruiting supervision engineer and collecting records.	
	Designer	1. Incorporating the environmental protection measures into the design program and budget; 2. Incorporating the ESMP mitigation measures into the technical specifications of the bidding documents.	3
	EIA consultant	1. Providing technical support to the environmental protection work included in the project design; 2. Preparing the EIA documents of the Project; 3. Development ESMP.	5
	Municipal EPB	1. Responsible for review and approval of EIA Report of the Project; 2. Providing guidance to the urban and county EPBs on proper implementation of the routine environment supervision and management work of the Project.	2
Construction stage	Project owner	1. Responsible for a series of environmental protection management work in the construction stage of the Project and securing the fund needed for the environmental protection work; 2. Managing and supervising the environmental protection work in the construction stage and investigating into and handling problems of public disturbance or pollution arising in the construction process; 3. Responsible for coordinating with the competent government department of environment protection for implementation of the environment management matters; 4. Following up with the execution status of the ESMP and reporting on a periodical basis to the competent government department of the same level, the provincial PMO and the World Bank ; 5. Accepting and handing public complaints.	3
	Contractor	1. Implementing the environmental protection measures and the various activities in the construction stage based on the bidding documents, the construction contract and this ESMP; 2. Accepting guidance and supervision by the environment management personnel of the Project owner, the construction supervision engineer and the related government departments; 3. Accepting technical supports provided by the environmental protection consulting agency; 4. Implementing safety protection measures, e.g. erecting signs and fences on the boundary of construction sites, setting up channels of public communication and assuring construction safety; 5. Executing the ESMP.	3

**Table 3-1: Contents of Environment Management in Different Stages**

Stage	Project stakeholders	Key Contents of Environment Management	Staffing
	Construction Supervision Engineer	1. Supervising the contractor's execution of the ESMP and carrying out the environment mitigation measures in the construction contract; 2. Carrying out site supervision of the implementation status of the Contractor; 3. Assisting the EA in carrying out the environment management work; 4. Keeping records of and developing and submitting to the Project owner on a periodical basis ESMP execution status reports.	5
	Environmental Monitoring Agency	1. Carrying out the environmental monitoring work of the construction stage and operation stage of the Project based on the authorization of the Project owner and the environmental monitoring plan included in this EIA report; 2. Conducting the monitoring activity under the authorization of the Project owner in case of any abnormalities in the construction process.	Depending on the scope of authorized assignment
	Local EPB	1. Supervising and inspecting the environmental protection measures of the Project owner and the Contractor; 2. Receiving ESMP execution reports submitted by the Project owner and the PMO and performing the administration functions based on such reports; 3. Arranging emergency response actions in the event of any abnormal environmental conditions in the construction process; 4. Accepting and coordinating the handling process of public complaints.	2
	Technical Assistance / Consultant	1. Providing technical supports to the environmental protection work in the construction stage of the Project according to the authorization of the Project owner and this EIA Report as well as the environmental protection design outcomes; 2. Providing the contractor with technical guidance on the environmental protection work and properly carrying out the environmental protection training work in the construction stage of the Project.	Unlimited
Operation stage	Project owner or Operator	1. Responsible for the post-operation management work of environmental protection and implementing the mitigation measures and monitoring of the ESMP in the operation stage; 2. Responsible for contacting and coordinating with the competent government department about the implementation of the environment management matters; 3. Making emergency responses to environmental accidents; 4. Providing periodical staff training to enhance their competence and actively organizing activities for exchange of environmental protection technology and experiences to further improve the management work of environmental protection.	3

**Table 3-1: Contents of Environment Management in Different Stages**

Stage	Project stakeholders	Key Contents of Environment Management	Staffing
	Environmental Monitoring Agency	1. Carrying out the environmental monitoring work of the operation stage of the Project as authorized by the Project owner and required in the environmental monitoring plan; 2. Carrying out the routine monitoring activities related to the Project on a periodical basis.	Depending on the scope of authorized assignment
	Municipal EPB	1. Responsible for the final acceptance of the environmental protection work of the Project; 2. Guiding the county EPB to properly carry out the routine environment supervision and management work of the Project.	2
	Local EPB	1. Managing and supervising the status of compliance with the environmental protection standards in the operation stage; 2. Carrying out routine supervision and inspection of the operation status of the built environmental protection facilities.	2
	Public or organizations	Public supervision	Not limited

### 3.3 Environmental protection supervision plan

Based on the characteristics of the Project, the implementation status of the environmental protection work of the Project is not only subject to the supervision of Hezhou Municipal EPB, but also the relevant department of the World Bank. Construction supervision engineers should be employed to assist the EA in site supervision and inspection in the construction stage of the Project and an environmental protection division should be set up to supervise the Project in the operation stage.

See Table 3-2 for the environmental protection supervision plan of the Project.

**Table 3-2 Environmental Protection Supervision Plan of the Project**

Stage	Agency	Content of Supervision	Purpose of Supervision
FS stage	Municipal EPB, WB	1. Reviewing EIA Outlines; 2. Reviewing EIA Report; 3. Reviewing EAP	1. To make sure the EIA Report has complete content, well-selected topics and clear focus; 2. To make sure that any significant and potential issues likely to arise in the Project are reflected; 3. To make sure that a specific and feasible implementation plan is available for the mitigation measures of the environmental impacts.
Design and construction stage	Municipal Government Municipal EPB Babu District EPB Pinggui District	1. Reviewing the preliminary environmental protection design and ESMP; 2. Inspecting the restoration of temporarily occupied land, and vegetation and environment	1. To strictly enforce the “three-simultaneousness” policy of the Project; 2. To assure that all the construction sites satisfy the environmental protection

**Table 3-2 Environmental Protection Supervision Plan of the Project**

Stage	Agency	Content of Supervision	Purpose of Supervision
	EPB Municipal Culture & Tourism Bureau	<p>affected by the construction works;</p> <p>3. Inspecting measures for control of dust and noise pollution and deciding construction time;</p> <p>4. Inspecting emission of air pollutants;</p> <p>5. Inspecting discharge and treatment of domestic sewage and waste engine oil on the construction sites;</p> <p>6. Inspecting restoration and treatment of borrow pits and waste disposal sites;</p> <p>7. Inspecting disposal of sludge;</p> <p>8. Inspecting and determining whether there any underground cultural relics.</p>	<p>requirements;</p> <p>3. To reduce the impacts on the surrounding environment in the construction stage and enforce the relevant laws and regulations and standards of environmental protection;</p> <p>4. To make sure that the water quality of He River and Nei River are not polluted;</p> <p>5. To make sure that the landscape and land resources are not seriously damaged to avoid soil erosion;</p> <p>6. To make sure that the sludge is properly disposed;</p> <p>7. To protect the cultural resources from damages.</p>
Operation stage	Municipal EPB Babu District EPB Pinggui District EPB Municipal public security and fire protection authorities	<p>1. Inspecting the implementation of EAP in the operation stage;</p> <p>2. Inspecting the implementation of the monitoring plan;</p> <p>3. Inspecting sensitive spots where further environmental protection measures are needed (and where unanticipated environmental problems may arise);</p> <p>4. Inspecting whether the environment quality at the environmentally-sensitive spots satisfies the requirements of the corresponding quality standard;</p> <p>5. Strengthening supervision to prevent unanticipated incidents and developing emergency response plans so that the environmental risks can be eliminated in time in the event of any accidents.</p>	<p>1. To implement EAP;</p> <p>2. To implement monitoring plan;</p> <p>3. To protect environment in the true sense;</p> <p>4. To strengthen environment management and actually safeguard personal health;</p> <p>5. To assure that the pollutant emission satisfies the emission standards.</p>

## 4. Environmental and social impacts and mitigation measures

The Project Components include He River Flood Risk Resilience Improvement Subproject and Urban Drainage and Wastewater Management Subproject. In

accordance with the relevant laws and codes of China and Guangxi and in association with the World Bank General Environment, Health and Safety (EHS) Guidelines, EHS Guidelines for Water Supply and Drainage, general and special countermeasures and mitigation measures are proposed for the preparation stage, the construction stage and the operation stage of different types of subprojects. For the general countermeasures and mitigation measures, three ECOPs and 1 MP are developed as annexes to the ESMP, namely Annex 1: ECOP for Embankment Construction Component, Annex 2: ECOP for Small Waterworks Construction Component, Annex 3: ECOP for Road and Pipeline Network Construction Component and Annex 4: Management Plan of Physical Cultural Resources. Table 4-1 shows the ECOPs and MP applicable to the respective subprojects while Tables 4-2 to 4-11 present a summary of the environmental and social impacts as well as the mitigation measures. Table 4-12 summarizes the LAR and social impacts and their mitigation measures while Table 4-13 presents the Dam Safety Action Plan. In addition, a Checklist of Environmental Mitigation Measures is also prepared under the ESMP as shown in Annex Table 5.



**Table 4-1: ECOP and ESMP applicable to each subproject**

<b>S.N</b>	<b>Name of subproject</b>	<b>Applicable ECOP</b>
<b>I</b>	<b>Flood risk control</b>	
A-1	He River Integrated Rehabilitation Subproject (Huangshi Hydropower Station – Guangming Bridge)	ESMP Annex 1: ECOP for Embankment Construction Component
A-2	He River Integrated Rehabilitation Subproject (Guangming Bridge --- Lingfeng Bridge)	ESMP Annex 1: ECOP for Embankment Construction Component; Annex 4: Physical Cultural Resources Management Plan
A-3	He River Integrated Rehabilitation Subproject (Lingfeng Bridge – Xiadao Hydropower Station)	ESMP Annex 1: ECOP for Embankment Construction Component
A-4	East Trunk Canal Integrated Rehabilitation and Mawei River Connection Subproject	ESMP Annex 2: ECOP for Small Waterworks Construction Component
<b>II</b>	<b>Urban drainage improvement</b>	
B-1	Huangansi Drainage Pump Station	ESMP Annex 2: ECOP for Small Waterworks Construction Component; Annex 4: Physical Cultural Resources Management Plan
B-2	Shizigang Drainage Pump Station	ESMP Annex 2: ECOP for Small Waterworks Construction Component
B-3	Lining River Rehabilitation	ESMP Annex 2: ECOP for Small Waterworks Construction Component
B-4	Changlong River Rehabilitation	ESMP Annex 2: ECOP for Small Waterworks Construction Component
B-5	Huangtian Branch Canal Rehabilitation	ESMP Annex 2: ECOP for Small Waterworks Construction Component ; Annex 3: ECOP for Road and Pipeline Network Construction Component
B-6	Guposhan Drainage Canal Rehabilitation	ESMP Annex 2: ECOP for Small Waterworks Construction Component
B-7	East No. 5 Branch Canal Rehabilitation	ESMP Annex 2: ECOP for Small Waterworks Construction Component
<b>III</b>	<b>Water quality improvement</b>	
C-1	Huangansi Drainage Canal Integrated Rehabilitation	ESMP Annex 1: ECOP for Embankment Construction Component; Annex 4: Physical Cultural Resources Management Plan
C-2	Shizigang Drainage Canal Integrated Rehabilitation	ESMP Annex 1: ECOP for Embankment Construction Component
C-3	Jiangnan WWTP and associated pipeline construction	ESMP Annex 3: ECOP for Road and Pipeline Network Construction Component
<b>IV</b>	<b>Institutional Capacity Building and Project Management</b>	
E-1	River supervisor system + Internet Smart Management System	ESMP Annex II: ECOP for Small Waterworks Construction Component

**Table 4-2 Environment Impacts and Mitigation Measures of Main Watercourse Widening Subcomponent**

Subcomponent	Period	Activity	Environmental Sensitive Receptor	Potential Impact	Mitigation/Prevention Measures	Cost CNY 10,000	Implemented By	Supervised By
Main Watercourse Widening for Flood Discharge: A-1 He River Rehabilitation (Huangshi Hydropower Station to Guangming Bridge); A-2 He River Rehabilitation (Guangming Bridge to Lingfeng Bridge); A-3 He River Rehabilitation (Lingfeng Bridge to Xiadao Hydropower Station)	Design	Technical design	Residents on the right bank of He River downstream from Huangshi Hydropower Station, ancient buildings in Xiyue Street Historical and Cultural Quarter, The Old Site of CCP Babu Special Branch within Xiadao Primary School	Original technical design requires demolition of large quantities of residential buildings on the right bank of He River downstream from Huangshi Hydropower Station, occupation of part of land of Hezhou Municipality High School, demolition of The Old Site of CCP Babu Special Branch, and occupation of protected area of Xiyue Street Historical and Cultural Quarter.	1. He River (Huangshi Hydropower Station to Guangming Bridge, GL20+800~GL21+485), 685 m in length. Embankment width of the right bank is narrowed by 40 m and glass retaining wall will be built to avoid relocation of residents downstream from Huangshi Hydropower Station. 2. He River (Huangshi Hydropower Station to Guangming Bridge, GL10+545~GL10+940), 395 m in length. Technical design is optimized by changing earth dike to glass retaining wall to narrow land area occupied and avoid impact to Hezhou High School on the right bank. 3. He River (Huangshi Hydropower Station to Guangming Bridge, GL2+760~GL2+800), 40 m in length. T-shaped revetment slope is changed to vertical retaining wall to narrow land area occupied and avoid demolition of The Old Site of CCP Babu Special Branch. 4. Construction area boundary is changed to avoid protected area of Xiyue Street Historical and Cultural Quarter.	/	Design Institute	/
	Construction	Watercourse widening, civil work construction, construction material and soil/stone transportation, construction camp, and temporary	Shangsong Village, shanty town of Xiwan Village, Xiwan Town residents, Pinggui District Government, Xiwan Community, houses of Jinshuiwan Community by He	Operation noise of excavator, bulldozer, loader, vibrator and dump truck during construction will have certain impact on sensitive receptors within 30 m around the construction site.	As specified in Annex 1 of the ESMP, ECOP for Embankment Construction, temporary sound barrier with height not lower than 2 m should be set for construction sites near Hezhou College, Hezhou Pilot Middle School and Xiadao Primary School, and construction activities should be scheduled to avoid normal school time.	30	Contractor	Hezhou Municipal EPB

**Table 4-2 Environment Impacts and Mitigation Measures of Main Watercourse Widening Subcomponent**

Subcomponent	Period	Activity	Environmental Sensitive Receptor	Potential Impact	Mitigation/Prevention Measures	Cost CNY 10,000	Implemented By	Supervised By
		construction site access road	River (not delivered for use), Jigongzhou, Songmuji Community of Gonghe Village, Longjiangdu, Hezhou College, Sanjia Village, Fanglin Street, Hezhou Municipality Pilot Middle School, Fanglin Village, Loacengwu, residential buildings of Wen Yuanhuadu Community by He River, residents in No.2 Xinan Alley of Babu Street, Xiyue Street residents, Xialiang Village, Diandengzhai, Chushuitang, Xiadao Primary School, Xiadao Village, Jichitan	Earth excavation, onsite storage, backfilling, people and vehicle moving, and leakage and spill of earth transportation vehicles will have impact on sensitive receptors within 50 m around construction site. Construction solid waste generated from demolition of buildings acquired and waste soil/stone from construction of new buildings/structures will have environmental impact, if not well managed.				
			Land area permanently and temporarily occupied by the Project	Soil erosion area of 166.09 hm <sup>2</sup> and soil loss of 24,350 tons caused by construction activities	① He River Rehabilitation (Huangshi Hydropower Station to Guangming Bridge) Reusable surface soil in disturbed area should be removed and stored in designated area before construction. Cut slope and surface with vegetation being removed should be covered with dense-mesh net for protection during construction and restored through soil	15.6	Contractor	Hezhou Water Resources Bureau

**Table 4-2 Environment Impacts and Mitigation Measures of Main Watercourse Widening Subcomponent**

Subcomponent	Period	Activity	Environmental Sensitive Receptor	Potential Impact	Mitigation/Prevention Measures	Cost CNY 10,000	Implemented By	Supervised By
					<p>covering and greening in later stage.</p> <p>Structural measures: removal of 227900m<sup>3</sup> surface soil, 227900m<sup>3</sup> surface soil backfill, and construction of 15123 m long bio-swale (included in technical design).</p> <p>Greening measures: 330031 m<sup>2</sup> embankment slope covered with grass, 30246 m<sup>2</sup> planting of trees, bush and grass, and 60 m<sup>2</sup> vertical greening (included in technical design). Temporary measures: temporary covering by 10,000m<sup>2</sup> dense-mesh net (new).</p> <p>② He River Rehabilitation (Guangming Bridge to Lingfeng Bridge)</p> <p>Reusable surface soil in disturbed area should be removed and stored in designated area before construction. Cut slope and surface with vegetation being removed should be covered with dense-mesh net for protection during construction and restored through soil covering and greening in later stage.</p> <p>Structural measures: removal of 31300 m<sup>3</sup> surface soil, 31300 m<sup>3</sup> surface soil backfill, and construction of 450 m long bio-swale, 3795m<sup>2</sup> for permeable bricks (included in technical design).</p> <p>Greening measures: 31924 m<sup>2</sup> embankment slope covered with grass, 750 m<sup>2</sup> planting of trees, bush and grass, 944m<sup>2</sup> vertical landscaping, 1145m<sup>2</sup> key area landscaping, 137998m<sup>2</sup> landscaping (included in technical design). Temporary measures: temporary covering by 1,000 m<sup>2</sup> dense-mesh net (new).</p> <p>③ He River Rehabilitation (Lingfeng</p>			

**Table 4-2 Environment Impacts and Mitigation Measures of Main Watercourse Widening Subcomponent**

Subcomponent	Period	Activity	Environmental Sensitive Receptor	Potential Impact	Mitigation/Prevention Measures	Cost CNY 10,000	Implemented By	Supervised By
					Bridge to Xiadao Hydropower Station) Reusable surface soil in disturbed area should be removed and stored in designated area before construction. Cut slope and surface with vegetation being removed should be covered with dense-mesh net for protection during construction and restored through soil covering and greening in later stage. Structural measures: removal of 35,100 m <sup>3</sup> surface soil, 35,100 m <sup>3</sup> surface soil backfill, and construction of 3040 m long ecological swale (included in technical design). Greening measures: 209926 m <sup>2</sup> embankment slope covered with grass, 3,040 m <sup>2</sup> planting of trees, bush and grass, 64441m <sup>2</sup> landscaping (included in technical design). Temporary measures: temporary covering by 7,000 m <sup>2</sup> dense-mesh net (new).			
		Watercourse widening, and dike construction	He River water quality	Without good management, construction material such as asphalt, fuel, chemicals and domestic sewage of construction workers may enter surface water and cause water environment pollution.	1. Construction should be scheduled in dry season as much as possible. 2. Construction area should be minimized and construction period should be shortened. 3. Vegetation should be restored as early as possible to minimize impact. 4. ECOP for dike construction, included as Annex 1 of the ESMP should be followed.	10	Contractor	Hezhou Municipal EPB
		Watercourse widening, civil work construction, construction material and soil/stone	Ancient buildings in Xiyue Street Historical and Cultural Quarter, The Old Site of CCP Babu Special	There are no protected ancient buildings or relics within construction area, but uncontrolled	Physical and cultural resources management plan as included in Annex 4 of the ESMP should be strictly followed by construction activities.	10	Contractor	Hezhou Culture and Press and Publications Bureau

**Table 4-2 Environment Impacts and Mitigation Measures of Main Watercourse Widening Subcomponent**

Subcomponent	Period	Activity	Environmental Sensitive Receptor	Potential Impact	Mitigation/Prevention Measures	Cost CNY 10,000	Implemented By	Supervised By
		transportation	Branch within Xiadao Primary School	construction activities may lead to damage to ancient buildings and the relics and pollution, and the damage may be irremediable.				
		civil work construction, construction material and soil/stone transportation	4 banyan in Xialiang Community, 2 hackberries, 1 banyan and 1 Cinnamomun camphor in Mid Jiangbei Road	Ancient and rare trees are not within construction area of the Project, but quite near the construction site, approximately 50 m away from the site. Normal growth of these trees will possibly be affected by earth taking and disposal, storage of construction solid waste, moving of construction vehicles and transportation of construction equipment.	<ol style="list-style-type: none"> <li>1. Construction scope should be minimized and construction period should be shortened as possible;</li> <li>2. It is prohibited to chop down the trees, transplant without being permitted, peel the bark, dig out the root and inject toxic and harmful substance to the trees;</li> <li>3. It is not allowed within 5 meters outside crown shadow of the trees for construction of buildings or structures, laying of pipelines, laying of power cables, pit excavation and earth taking, sand and stone taking, inundation or paving ground surface, fume emission, wastewater discharge and solid waste dumping, storage or dumping of flammable and combustible or toxic and harmful substances;</li> <li>4. It is not allowed for carving, nailing, winding, hanging on the trees or piling material against the tree trunk; and</li> <li>5. Entry of construction vehicles and equipment is not allowed within 5 meters outside crown shadow of the trees.</li> </ol>	/	Contractor	Hezhou Urban Administration Bureau
		Road occupation by construction activity,	Hezhou College, Hezhou Municipality Pilot Middle School,	Occupation of school access road will cause access	<ol style="list-style-type: none"> <li>1. For construction activities that will affect public traffic, construction program should be provided to</li> </ol>	2	Contractor	Hezhou Transport Bureau, Hezhou

**Table 4-2 Environment Impacts and Mitigation Measures of Main Watercourse Widening Subcomponent**

Subcomponent	Period	Activity	Environmental Sensitive Receptor	Potential Impact	Mitigation/Prevention Measures	Cost CNY 10,000	Implemented By	Supervised By
		construction material and soil/stone transportation	and Xiadao Primary School	difficulties of students, school staff and parents and may affect access safety of the students and disturb normal school activities.	<p>public traffic authority in advance for arrangements for adjusting public traffic route, and construction cannot commence until permission is obtained.</p> <p>2. Signs should be set on construction site before construction indicating construction description and schedule, requesting public understanding of inconvenience caused by construction activities, and disclosing contact information and complaint hotline. This information could be disclosed in advance through media, micro-blog and wechat, as possible.</p> <p>3. Excavation and backfilling should be done by zone.</p> <p>4. Temporary access path should be built when construction site is near public facilities like bus stop. Material transportation should be scheduled to avoid peak hours to reduce peak traffic volume.</p> <p>5. Traffic diversion and adjustment should be done by traffic police in peak school hours and temporary traffic lights and other signs should be set.</p> <p>6. Training on construction management and environmental protection should be strengthened.</p>			Traffic Police Group
		Civil work construction, and watercourse widening	Water supply pipeline located 23 m upstream from Sanjia Bridge	Interruption of existing underground pipelines due to poor construction management	<p>1. The contractor should further coordinate with municipal and urban development authorities during construction for collection of underground pipeline information including pipeline type, alignment and depth, and establish pipeline</p>	/	Contractor	Hezhou Housing and Urban and Rural Development Bureau

**Table 4-2 Environment Impacts and Mitigation Measures of Main Watercourse Widening Subcomponent**

Subcomponent	Period	Activity	Environmental Sensitive Receptor	Potential Impact	Mitigation/Prevention Measures	Cost CNY 10,000	Implemented By	Supervised By
					<p>coordination team. Prior approval should be obtained from municipal and urban development authorities for excavation interfering with underground pipelines.</p> <p>2. Construction plan and emergency responsive program should be developed based on pipeline alignment and depth to avoid interference with existing underground pipelines as much as possible.</p> <p>3. In the event of interference with existing pipelines, the concerned authority should be informed of particular construction location and schedule of excavation activities, and emergency responsive program should be in place.</p>			
		Earth borrow, and waste soil disposal	2 borrow areas located at 1.25 km east to Xiadao Bridge in eastern Hezhou Municipality and west to Hezhou Municipality electronic technology ecological industrial park; the disposal site located in construction solid waste landfill in Huangtian Town Gonghe Village of Hezhou Municipality	Soil erosion area of 87.72 hm <sup>2</sup> and soil loss of 100058 tons caused by earth borrow and disposal for temporary land use, construction access road, construction camp, etc.	<p>① Temporary Construction Path Surface soil should be removed and be stored in temporary storage site in The main watercourse of He River rehabilitation zone, and temporary drainage and sedimentation structures should be built along both sides of the road. The site should be restored in late construction stage. Structural measures: removal of 41600 m<sup>3</sup> surface soil, 41600 m<sup>3</sup> surface soil backfill and 20.82 hm<sup>2</sup> land restoration (new). Greening measures: 5.12 hm<sup>2</sup> forest restoration and 7.04 hm<sup>2</sup> grass land restoration (new). Temporary measures: 138660 m temporary earth drainage canal, and 139 temporary sedimentation tanks (new).</p> <p>② Construction Site and Camp</p>	1491.16	Contractor	Hezhou Water Resources Bureau



**Table 4-2 Environment Impacts and Mitigation Measures of Main Watercourse Widening Subcomponent**

Subcomponent	Period	Activity	Environmental Sensitive Receptor	Potential Impact	Mitigation/Prevention Measures	Cost CNY 10,000	Implemented By	Supervised By
					<p>Surface soil should be removed and be stored in designated storage site, and temporary drainage and sedimentation structures should be built around the site before construction. Temporary material storage site should be covered during construction. The site should be restored in late construction stage.</p> <p>Structural measures: removal of 9,000 m<sup>3</sup> surface soil, 9,000 m<sup>3</sup> surface soil backfill and 4.50 hm<sup>2</sup> land restoration (new).</p> <p>Greening measures: 0.11 hm<sup>2</sup> garden plot restoration and 2.71 hm<sup>2</sup> grass land restoration (new).</p> <p>Temporary measures: 4,685 m temporary earth drainage canal, and 26 temporary sedimentation tanks, and 7,700 m<sup>2</sup> dense-mesh net (new).</p> <p>③ Temporary Soil Storage Site</p> <p>Straw bag stuffed with soil will be put surrounding the site, and temporary drainage and sedimentation structures should be built around the site before construction. Temporary soil storage site should be covered during construction. The site should be restored in late construction stage.</p> <p>Structural measures: 18.05 hm<sup>2</sup> land restoration (new).</p> <p>Greening measures: 4.31 hm<sup>2</sup> forest land restoration, 1.38hm<sup>2</sup> garden restoration and 2.22 hm<sup>2</sup> grass land restoration (new).</p> <p>Temporary measures: installation and removal of 8658 m long temporary straw bag stuffed with soil, 5758 m temporary earth drainage canal, and 53 temporary sedimentation tanks, and 206250 m<sup>2</sup></p>			

**Table 4-2 Environment Impacts and Mitigation Measures of Main Watercourse Widening Subcomponent**

Subcomponent	Period	Activity	Environmental Sensitive Receptor	Potential Impact	Mitigation/Prevention Measures	Cost CNY 10,000	Implemented By	Supervised By
					<p>dense-mesh net (new).</p> <p>④ Borrow Area</p> <p>Water and soil conservation measures for borrow area are not included in project technical design, which should be a comprehensive system composed of structural measures, planting measures and temporary measures. Surface soil should be removed and be stored in temporary storage site before construction. Excavation during construction should be done from top to bottom and bench by bench to form stable cut slope. Retaining wall of soil bags should be built along slope bottom and bare ground surface should be covered with dense-mesh net. Temporary drainage canals and structures should be built around the site. The borrow area should be restored in late construction stage through surface soil backfill and vegetation replanting.</p> <p>Structural measures: removal of 11,080 m<sup>3</sup> surface soil, 11,080 m<sup>3</sup> surface soil backfill, 36.95 hm<sup>2</sup> land restoration, 3,800 m long brick drainage canal, and 15 brick sedimentation tanks (new).</p> <p>Greening measures: 36.95 hm<sup>2</sup> grass planting, planting of 46,187 pines and 92,375 bushes (new).</p> <p>Temporary measures: 1,000 m retaining wall for temporary storage site and 36,000 m<sup>2</sup> dense-mesh net (new).</p> <p>⑤ Disposal Site</p> <p>Water and soil conservation measures for disposal site are not included in project technical design, which should be a comprehensive system composed of structural measures, planting measures</p>			

**Table 4-2 Environment Impacts and Mitigation Measures of Main Watercourse Widening Subcomponent**

Subcomponent	Period	Activity	Environmental Sensitive Receptor	Potential Impact	Mitigation/Prevention Measures	Cost CNY 10,000	Implemented By	Supervised By
					<p>and temporary measures. Surface soil should be removed and be stored in temporary storage site before construction. Retaining wall, masonry drainage canal and various drainage structures should built around the site. The disposal site should be restored in late construction stage through surface soil backfill and vegetation replanting.</p> <p>Structural measures: removal of 22,200 m<sup>3</sup> surface soil, 22,200 m<sup>3</sup> surface soil backfill, 7.4 hm<sup>2</sup> land restoration, 150 m long masonry retaining wall, 1,100m long masonry interception/drainage canal, and 4 brick sedimentation tanks (new).</p> <p>Greening measures: 7.4 hm<sup>2</sup> grass planting, planting of 9,250 pines and 18,500 bushes (new).</p> <p>Temporary measures: installation of 2,000 m<sup>2</sup> dense-mesh net (new).</p> <p>⑥Mud transfer tank:</p> <p>Temporary measures: 21 mud transfer tanks to be provided; 11193m<sup>3</sup> for earthwork excavation and backfill; 861m<sup>3</sup> for fencing and demolition of earth-filled woven bags; 495m for temporary drainage ditches.</p>			

**Table 4-3 Environmental Impacts and Mitigation Measures of Water Diversion Subcomponent**

Subcomponent	Period	Activity	Environmental Sensitive Receptor	Potential Impact	Mitigation/Prevention Measures	Cost CNY 10,000	Implemented By	Supervised By
Water Diversion (A-4 East Trunk Canal Rehabilitation and Connection with Mawei River)	Construction	Watercourse widening, civil work construction, construction material and earth transportation, construction camp, temporary construction path	Xianghuadao	Noise of exactor, bulldozer, loader, vibrator and dump truck during construction will have certain impact on sensitive receptors within 30 m. Dust from earth exaction, onsite storage and backfilling, moving of construction workers and vehicles, and leakage and spill of transportation vehicles will have impact on sensitive receptors within 50 m of the construction site. Demolition of buildings acquired and construction of new buildings/structures will generate construction solid waste and waste soil, which will have environmental impact without proper management.	ECOP for small waterworks as included in Annex 2 of the ESMP should be followed.	1	Contractor	Hezhou Municipal EPB
			Land area permanently and temporarily occupied by the Project	Soil erosion area and soil loss caused by construction of the Project will be 26.10 hm <sup>2</sup> and 2,368 tons, respectively.	Reusable surface soil in disturbed area should be removed and stored in designated area before construction. Cut slope and surface with vegetation being removed should be covered with dense-mesh net for protection during construction and restored through soil covering and greening in later stage. East Trunk Canal Rehabilitation Structural measures: removal of 20,100 m <sup>3</sup> surface soil,	18	Contractor	Hezhou Water Resources Bureau

**Table 4-3 Environmental Impacts and Mitigation Measures of Water Diversion Subcomponent**

Subcomponent	Period	Activity	Environmental Sensitive Receptor	Potential Impact	Mitigation/Prevention Measures	Cost CNY 10,000	Implemented By	Supervised By
					<p>20,100 m<sup>3</sup> surface soil backfill, 12300 permeable bricks (included in technical design).  Greening measures: 62424m<sup>2</sup> turfing, 16343m<sup>2</sup> greenbelt, 99492m<sup>2</sup> landscaping (included in technical design).  Temporary measures: temporary covering by 5,000 m<sup>2</sup> dense-mesh net (new).  Flood Diversion Canal of East Trunk Canal  Structural measures: removal of 5,500 m<sup>3</sup> surface soil, 5,500 m<sup>3</sup> surface soil backfill, 5386m ecological swale, 5386m<sup>2</sup> permeable bricks (included in technical design).  Greening measures: 24267 m<sup>2</sup> three-dimensional geo-technical net embankment slope with grass, 5386 m<sup>2</sup> greening belt, 4200 m<sup>2</sup> landscaping and greening (included in technical design).  Temporary measures: temporary covering by 3,000 m<sup>2</sup> dense-mesh net (new).</p>			
		Operation of dredging equipment and dewatering facility	Water quality of East Trunk Canal, area along sediment transportation route	Dredging will have temporary disturbance to water body, cause increase of suspended solids, and possibly have odor emission. Without strict management, transportation process may have secondary pollution.	<ol style="list-style-type: none"> <li>1. Information of construction schedule, environmental impact and sediment transportation route should be disclosed to the public in a timely manner.</li> <li>2. Dredging should be scheduled in dry season</li> </ol>	2	Contractor	Hezhou Municipal EPB

**Table 4-3 Environmental Impacts and Mitigation Measures of Water Diversion Subcomponent**

Subcomponent	Period	Activity	Environmental Sensitive Receptor	Potential Impact	Mitigation/Prevention Measures	Cost CNY 10,000	Implemented By	Supervised By
					<p>as possible and construction period should be shorted to minimize disturbance to water body.</p> <p>3. Mechanical excavation supplemented by manual excavation is adopted for East Trunk Canal, and movable vehicular dewatering equipment is used for onsite dewatering. Dredging effluent is discharged to the canal. Interception and diversion + dry dredging method may be used for dredging provided that the construction condition permits (with the required operation space available for inner river interception and diversion) and a sound regional intercepting pipeline network is in place.</p> <p>4. Sediment is dewatered to sludge cake with moisture content less than 50%, and is hauled through enclosed vehicle to Hezhou solid waste landfill for disposal.</p> <p>5. Strict equipment inspection should be done during dredging to prevent oil leakage. Wastewater and solid waste should be collected with other</p>			

**Table 4-3 Environmental Impacts and Mitigation Measures of Water Diversion Subcomponent**

Subcomponent	Period	Activity	Environmental Sensitive Receptor	Potential Impact	Mitigation/Prevention Measures	Cost CNY 10,000	Implemented By	Supervised By
					construction waste, and is not allowed to enter surface water.			
		Watercourse widening, dike construction	Water quality of East Trunk Canal and Mawei River	Without appropriate management, construction material (asphalt, oil, chemicals), oily construction wastewater and domestic sewage of construction workers may enter surface water and cause water pollution.	<ol style="list-style-type: none"> <li>1. Construction should be scheduled in dry season as possible.</li> <li>2. Construction area should be minimized as possible and construction period should be shortened.</li> <li>3. Vegetation should be restored as early as possible to minimize impact on local environment.</li> <li>4. ECOP for small waterworks as included in Annex 2 of the ESMP should be followed.</li> </ol>	1	Contractor	Hezhou Municipal EPB
		Earth borrow and disposal	Two borrow areas located 1.25 km east to Xiadao Bridge in eastern Hezhou and west to Hezhou Municipality electronic technology industrial park; disposal site located in construction solid waste landfill in Gonghe village.	Soil erosion area and soil loss caused by earth borrow and disposal for temporary land use, construction access road and construction camps will be 87.72 hm <sup>2</sup> and 100058 tons, respectively.	<p>① Temporary Construction Path</p> <p>Surface soil should be removed and be stored in temporary storage site in The main watercourse of He River rehabilitation zone, and temporary drainage and sedimentation structures should be built along both sides of the road. The site should be restored in late construction stage.</p> <p>Structural measures: removal of 41600 m<sup>3</sup> surface soil, 41600 m<sup>3</sup> surface soil backfill and 120.82 hm<sup>2</sup> land restoration (new).</p> <p>Greening measures: 5.12 hm<sup>2</sup></p>	1491.16	Contractor	Hezhou Water Resources Bureau

**Table 4-3 Environmental Impacts and Mitigation Measures of Water Diversion Subcomponent**

Subcomponent	Period	Activity	Environmental Sensitive Receptor	Potential Impact	Mitigation/Prevention Measures	Cost CNY 10,000	Implemented By	Supervised By
					<p>forest restoration and 7.04 hm<sup>2</sup> grass land restoration (new).  Temporary measures: 138660 m temporary earth drainage canal, and 139 temporary sedimentation tanks (new).  ② Construction Site and Camp  Surface soil should be removed and be stored in designated storage site, and temporary drainage and sedimentation structures should be built around the site before construction. Temporary material storage site should be covered during construction. The site should be restored in late construction stage.  Structural measures: removal of 9,000 m<sup>3</sup> surface soil, 9,000 m<sup>3</sup> surface soil backfill and 4.50 hm<sup>2</sup> land restoration (new).  Greening measures: 0.11 hm<sup>2</sup> garden plot restoration and 2.71 hm<sup>2</sup> grass land restoration (new).  Temporary measures: 4,685 m temporary earth drainage canal, and 26 temporary sedimentation tanks, and 7,700 m<sup>2</sup> dense-mesh net (new).  ③ Temporary Soil Storage Site  Straw bag stuffed with soil will be put surrounding the site, and temporary drainage and</p>			



**Table 4-3 Environmental Impacts and Mitigation Measures of Water Diversion Subcomponent**

Subcomponent	Period	Activity	Environmental Sensitive Receptor	Potential Impact	Mitigation/Prevention Measures	Cost CNY 10,000	Implemented By	Supervised By
					<p>sedimentation structures should be built around the site before construction. Temporary soil storage site should be covered during construction. The site should be restored in late construction stage.</p> <p>Structural measures: 18.05 hm<sup>2</sup> land restoration (new).</p> <p>Greening measures: 4.31 hm<sup>2</sup> forest land restoration, 1.38hm<sup>2</sup> garden restoration and 2.22 hm<sup>2</sup> grass land restoration (new).</p> <p>Temporary measures: installation and removal of 8658 m long temporary straw bag stuffed with soil, 5758 m temporary earth drainage canal, and 53 temporary sedimentation tanks, and 206250 m<sup>2</sup> dense-mesh net (new).</p> <p>④ Borrow Area</p> <p>Water and soil conservation measures for borrow area are not included in project technical design, which should be a comprehensive system composed of structural measures, planting measures and temporary measures. Surface soil should be removed and be stored in temporary storage site before construction. Excavation during construction should be done from top to bottom and bench by bench to</p>			

**Table 4-3 Environmental Impacts and Mitigation Measures of Water Diversion Subcomponent**

Subcomponent	Period	Activity	Environmental Sensitive Receptor	Potential Impact	Mitigation/Prevention Measures	Cost CNY 10,000	Implemented By	Supervised By
					<p>form stable cut slope. Retaining wall of soil bags should be built along slope bottom and bare ground surface should be covered with dense-mesh net. Temporary drainage canals and structures should be built around the site. The borrow area should be restored in late construction stage through surface soil backfill and vegetation replanting.</p> <p>Structural measures: removal of 11,080 m<sup>3</sup> surface soil, 11,080 m<sup>3</sup> surface soil backfill, 36.95 hm<sup>2</sup> land restoration, 3,800 m long brick drainage canal, and 15 brick sedimentation tanks (new).</p> <p>Greening measures: 36.95 hm<sup>2</sup> grass planting, planting of 46,187 pines and 92,375 bushes (new).</p> <p>Temporary measures: 1,000 m retaining wall for temporary storage site and 36,000 m<sup>2</sup> dense-mesh net (new).</p> <p>⑤ Disposal Site</p> <p>Water and soil conservation measures for disposal site are not included in project technical design, which should be a comprehensive system composed of structural measures, planting measures and temporary measures. Surface soil should be removed</p>			

**Table 4-3 Environmental Impacts and Mitigation Measures of Water Diversion Subcomponent**

Subcomponent	Period	Activity	Environmental Sensitive Receptor	Potential Impact	Mitigation/Prevention Measures	Cost CNY 10,000	Implemented By	Supervised By
					<p>and be stored in temporary storage site before construction. Retaining wall, masonry drainage canal and various drainage structures should built around the site. The disposal site should be restored in late construction stage through surface soil backfill and vegetation replanting.</p> <p>Structural measures: removal of 22,200 m<sup>3</sup> surface soil, 22,200 m<sup>3</sup> surface soil backfill, 7.4 hm<sup>2</sup> land restoration, 150 m long masonry retaining wall, 1,100m long masonry interception/drainage canal, and 4 brick sedimentation tanks (new).</p> <p>Greening measures: 7.4 hm<sup>2</sup> grass planting, planting of 9,250 pines and 18,500 bushes (new).</p> <p>Temporary measures: installation of 2,000 m<sup>2</sup> dense-mesh net (new).</p> <p>⑥ Mud transfer tank: Temporary measures: 21 mud transfer tanks to be provided; 11193m<sup>3</sup> for earthwork excavation and backfill; 861m<sup>3</sup> for fencing and demolition of earth-filled woven bags; 495m for temporary drainage ditches.</p>			

**Table 4-4 Environmental Impacts and Mitigation Measures of Waterworks Improvement**

Subcomponent	Period	Activity	Environmental Sensitive Receptor	Potential Impact	Mitigation/Prevention Measures	Cost CNY 10,000	Implemented By	Supervised By
Waterworks Improvement: A-5 Xiadao Hydropower Station Upgrade; A-6 Fanglin Hydropower Station Upgrade; A-7 Huangshi Hydropower Station Upgrade	Construction	Water-related construction, transportation of construction material and earth, construction camp, and temporary construction path	Jichitan	Operation noise of exactor, bulldozer, loader, vibrator and dump truck during construction will have certain impact on sensitive receptors within 30 m. Dust from earth exaction, onsite storage and backfilling, moving of construction workers and vehicles, and leakage and spill of transportation vehicles will have impact on sensitive receptors within 50 m of the construction site. Demolition of buildings acquired and construction of new buildings/structures will generate construction solid waste and waste soil, which will have environmental impact without proper management.	ECOP for small waterworks as included in Annex 2 of the ESMP should be followed.	1	Contractor	Hezhou Municipal EPB
			Water quality of He River	Without appropriate management, construction material (asphalt, oil, chemicals) , oily construction wastewater and domestic sewage of construction workers may enter surface water	<ol style="list-style-type: none"> <li>1. Construction should be scheduled in dry season as possible.</li> <li>2. Construction area should be minimized as possible and construction period should be shortened.</li> <li>3. Vegetation should be restored as early as possible to minimize impact on local environment.</li> <li>4. ECOP for dike construction as included</li> </ol>	1	Contractor	Hezhou Municipal EPB

**Table 4-4 Environmental Impacts and Mitigation Measures of Waterworks Improvement**

Subcomponent	Period	Activity	Environmental Sensitive Receptor	Potential Impact	Mitigation/Prevention Measures	Cost CNY 10,000	Implemented By	Supervised By
				and cause water pollution.	in Annex 1 of the ESMP should be followed.			
		Removal of Huangshi Hydropower Station and Fanglin Hydropower Station gate dams.	Residents of Fanglin Street and Tianchang Village	Traffic interruption and travel inconvenience during construction	<ol style="list-style-type: none"> <li>1. For construction activities that will affect public traffic, construction program should be provided to public traffic authority in advance for arrangements for adjusting public traffic route, and construction cannot commence until permission is obtained.</li> <li>2. Signs should be set on construction site before construction indicating construction description and schedule, requesting public understanding of inconvenience caused by construction activities, and disclosing contact information and complaint hotline. This information could be disclosed in advance through media, micro-blog and wechat, as possible.</li> <li>3. Excavation and backfilling should be done by zone.</li> <li>4. Temporary access path should be built when construction site is near public facilities like bus stop. Material transportation should be scheduled to avoid peak hours to reduce peak traffic volume. Separate construction access road should be built for construction in rural area to avoid use of rural road and damage of rural road by oversize equipment and vehicle.</li> <li>5. Training on construction management and environmental protection should be strengthened.</li> <li>6. During construction of Fanglin Hydropower Station improvement, travel from Fanglin Street and</li> </ol>	1	Contractor	Hezhou Transport Bureau, Hezhou Traffic Police Group

**Table 4-4 Environmental Impacts and Mitigation Measures of Waterworks Improvement**

Subcomponent	Period	Activity	Environmental Sensitive Receptor	Potential Impact	Mitigation/Prevention Measures	Cost CNY 10,000	Implemented By	Supervised By
					Tianchang Village to area north to He River will be re-routed along Fanglin Road, G207 and Sanjia Bridge or through Mintian rural road and Bahuang Class 2 road. Traffic re-routing plan is subject to approval of traffic police and road closing and re-routing signs will be posted.			
		Removal of Fanglin Hydropower Station river flashboard	400 mu dry and paddy field in Tianchang Village, 200 mu farmland in Mintian Village and 1,000 mu farmland in Fanglin Village	Fanglin Hydropower Station has irrigation function. Relying on high water level contributed by barrage, river water can flow to irrigation channels through diversion culverts by gravity. As flashboard is removed, existing irrigated area will be affected.	A small-sized pump station will be built. River water will be lifted by three pumps with designed delivery head of 30 m and distance of 800 m and diverted to irrigated area in Tianchang, Fanglin and Mintian villages through existing water diversion culverts and channels.	400	Contractor	Hezhou Water Resources Bureau
		Earth borrow and disposal	Two borrow areas located 1.25 km east to Xiadao Bridge in eastern Hezhou and west to Hezhou Municipality electronic technology ecological industrial park; disposal site located in construction solid waste landfill in Gonghe village.	Soil erosion area and soil loss caused by earth borrow and disposal for temporary land use, construction access roads and construction camps will be 87.82 hm <sup>2</sup> and 10058 tons, respectively.	① Temporary Construction Path Surface soil should be removed and be stored in temporary storage site in The main watercourse of He River rehabilitation zone, and temporary drainage and sedimentation structures should be built along both sides of the road. The site should be restored in late construction stage. Structural measures: removal of 41600 m <sup>3</sup> surface soil, 41600 m <sup>3</sup> surface soil backfill and 20.82 hm <sup>2</sup> land restoration (new). Greening measures: 5.12 hm <sup>2</sup> forest restoration and 7.04 hm <sup>2</sup> grass land restoration (new). Temporary measures: 138660 m temporary earth drainage canal, and 139 temporary sedimentation tanks (new). ② Construction Site and Camp	1491.16	Contractor	Hezhou Water Resources Bureau

**Table 4-4 Environmental Impacts and Mitigation Measures of Waterworks Improvement**

Subcomponent	Period	Activity	Environmental Sensitive Receptor	Potential Impact	Mitigation/Prevention Measures	Cost CNY 10,000	Implemented By	Supervised By
					<p>Surface soil should be removed and be stored in designated storage site, and temporary drainage and sedimentation structures should be built around the site before construction. Temporary material storage site should be covered during construction. The site should be restored in late construction stage.</p> <p>Structural measures: removal of 9,000 m<sup>3</sup> surface soil, 9,000 m<sup>3</sup> surface soil backfill and 4.50 hm<sup>2</sup> land restoration (new).</p> <p>Greening measures: 0.11 hm<sup>2</sup> garden plot restoration and 2.71 hm<sup>2</sup> grass land restoration (new).</p> <p>Temporary measures: 4,685 m temporary earth drainage canal, and 26 temporary sedimentation tanks, and 7,700 m<sup>2</sup> dense-mesh net (new).</p> <p>③ Temporary Soil Storage Site</p> <p>Straw bag stuffed with soil will be put surrounding the site, and temporary drainage and sedimentation structures should be built around the site before construction. Temporary soil storage site should be covered during construction. The site should be restored in late construction stage.</p> <p>Structural measures: 18.05 hm<sup>2</sup> land restoration (new).</p> <p>Greening measures: 4.31 hm<sup>2</sup> forest land restoration, 1.38hm<sup>2</sup> garden restoration and 2.22 hm<sup>2</sup> grass land restoration (new).</p> <p>Temporary measures: installation and removal of 8658 m long temporary straw bag stuffed with soil, 5758 m temporary earth drainage canal, and 47 temporary sedimentation tanks, and 206250 m<sup>2</sup> dense-mesh net (new).</p>			

**Table 4-4 Environmental Impacts and Mitigation Measures of Waterworks Improvement**

Subcomponent	Period	Activity	Environmental Sensitive Receptor	Potential Impact	Mitigation/Prevention Measures	Cost CNY 10,000	Implemented By	Supervised By
					<p>④ Borrow Area</p> <p>Water and soil conservation measures for borrow area are not included in project technical design, which should be a comprehensive system composed of structural measures, planting measures and temporary measures. Surface soil should be removed and be stored in temporary storage site before construction. Excavation during construction should be done from top to bottom and bench by bench to form stable cut slope. Retaining wall of soil bags should be built along slope bottom and bare ground surface should be covered with dense-mesh net. Temporary drainage canals and structures should be built around the site. The borrow area should be restored in late construction stage through surface soil backfill and vegetation replanting.</p> <p>Structural measures: removal of 11,080 m<sup>3</sup> surface soil, 11,080 m<sup>3</sup> surface soil backfill, 36.95 hm<sup>2</sup> land restoration, 3,800 m long brick drainage canal, and 15 brick sedimentation tanks (new).</p> <p>Greening measures: 36.95 hm<sup>2</sup> grass planting, planting of 46,187 pines and 92,375 bushes (new).</p> <p>Temporary measures: 1,000 m retaining wall for temporary storage site and 36,000 m<sup>2</sup> dense-mesh net (new).</p> <p>⑤ Disposal Site</p> <p>Water and soil conservation measures for disposal site are not included in project technical design, which should be a comprehensive system composed of structural measures, planting measures and temporary measures. Surface soil should be removed and be stored in temporary storage</p>			



**Table 4-4 Environmental Impacts and Mitigation Measures of Waterworks Improvement**

Subcomponent	Period	Activity	Environmental Sensitive Receptor	Potential Impact	Mitigation/Prevention Measures	Cost CNY 10,000	Implemented By	Supervised By
					<p>site before construction. Retaining wall, masonry drainage canal and various drainage structures should built around the site. The disposal site should be restored in late construction stage through surface soil backfill and vegetation replanting.</p> <p>Structural measures: removal of 22,200 m<sup>3</sup> surface soil, 22,200 m<sup>3</sup> surface soil backfill, 7.4 hm<sup>2</sup> land restoration, 150 m long masonry retaining wall, 1,100m long masonry interception/drainage canal, and 4 brick sedimentation tanks (new).</p> <p>Greening measures: 7.4 hm<sup>2</sup> grass planting, planting of 9,250 pines and 18,500 bushes (new).</p> <p>Temporary measures: installation of 2,000 m<sup>2</sup> dense-mesh net (new).</p> <p>⑥ Mud transfer tank:</p> <p>Temporary measures: 21 mud transfer tanks to be provided; 11193m<sup>3</sup> for earthwork excavation and backfill; 861m<sup>3</sup> for fencing and demolition of earth-filled woven bags; 495m for temporary drainage ditches.</p>			

**Table 4-5 Environmental impacts of He River Dredging Subproject and their mitigation measures**

Name of subproject	Stage	Activity	Environmentally sensitive spot	Potential impact	Mitigation / control measures	Environmental protection investment (CNY10000)	EA	Supervision agency
River dredging (A-8 He River Dredging Subproject (Huangshi Hydropower Station – Xiadao Hydropower Station))	Design stage	Schematic design	Hezhou Institute, Hezhou Experimental Middle School, areas along sludge transportation route	Odor generated in dredging process, odor and leachate generated from temporary sludge storage, tail water generated from sludge dewatering and impacts from sludge transportation route, etc.	1. With heavy load of dredging, wide water surface and a certain water depth, He River has the conditions required for operation of large dredgers. In the optimized design proposal, cutter suction dredger known for its high dredging efficiency is selected to significantly shorten the construction period, reduce disturbances to water systems and correspondingly reduce the time of impacts of the sludge dewatering sites. 2. As the optimum choice, No. 1 dewatering site (river shores on the right bank of He River approximately 100m upstream from Lingfeng Bridge) and No. 2 dewatering site (river shore on the left bank of He River approximately 100m upstream from Fanglin Bridge) are selected, both located more than 100m away from the closest sensitive spot, helpful	/	FS unit	

**Table 4-5 Environmental impacts of He River Dredging Subproject and their mitigation measures**

<b>Name of subproject</b>	<b>Stage</b>	<b>Activity</b>	<b>Environmentally sensitive spot</b>	<b>Potential impact</b>	<b>Mitigation / control measures</b>	<b>Environmental protection investment (CNY10000)</b>	<b>EA</b>	<b>Supervision agency</b>
					to avoid impacts on the environmentally sensitive sites from temporary storage and dewatering of sludge. 3. Optimization of sludge transportation routes: The transportation route from No. 1 sludge dewatering site to the solid waste landfill is from Lingfengnan Road to National Highway 207, Gongye Avenue, National Highway 323 and then the access road to the solid waste landfill, involving a haulage of approximately 14km; The transportation route from No. 2 sludge dewatering site to the solid waste landfill is from Fanglin Road to Guangming Avenue, National Highway 207, Gongye Avenue, National Highway 323 and then the access road to the solid waste landfill, involving a haulage of approximately 18km. Such a selection of the sludge transportation routes has considered the need for avoiding densely populated residential areas, shortening			

**Table 4-5 Environmental impacts of He River Dredging Subproject and their mitigation measures**

Name of subproject	Stage	Activity	Environmentally sensitive spot	Potential impact	Mitigation / control measures	Environmental protection investment (CNY10000)	EA	Supervision agency
					haulage to the best possibility and reducing the environmental impacts.			
	Construction stage	Operation of dredging vessel, operation of integrated sludge treatment facility, sludge dewatering and onsite dewatering	Hezhou Institute, Hezhou Experimental Middle School, water quality of He River	The dredging process will generate temporary disturbances to water systems and result in increased SS concentration and possibly fugitive odor in a small amount. Improper management of sludge dewatering or transportation process may cause secondary pollution.	1. Information on the construction plan, the environmental impact descriptions, dredger operation route and sludge transportation route should be disclosed in time to the public. 2. The dredging operation should be conducted in the low-water season and the construction time should be shortened, if possible, to reduce disturbances to water systems. 3. Cutter suction dredger is selected for the dredging operation of the main watercourse of He River and the sludge is delivered to dewatering facilities on No. 1 and No. 2 dewatering sites along He River and dewatered into sludge cakes with a moisture content of less than 50%, which are then transported in enclosed vehicles to Hezhou Municipal Domestic Solid Waste Landfill	5	Construction contractor	Municipal EPB

**Table 4-5 Environmental impacts of He River Dredging Subproject and their mitigation measures**

<b>Name of subproject</b>	<b>Stage</b>	<b>Activity</b>	<b>Environmentally sensitive spot</b>	<b>Potential impact</b>	<b>Mitigation / control measures</b>	<b>Environmental protection investment (CNY10000)</b>	<b>EA</b>	<b>Supervision agency</b>
					<p>for disposal.</p> <p>4. Construction plants and vessels involved in the dredging process must be subject to strict inspection to prevent oil leakage. Sewage, solid wastes and oily wastewater from vessel cabins must not be cast into the water systems and should, instead, be collected and treated together with the other construction wastes.</p> <p>5. Flood interception ditches should be excavated around the temporary sludge storage tanks on the dewatering site and connected to the wastewater sedimentation tanks.</p> <p>6. Stormwater, tail water from sludge dewatering collected by the flood interception ditches should be discharged into the wastewater sedimentation tank for sedimentation before finally discharged into He River.</p> <p>7. The sludge should be dewatered and transported out of site in a timely manner</p>			

**Table 4-5 Environmental impacts of He River Dredging Subproject and their mitigation measures**

Name of subproject	Stage	Activity	Environmentally sensitive spot	Potential impact	Mitigation / control measures	Environmental protection investment (CNY10000)	EA	Supervision agency
					to avoid the generation of leachate due to excessive storage. 8. Quick lime and deodorants should be provided for sterilization and deodorization of the dewatering site and labor protection devices such as masks should be provided to the construction workers.			

**Table 4-6 Environmental Impacts of the Water Conservancy Infrastructure Construction Subproject and their Mitigation Measures**

Name of subproject	Stage	Activity	Environmentally sensitive spot	Potential impact	Mitigation / control measures	Environmental protection investment (CNY10000)	EA	Supervision agency
Water conservancy infrastructure construction (B-1 Huangansi Drainage Canal Pump Station, B-2 Shizigang Drainage Canal Pump Station)	Design stage	Schematic design	Xiyue Street Historical and Cultural Quarter, residential buildings on Xiyue Street, residential buildings and staff dormitory of Transportation Bureau on Jiangbeizhong Road	Flood risks for the Xiyue Street Historical and Cultural Quarter, noise impacts from the operation of pump stations along Huangansi Drainage Canal and Shizigang Drainage Canal	1. The optimized design takes account of the preservation of the historical and cultural relics of Xiyue Street and aims to assure that the cultural relics protection zone is not flooded and not relocated, land use difficulty is addressed through capacity minimization of drainage pump stations and selection of existing watercourses	/	FS unit	/

**Table 4-6 Environmental Impacts of the Water Conservancy Infrastructure Construction Subproject and their Mitigation Measures**

Name of subproject	Stage	Activity	Environmentally sensitive spot	Potential impact	Mitigation / control measures	Environmental protection investment (CNY10000)	EA	Supervision agency
					<p>needing no widening and full diversion of regional flood via Shizigang Drainage Canal.</p> <p>2. In order to reduce the impacts of noises generated in the operation of the drainage pump stations, well-designed and low-noise mechanical equipment is selected and vibration insulation and control measures are adopted where possible during installation and operation to reduce noise; the robust structure and evenly grouted bases of the pump equipment can absorb vibrations and provide a solid support to the base plate. Through reasonable arrangement of sound absorbing materials and vibration reduction devices, e.g. asbestos boards and shock absorbers, on the inner walls, ceilings, floors and beside the equipment in the pump station helps to effectively control and eliminate spread and reflection of noises.</p>			

**Table 4-6 Environmental Impacts of the Water Conservancy Infrastructure Construction Subproject and their Mitigation Measures**

Name of subproject	Stage	Activity	Environmentally sensitive spot	Potential impact	Mitigation / control measures	Environmental protection investment (CNY10000)	EA	Supervision agency
	Construction stage	Civil works construction, construction material and earth and aggregate transportation, construction camps, access roads	Residential buildings on Xiyue Street, residential buildings and staff dormitory of Transportation Bureau on Jiangbeizhong Road	Noises generated in the operation of excavators, bull dozers, dump trucks and other construction plants used in the construction stage will generate certain impacts on sensitive sites within a distance of 30m in the neighborhood. Dust generated in earthwork excavation, stockpiling, backfill, pedestrian and motor vehicle movement, spillage from earthwork transportation vehicles in the construction stage will	Requirements included in ESMP Annex 2: World Bank Loan Guangxi Hezhou Urban Water Infrastructure and Environment Improvement Project ECOP for Small Waterworks Construction Component will be implemented.	5	Construction contractor	Municipal EPB



**Table 4-6 Environmental Impacts of the Water Conservancy Infrastructure Construction Subproject and their Mitigation Measures**

Name of subproject	Stage	Activity	Environmentally sensitive spot	Potential impact	Mitigation / control measures	Environmental protection investment (CNY10000)	EA	Supervision agency
				generate certain impacts on sensitive sites within a distance of 50m in the neighborhood. Poor management of construction wastes and debris, waste soil generated in the demolition of acquired buildings and construction of new buildings will cause impacts on the environment.				
			Right of way and temporary land use for the Project	Construction activities will result in additional soil erosion of 0.37hm <sup>2</sup> and 20t.	(1) Huangansi Drainage Pump Station Cut slope and ground with vegetation being removed should be covered with dense-mesh net during construction, and temporary drainage canals and structures should be	24.95	Construction contractor	Municipal WRB

**Table 4-6 Environmental Impacts of the Water Conservancy Infrastructure Construction Subproject and their Mitigation Measures**

Name of subproject	Stage	Activity	Environmentally sensitive spot	Potential impact	Mitigation / control measures	Environmental protection investment (CNY10000)	EA	Supervision agency
					<p>built on construction site.  Structural measures: 20 m long stormwater pipelines (already included in the technical design)  Temporary measures: 42 m long temporary earth drainage canal, 2 temporary sedimentation tanks, and temporary covering of dense-mesh net of 100 m<sup>2</sup> (newly included in the technical design)。  (2) Shizigang Drainage Pump Station  Cut slope and ground with vegetation being removed should be covered with dense-mesh net during construction, and temporary drainage canals and structures should be built on construction site.  Structural measures: 150 m long stormwater pipelines (already included in the technical design)  Temporary measures: 150 m long temporary earth drainage canal, 2</p>			

**Table 4-6 Environmental Impacts of the Water Conservancy Infrastructure Construction Subproject and their Mitigation Measures**

Name of subproject	Stage	Activity	Environmentally sensitive spot	Potential impact	Mitigation / control measures	Environmental protection investment (CNY10000)	EA	Supervision agency
					temporary sedimentation tanks, and temporary covering of dense-mesh net of 500 m <sup>2</sup> (newly included in the technical design)。			
		Construction of civil works, transportation of construction materials and earth and stone materials	Ancient buildings in the Xiyue Street Historical and Cultural Quarter	No preserved ancient buildings are distributed in the construction area. However, poor construction management and uncivilized construction behaviors may lead to irrevocable consequences such as damage, contamination and even destruction of the preserved ancient buildings and sites.	The construction activities will be carried out in strict accordance with the requirements included in ESMP Annex 4: World Bank Financed Guangxi Hezhou Urban Water Infrastructure and Environment Improvement Project Management Plan of Physical Cultural Resources.	2	Construction contractor	Municipal CPPRFTB

**Table 4-6 Environmental Impacts of the Water Conservancy Infrastructure Construction Subproject and their Mitigation Measures**

Name of subproject	Stage	Activity	Environmentally sensitive spot	Potential impact	Mitigation / control measures	Environmental protection investment (CNY10000)	EA	Supervision agency
		Construction of civil works, transportation of construction materials and earth and stone materials	2 camphor trees and 1 banyan tree at Xinaner Street, 1 camphor tree at Xiyue Street	No famous or ancient trees are found in the project implementation area, but temporary borrow and dump of soil, stockpiling of construction wastes and movement of construction vehicles and plants on the construction sites may affect the normal growth of such trees in the vicinity with a distance of less than 50m.	<ol style="list-style-type: none"> <li>1. Construction scope should be narrowed and construction period should be shortened as much as possible;</li> <li>2. Tree felling, unlicensed transplanting, bark peeling, root digging and injection of toxic and hazardous substances to trees should be prohibited;</li> <li>3. It is not allowed to construct buildings or structures, lay pipelines, install power cables, excavate borrow areas, mine sand and stone, flood or seal the ground, emit fumes, discharge wastewater and dump solid wastes, stockpile or dump flammables, explosives or toxic and hazardous substances in the area with a distance of less than 5m from the outer edge of the crown shadow of</li> </ol>	/	Construction contractor	Municipal MEB

**Table 4-6 Environmental Impacts of the Water Conservancy Infrastructure Construction Subproject and their Mitigation Measures**

Name of subproject	Stage	Activity	Environmentally sensitive spot	Potential impact	Mitigation / control measures	Environmental protection investment (CNY10000)	EA	Supervision agency
					<p>trees.</p> <p>4. It is not allowed to engrave, nail, wind, hang or support or stack articles on or around tree trunks; and</p> <p>5. Construction vehicles and plants are not permitted to enter or roll the area with a distance of less than 5m from the outer edge of the crown shadow of trees.</p>			
		Excavations during civil works construction	Pipelines at the intersection between Shizigang Drainage Canal and the Transportation Bureau on Jiangbeizhong Road	Poor construction management may lead to interruption of underground pipelines.	<p>1. The contractor should further coordinate with municipal and urban development authorities during construction for collection of underground pipeline information including pipeline type, alignment and depth, and establish a pipeline coordination team. Prior approval should be obtained from</p>	/	Construction contractor	Municipal HURB

**Table 4-6 Environmental Impacts of the Water Conservancy Infrastructure Construction Subproject and their Mitigation Measures**

Name of subproject	Stage	Activity	Environmentally sensitive spot	Potential impact	Mitigation / control measures	Environmental protection investment (CNY10000)	EA	Supervision agency
					<p>municipal and urban development authorities for excavation interfering with underground pipelines.</p> <p>2. Construction plan and emergency response plan should be developed based on pipeline alignment and depth to avoid interference with existing underground pipelines as much as possible.</p> <p>3. In the event of interference with existing pipelines, the concerned authority should be informed of particular construction location and schedule of excavation activities to be prepared for emergency responses.</p>			
		Borrow fill and waste oil	Borrow area located 1.25km	Borrow fill and waste soil for	(1) Construction access roads	1491.16	Construction contractor	Municipal WRB

**Table 4-6 Environmental Impacts of the Water Conservancy Infrastructure Construction Subproject and their Mitigation Measures**

Name of subproject	Stage	Activity	Environmentally sensitive spot	Potential impact	Mitigation / control measures	Environmental protection investment (CNY10000)	EA	Supervision agency
			east of Xiadao Bridge in the eastern part of Hezhou Municipality, borrow area located at Hezhou Electronic Technology Ecological Industry Park and the construction waste disposal site located at Gonghe Village, Huangtian of Hezhou Municipality	temporary land use, construction access road and construction camps will result in soil erosion in a total area of 87.72hm <sup>2</sup> and an additional soil erosion of 100058t.	Prior to construction, top soil in the right of way will be removed and stockpiled on a temporary stockpiling site in the construction area of the main stream rehabilitation works of He River. In the meanwhile, temporary drainage and sedimentation measures will be taken on both sides of the road and land rehabilitation and cut-over land restoration will be conducted in the late stage of the Project. Structural measures: top soil removal in a total volume of 41600m <sup>3</sup> , top soil backfill in a total volume of 41600 m <sup>3</sup> and land rehabilitation in a total area of 20.82hm <sup>2</sup> (newly included in the technical design); Greening measures: 5.12hm <sup>2</sup> for forest land restoration, 7.04hm <sup>2</sup> for grassland restoration (newly included in the technical design); Temporary measures: 138660m for temporary earth			

**Table 4-6 Environmental Impacts of the Water Conservancy Infrastructure Construction Subproject and their Mitigation Measures**

Name of subproject	Stage	Activity	Environmentally sensitive spot	Potential impact	Mitigation / control measures	Environmental protection investment (CNY10000)	EA	Supervision agency
					<p>drainage gutter; 139 temporary sedimentation tanks (newly included in the technical design).</p> <p>(2) Construction production and domestic activity areas Prior to construction, top soil in the right of way will be removed and stockpiled on a temporary stockpiling site in the construction area of the main stream rehabilitation works of He River. In the meanwhile, temporary drainage and sedimentation measures will be taken on both sides of the road and land rehabilitation and cut-over land restoration will be conducted in the late stage of the Project.</p> <p>Structural measures: top soil removal in a total volume of 9000m<sup>3</sup>, top soil backfill in a total volume of 9000 m<sup>3</sup> and land rehabilitation in a total area of 4.50hm<sup>2</sup> (newly included in the technical design); Greening measures:</p>			



**Table 4-6 Environmental Impacts of the Water Conservancy Infrastructure Construction Subproject and their Mitigation Measures**

Name of subproject	Stage	Activity	Environmentally sensitive spot	Potential impact	Mitigation / control measures	Environmental protection investment (CNY10000)	EA	Supervision agency
					<p>0.11hm<sup>2</sup> for garden land restoration, 2.71hm<sup>2</sup> for grassland restoration (newly included in the technical design);</p> <p>Temporary measures: 4685m for temporary earth drainage gutter; 26 temporary sedimentation tanks; 7700m<sup>2</sup> for dense-mesh net (newly included in the technical design).</p> <p>(3) Temporary soil storage site</p> <p>Straw bag stuffed with soil will be placed and temporary drainage and sedimentation structures should be built around the site before construction. Temporary soil storage site should be covered during and restored through land rehabilitation and cut-over land restoration at the end of the construction stage.</p> <p>Structural measures: 18.05 hm<sup>2</sup> land rehabilitation (newly included in the technical design).</p> <p>Greening measures: 4.31</p>			

**Table 4-6 Environmental Impacts of the Water Conservancy Infrastructure Construction Subproject and their Mitigation Measures**

Name of subproject	Stage	Activity	Environmentally sensitive spot	Potential impact	Mitigation / control measures	Environmental protection investment (CNY10000)	EA	Supervision agency
					<p>hm<sup>2</sup> forest land restoration, 1.38hm<sup>2</sup> for garden restoration and 2.22 hm<sup>2</sup> grass land restoration (newly included in the technical design).</p> <p>Temporary measures: installation and removal of 8658 m long temporary straw bag stuffed with soil, 5758 m long temporary earth drainage canal, and 53 temporary sedimentation tanks, and 206250 m<sup>2</sup> dense-mesh net (newly included in the technical design).</p> <p>① Borrow sites</p> <p>Water and soil conservation measures for borrow area are not included in project technical design, which should be a comprehensive system composed of structural measures, planting measures and temporary measures. Surface soil should be removed and be stored in temporary storage site before construction.</p>			

**Table 4-6 Environmental Impacts of the Water Conservancy Infrastructure Construction Subproject and their Mitigation Measures**

Name of subproject	Stage	Activity	Environmentally sensitive spot	Potential impact	Mitigation / control measures	Environmental protection investment (CNY10000)	EA	Supervision agency
					Excavation during construction should be done from top to bottom and bench by bench to form stable cut slope. Retaining wall of soil bags should be built along slope bottom and bare ground surface should be covered with dense-mesh net. Temporary drainage canals and structures should be built around the site. The borrow area should be restored in late construction stage through surface soil backfill and vegetation replanting Structural measures: 11,080 m <sup>3</sup> for surface soil removal, 11,080 m <sup>3</sup> for surface soil backfill, 36.95 hm <sup>2</sup> for land rehabilitation, 3,800 m long brick masonry drainage canal, and 15 brick masonry sedimentation tanks (newly included in the technical design). Greening measures: 36.95 hm <sup>2</sup> for grass planting, planting of 46,187 pines			

**Table 4-6 Environmental Impacts of the Water Conservancy Infrastructure Construction Subproject and their Mitigation Measures**

Name of subproject	Stage	Activity	Environmentally sensitive spot	Potential impact	Mitigation / control measures	Environmental protection investment (CNY10000)	EA	Supervision agency
					<p>and 92,375 bushes (newly included in the technical design).</p> <p>Temporary measures: 1,000 m long retaining wall for temporary storage site and 36,000 m<sup>2</sup> dense-mesh net (newly included in the technical design).</p> <p>(1) Waste disposal sites</p> <p>Water and soil conservation measures for disposal site are not included in project technical design, which should be a comprehensive system composed of structural measures, planting measures and temporary measures. Surface soil should be removed and be stored in temporary storage site before construction. Retaining wall, masonry drainage canal and various drainage structures should be built around the site. The disposal site should be restored at the end of the construction stage through surface soil backfill and</p>			

**Table 4-6 Environmental Impacts of the Water Conservancy Infrastructure Construction Subproject and their Mitigation Measures**

Name of subproject	Stage	Activity	Environmentally sensitive spot	Potential impact	Mitigation / control measures	Environmental protection investment (CNY10000)	EA	Supervision agency
					<p>vegetation replanting.</p> <p>Structural measures: 22,200 m<sup>3</sup> for surface soil removal, 22,200 m<sup>3</sup> for surface soil backfill, 7.4 hm<sup>2</sup> for land rehabilitation, 150 m long masonry retaining wall, 1,100m long masonry interception/drainage canal, and 4 brick masonry sedimentation tanks (newly included in the technical design).</p> <p>Greening measures: 7.4 hm<sup>2</sup> grass planting, planting of 9,250 pines and 18,500 bushes (newly included in the technical design).</p> <p>Temporary measures: installation of 2,000 m<sup>2</sup> dense-mesh net (newly included in the technical design).</p> <p>⑥ Mud transfer tank: Temporary measures: 21 mud transfer tanks to be provided; 11193m<sup>3</sup> for earthwork excavation and backfill; 861m<sup>3</sup> for fencing and demolition of earth-filled woven bags; 495m for temporary drainage ditches.</p>			

**Table 4-6 Environmental Impacts of the Water Conservancy Infrastructure Construction Subproject and their Mitigation Measures**

Name of subproject	Stage	Activity	Environmentally sensitive spot	Potential impact	Mitigation / control measures	Environmental protection investment (CNY10000)	EA	Supervision agency
	Operation stage	Operation of drainage pump station	Residences on Xiyue Street and Jiangbeizhong Road and staff dormitory of Transportation Bureau	Noise impacts from operation of drainage pump station of Huangansi Drainage Canal and Shizigang Drainage Canal	Maintenance and servicing of water pumps should be strengthened by means of periodical inspection of electric motor and pump axle concentricity and assuring excellent lubrication of axles so as to reduce wearing of pump parts and reduce noise.	1	Operator	Municipal EPB

**Table 4-7 Environmental Impacts of He River-lake Connection Subproject and their Mitigation Measures**

Name of subproject	Stage	Activity	Environmentally sensitive spot	Potential impact	Mitigation / control measures	Environmental protection investment (CNY10000)	EA	Supervision agency
River-lake connection (B-3 Lining River Rehabilitation, B-4 Changlong River Rehabilitation, B-5 Huangtian Branch Canal Rehabilitation, B-6	Construction stage	Watercourse widening, Civil works construction, construction material and earth and aggregate transportation, construction camps, access roads	Pingjing, Lijiatang, Lining Village, Daninggang, Xiangjiayuan, Taipingzhai, Yingshi Primary School, Huangtian Town, Pinggui No. 3 Middle School, Douhang, Bantanggang,	Noises generated in the operation of excavators, bull dozers, dump trucks and other construction plants used in the construction stage will generate	Requirements included in ESMP Annex 2: World Bank Loan Guangxi Hezhou Urban Water Infrastructure and Environment Improvement Project ECOP for Small Waterworks Construction Component will be implemented. Temporary sound	25	Construction contractor	Municipal EPB

**Table 4-7 Environmental Impacts of He River-lake Connection Subproject and their Mitigation Measures**

<b>Name of subproject</b>	<b>Stage</b>	<b>Activity</b>	<b>Environmentally sensitive spot</b>	<b>Potential impact</b>	<b>Mitigation / control measures</b>	<b>Environmental protection investment (CNY10000)</b>	<b>EA</b>	<b>Supervision agency</b>
Guposhan Drainage Canal Rehabilitation, B-7 East No. 5 Branch Canal Rehabilitation)			Xinzhai, Huangtian Village, Muyuanna, Baijiazhai, Shizigang	certain impacts on sensitive sites within a distance of 30m in the neighborhood. Dust generated in earthwork excavation, stockpiling, backfill, pedestrian and motor vehicle movement, spillage from earthwork transportation vehicles in the construction stage will generate certain impacts on sensitive sites within a distance of 50m in the neighborhood. Poor management of construction	barriers with a height of no less than 2m and high effectiveness of noise reduction should be provided for construction sites around Yingshi Primary School and Pinggui No. 3 Middle School and the construction activities should be scheduled in such a way that the teaching periods are avoided.			

**Table 4-7 Environmental Impacts of He River-lake Connection Subproject and their Mitigation Measures**

Name of subproject	Stage	Activity	Environmentally sensitive spot	Potential impact	Mitigation / control measures	Environmental protection investment (CNY10000)	EA	Supervision agency
				wastes and debris, waste soil generated in the demolition of acquired buildings and construction of new buildings will cause impacts on the environment.				
			Right of way and temporary land use for the Project	Construction activities will result in additional soil erosion of 67.73hm <sup>2</sup> and 6040t.	(1) Lining River Rehabilitation Reusable surface soil in disturbed area should be removed and stored in designated area before construction. Cut slope and surface with vegetation being removed should be covered with dense-mesh net for protection during construction and restored through soil	60	Construction contractor	Municipal WRB



**Table 4-7 Environmental Impacts of He River-lake Connection Subproject and their Mitigation Measures**

<b>Name of subproject</b>	<b>Stage</b>	<b>Activity</b>	<b>Environmentally sensitive spot</b>	<b>Potential impact</b>	<b>Mitigation / control measures</b>	<b>Environmental protection investment (CNY10000)</b>	<b>EA</b>	<b>Supervision agency</b>
					<p>covering and greening in later stage.</p> <p>Structural measures: removal of 28,600 m<sup>3</sup> surface soil, 28,600 m<sup>3</sup> surface soil backfill (already included in the technical design).</p> <p>Greening measures: 56146 m<sup>2</sup> three-dimensional geo-technical net embankment slope covered with grass, 9310 m<sup>2</sup> greening belt, 35,020 m<sup>2</sup> landscaping and greening (already included in the technical design).</p> <p>Temporary measures: temporary covering by 10,000 m<sup>2</sup> dense-mesh net (newly included in</p>			

**Table 4-7 Environmental Impacts of He River-lake Connection Subproject and their Mitigation Measures**

<b>Name of subproject</b>	<b>Stage</b>	<b>Activity</b>	<b>Environmentally sensitive spot</b>	<b>Potential impact</b>	<b>Mitigation / control measures</b>	<b>Environmental protection investment (CNY10000)</b>	<b>EA</b>	<b>Supervision agency</b>
					<p>the technical design).</p> <p>(2) Changlong River Rehabilitation</p> <p>Reusable surface soil in disturbed area should be removed and stored in designated area before construction. Cut slope and ground surface with vegetation being removed should be covered with dense-mesh net for protection during construction and restored through soil covering and greening in later stage.</p> <p>Structural measures: removal of 22,600 m<sup>3</sup> surface soil, 22,600 m<sup>3</sup> surface soil backfill, 6306m ecological swale (already included in the technical design).</p>			

**Table 4-7 Environmental Impacts of He River-lake Connection Subproject and their Mitigation Measures**

<b>Name of subproject</b>	<b>Stage</b>	<b>Activity</b>	<b>Environmentally sensitive spot</b>	<b>Potential impact</b>	<b>Mitigation / control measures</b>	<b>Environmental protection investment (CNY10000)</b>	<b>EA</b>	<b>Supervision agency</b>
					<p>Greening measures: 47113m<sup>2</sup> three-dimensional geo-technical net embankment slope covered with grass, 7966 m<sup>2</sup> greening belt, 29,630 m<sup>2</sup> landscaping and greening (already included in the technical design).</p> <p>Temporary measures: temporary covering by 10,000 m<sup>2</sup> dense-mesh net (newly included in the technical design).</p> <p>(3) Dongwu Branch Canal Rehabilitation</p> <p>Reusable surface soil in disturbed area should be removed and stored in designated area before construction. Cut</p>			

**Table 4-7 Environmental Impacts of He River-lake Connection Subproject and their Mitigation Measures**

<b>Name of subproject</b>	<b>Stage</b>	<b>Activity</b>	<b>Environmentally sensitive spot</b>	<b>Potential impact</b>	<b>Mitigation / control measures</b>	<b>Environmental protection investment (CNY10000)</b>	<b>EA</b>	<b>Supervision agency</b>
					<p>slope and surface with vegetation removed should be covered with dense-mesh net for protection during construction and restored through soil covering and greening in later stage.</p> <p>Structural measures: removal of 45,000 m<sup>3</sup> surface soil, 45,000 m<sup>3</sup> surface soil backfill, 4270m ecological swale, 18675m<sup>2</sup> permeable bricks (already included in the technical design).</p> <p>Greening measures: 113930 m<sup>2</sup> bush planting and 7685m<sup>2</sup> greening (already included in the technical design).</p>			

**Table 4-7 Environmental Impacts of He River-lake Connection Subproject and their Mitigation Measures**

<b>Name of subproject</b>	<b>Stage</b>	<b>Activity</b>	<b>Environmentally sensitive spot</b>	<b>Potential impact</b>	<b>Mitigation / control measures</b>	<b>Environmental protection investment (CNY10000)</b>	<b>EA</b>	<b>Supervision agency</b>
					<p>Temporary measures: temporary covering by 15,000 m<sup>2</sup> dense-mesh net (newly included in the technical design).</p> <p>(4) Huangtian Branch Canal Rehabilitation</p> <p>Reusable surface soil in disturbed area should be removed and stored in designated area before construction. Cut slope and ground surface with vegetation being removed should be covered with dense-mesh net for protection during construction and restored through soil covering and greening in later stage.</p> <p>Structural measures: removal of 24,400 m<sup>3</sup></p>			

**Table 4-7 Environmental Impacts of He River-lake Connection Subproject and their Mitigation Measures**

Name of subproject	Stage	Activity	Environmentally sensitive spot	Potential impact	Mitigation / control measures	Environmental protection investment (CNY10000)	EA	Supervision agency
					<p>surface soil, 24,400 m<sup>3</sup> surface soil backfill, 18750m<sup>2</sup> permeable bricks (already included in the technical design).  Greening measures: 54260m<sup>2</sup> three-dimensional geo-technical net embankment slope covered with grass and 14880 m<sup>2</sup> greenbelt, 45000m<sup>2</sup> landscaping (already included in the technical design).  Temporary measures: temporary covering by 10,000 m<sup>2</sup> dense-mesh net (newly included in the technical design).  (5) Guposhan Drainage Canal Rehabilitation  Cut slope and ground</p>			

**Table 4-7 Environmental Impacts of He River-lake Connection Subproject and their Mitigation Measures**

<b>Name of subproject</b>	<b>Stage</b>	<b>Activity</b>	<b>Environmentally sensitive spot</b>	<b>Potential impact</b>	<b>Mitigation / control measures</b>	<b>Environmental protection investment (CNY10000)</b>	<b>EA</b>	<b>Supervision agency</b>
					<p>surface with vegetation being removed should be covered with dense-mesh net for protection during construction.</p> <p>Greening measures: 6000 m<sup>2</sup> landscaping and greening (already included in the technical design).</p> <p>Temporary measures: temporary covering by 5,000 m<sup>2</sup> dense-mesh net (newly included in the technical design).</p>			
		Watercourse widening, dike construction, etc.	Water quality of Lining River, Changlong River, Huangtian Branch Canal, Guposhan Branch Canal and East No. 5 Branch Canal	Improper management of construction materials such as asphalt, oils, chemical substances and oily construction wastewater, domestic	<p>1. The construction works should be arranged in the low-water season where possible;</p> <p>2. The scope of the construction activities should be narrowed and the construction period should be shortened as much as</p>	10	Construction contractor	Municipal EPB

**Table 4-7 Environmental Impacts of He River-lake Connection Subproject and their Mitigation Measures**

<b>Name of subproject</b>	<b>Stage</b>	<b>Activity</b>	<b>Environmentally sensitive spot</b>	<b>Potential impact</b>	<b>Mitigation / control measures</b>	<b>Environmental protection investment (CNY10000)</b>	<b>EA</b>	<b>Supervision agency</b>
				sewage of construction workers may result in their discharge into the surface water and cause pollution of the water environment.	possible. 3. The construction works should be implemented according to the requirements included in ESMP Annex 1: ECOP for the Embankment Construction Component of World Bank Financed Guangxi Hezhou Urban Water Infrastructure and Environment Improvement Project.			
		Operation of dredging plants, operation of integrated sludge treatment facility	Water systems of Huangtian Branch Canal, Guposhan Branch Canal and areas along the sludge transportation routes	The dredging process will generate temporary disturbances to water systems and result in increased SS concentration and possibly fugitive odor in a small amount. Improper management of	1. Information on the construction plan, the environmental impact descriptions and sludge transportation route should be disclosed in time to the public. 2. The dredging operation should be conducted in the low-water season and the construction time should be shortened, if possible, to reduce disturbances to water systems. 3. Dredging for Huangtian Branch Canal and	4	Construction contractor	Municipal EPB



**Table 4-7 Environmental Impacts of He River-lake Connection Subproject and their Mitigation Measures**

<b>Name of subproject</b>	<b>Stage</b>	<b>Activity</b>	<b>Environmentally sensitive spot</b>	<b>Potential impact</b>	<b>Mitigation / control measures</b>	<b>Environmental protection investment (CNY10000)</b>	<b>EA</b>	<b>Supervision agency</b>
				transportation process may cause secondary pollution.	Guposhan Branch Canal is conducted through mechanical dredging assisted with artificial operation. Dewatering is achieved on site using the movable vehicle-mounted integrated drying facility and the residual water is discharged into Huangtian Branch Canal and Guposhan Branch Canal in the vicinity. Interception and diversion + dry dredging method may be used for dredging provided that the construction condition permits (with the required operation space available for inner river interception and diversion) and a sound regional intercepting pipeline network is in place. 4. The sludge is dewatered into sludge cakes with a moisture content of less than 50%, which are then transported in enclosed vehicles to Hezhou Municipal Domestic Solid			

**Table 4-7 Environmental Impacts of He River-lake Connection Subproject and their Mitigation Measures**

<b>Name of subproject</b>	<b>Stage</b>	<b>Activity</b>	<b>Environmentally sensitive spot</b>	<b>Potential impact</b>	<b>Mitigation / control measures</b>	<b>Environmental protection investment (CNY10000)</b>	<b>EA</b>	<b>Supervision agency</b>
					Waste Landfill for disposal. 5. Construction plants involved in the dredging process must be subject to strict inspection to prevent oil leakage. Sewage and solid wastes must not be cast into the water systems and should, instead, be collected and treated together with the other construction wastes.			
		Occupation of local roads by the construction activities, transportation of earth and aggregates	Pinggui No. 3 Middle School	School access roads are occupied, resulting in travelling difficulty for students, school faculty and parents and possibly affecting traffic safety of students and order of school teaching.	1. A construction plan should be submitted to the transportation authority for construction activities with impacts on public transit and re-routing of public transit must be well planned and permit must be obtained before proceeding with such construction activities. 2. A bulletin board should be erected on the construction site before the construction works commences to introduce the project	1	Construction contractor	Municipal Transportation Bureau Municipal Traffic Police Brigade

**Table 4-7 Environmental Impacts of He River-lake Connection Subproject and their Mitigation Measures**

<b>Name of subproject</b>	<b>Stage</b>	<b>Activity</b>	<b>Environmentally sensitive spot</b>	<b>Potential impact</b>	<b>Mitigation / control measures</b>	<b>Environmental protection investment (CNY10000)</b>	<b>EA</b>	<b>Supervision agency</b>
					<p>components and construction time to obtain public understanding of inconveniences generated in the construction process. Contact information and complaint hotlines should be also disclosed. If possible, such prior announcement may be achieved via the news media, micro blog, wechat, etc.</p> <p>3. The construction works should be implemented on a section-by-section or zone-by-zone basis and excavation and backfill should be carried out in the shortest possible time.</p> <p>4. Temporary access roads should be provided for construction works close to bus stops and other public facilities.</p>			

**Table 4-7 Environmental Impacts of He River-lake Connection Subproject and their Mitigation Measures**

Name of subproject	Stage	Activity	Environmentally sensitive spot	Potential impact	Mitigation / control measures	Environmental protection investment (CNY10000)	EA	Supervision agency
					Material transportation should be time in such a way that the traffic peak hours are avoided to alleviate pressure on urban traffic. 5. Traffic police guiding and dispatching should be needed during school peak hours and temporary signal lights and other signs should be provided. 6. Stronger efforts should be made in construction management and environmental protection training for construction workers.			
		Civil works construction, watercourse widening, etc.	Pipelines at the intersection of Lining River with Zhanqian Avenue, the intersections of Changlong River with Guangming Avenue and Guposhan Avenue and the	Poor construction management may lead to interruption of underground pipelines.	1. The contractor should further coordinate with municipal and urban development authorities during construction for collection of	/	Construction contractor	Municipal HURDB

**Table 4-7 Environmental Impacts of He River-lake Connection Subproject and their Mitigation Measures**

<b>Name of subproject</b>	<b>Stage</b>	<b>Activity</b>	<b>Environmentally sensitive spot</b>	<b>Potential impact</b>	<b>Mitigation / control measures</b>	<b>Environmental protection investment (CNY10000)</b>	<b>EA</b>	<b>Supervision agency</b>
			intersection of East No. 5 Branch Canal with National Highway No. 207		<p>underground pipeline information including pipeline type, alignment and depth, and establish a pipeline coordination team. Prior approval should be obtained from municipal and urban development authorities for excavation interfering with underground pipelines.</p> <p>2. Construction plan and emergency response plan should be developed based on pipeline alignment and</p>			

**Table 4-7 Environmental Impacts of He River-lake Connection Subproject and their Mitigation Measures**

Name of subproject	Stage	Activity	Environmentally sensitive spot	Potential impact	Mitigation / control measures	Environmental protection investment (CNY10000)	EA	Supervision agency
					depth to avoid interference with existing underground pipelines as much as possible. 3. In the event of interference with existing pipelines, the concerned authority should be informed of particular construction location and schedule of excavation activities to be prepared for emergency responses.			
		LAR involved in Changlong River	53 recently constructed private tombs	Improper implementation of LAR may	Requirements included in ESMP Annex 4: World Bank Financed	/	Construction contractor	Resettlement external monitoring

**Table 4-7 Environmental Impacts of He River-lake Connection Subproject and their Mitigation Measures**

Name of subproject	Stage	Activity	Environmentally sensitive spot	Potential impact	Mitigation / control measures	Environmental protection investment (CNY10000)	EA	Supervision agency
		Integrated Rehabilitation		affect the progress of the Project.	Guangxi Hezhou Urban Water Infrastructure and Environment Improvement Project Management Plan of Physical Cultural Resources			agency
		Earthwork and stonework construction at the intersections of East Trunk Canal and Lining River with Gui-Guang Express Railway	Gui-Guang Express Railway	Improper construction measures and management may affect the foundation stability and safe operation of railway		/	Construction contractor	Nanning Railway Bureau
		Borrow fill and waste oil	Borrow area located 1.25km east of Xiadao Bridge in the eastern part of Hezhou Municipality, borrow area located at Hezhou Electronic	Borrow fill and waste soil for temporary land use, construction access road and construction camp will result in soil erosion in a	(1) Construction access roads Prior to construction, top soil in the right of way will be removed and stockpiled on a temporary stockpiling site in the construction area of the main stream rehabilitation works of He River. In the	1491.16	Construction contractor	Municipal WRB

**Table 4-7 Environmental Impacts of He River-lake Connection Subproject and their Mitigation Measures**

Name of subproject	Stage	Activity	Environmentally sensitive spot	Potential impact	Mitigation / control measures	Environmental protection investment (CNY10000)	EA	Supervision agency
			Technology Ecological Industry Park and the construction waste disposal site located at Gonghe Village, Huangtian of Hezhou Municipality	total area of 87.72hm <sup>2</sup> and an additional soil erosion of 100058t.	meanwhile, temporary drainage and sedimentation measures will be taken on both sides of the road and land rehabilitation and cut-over land restoration will be conducted in the late stage of the Project. Structural measures: top soil removal in a total volume of 41600m <sup>3</sup> , top soil backfill in a total volume of 41600 m <sup>3</sup> and land rehabilitation in a total area of 20.82hm <sup>2</sup> (newly included in the technical design); Greening measures: 5.12hm <sup>2</sup> for forest land restoration, 7.04hm <sup>2</sup> for grassland restoration (newly included in the technical design); Temporary measures: 138660m for temporary earth drainage gutter; 139temporary			



**Table 4-7 Environmental Impacts of He River-lake Connection Subproject and their Mitigation Measures**

<b>Name of subproject</b>	<b>Stage</b>	<b>Activity</b>	<b>Environmentally sensitive spot</b>	<b>Potential impact</b>	<b>Mitigation / control measures</b>	<b>Environmental protection investment (CNY10000)</b>	<b>EA</b>	<b>Supervision agency</b>
					<p>sedimentation tanks (newly included in the technical design).</p> <p>(2) Construction production and domestic activity areas</p> <p>Prior to construction, top soil in the right of way will be removed and stockpiled on a temporary stockpiling site in the construction area of the main stream rehabilitation works of He River. In the meanwhile, temporary drainage and sedimentation measures will be taken on both sides of the road and land rehabilitation and cut-over land restoration will be conducted in the late stage of the Project.</p> <p>Structural measures: top soil removal in a total volume of 9000m<sup>3</sup>, top soil backfill in a total</p>			

**Table 4-7 Environmental Impacts of He River-lake Connection Subproject and their Mitigation Measures**

Name of subproject	Stage	Activity	Environmentally sensitive spot	Potential impact	Mitigation / control measures	Environmental protection investment (CNY10000)	EA	Supervision agency
					<p>volume of 9000 m<sup>3</sup> and land rehabilitation in a total area of 4.50hm<sup>2</sup> (newly included in the technical design);</p> <p>Greening measures: 0.11hm<sup>2</sup> for garden land restoration, 2.71hm<sup>2</sup> for grassland restoration (newly included in the technical design);</p> <p>Temporary measures: 4685m for temporary earth drainage gutter; 26 temporary sedimentation tanks; 7700m<sup>2</sup> for dense-mesh net (newly included in the technical design).</p> <p>(3) Temporary soil storage site</p> <p>Straw bag stuffed with soil will be placed and temporary drainage and sedimentation structures should be built around the site before construction. Temporary soil storage site should be covered</p>			

**Table 4-7 Environmental Impacts of He River-lake Connection Subproject and their Mitigation Measures**

<b>Name of subproject</b>	<b>Stage</b>	<b>Activity</b>	<b>Environmentally sensitive spot</b>	<b>Potential impact</b>	<b>Mitigation / control measures</b>	<b>Environmental protection investment (CNY10000)</b>	<b>EA</b>	<b>Supervision agency</b>
					<p>during and restored through land rehabilitation and cut-over land restoration at the end of the construction stage.</p> <p>Structural measures: 18.05 hm<sup>2</sup> land rehabilitation (newly included in the technical design).</p> <p>Greening measures: 4.31 hm<sup>2</sup> forest land restoration, 1.38hm<sup>2</sup> garden restoration and 2.22 hm<sup>2</sup> grass land restoration (newly included in the technical design).</p> <p>Temporary measures: installation and removal of 8658 m long temporary straw bag stuffed with soil, 5758 m long temporary earth drainage canal, and 53 temporary sedimentation tanks, and 206250 m<sup>2</sup> dense-mesh net (newly included in the technical</p>			

**Table 4-7 Environmental Impacts of He River-lake Connection Subproject and their Mitigation Measures**

<b>Name of subproject</b>	<b>Stage</b>	<b>Activity</b>	<b>Environmentally sensitive spot</b>	<b>Potential impact</b>	<b>Mitigation / control measures</b>	<b>Environmental protection investment (CNY10000)</b>	<b>EA</b>	<b>Supervision agency</b>
					design). (4) Borrow sites Water and soil conservation measures for borrow area are not included in project technical design, which should be a comprehensive system composed of structural measures, planting measures and temporary measures. Surface soil should be removed and be stored in temporary storage site before construction. Excavation during construction should be done from top to bottom and bench by bench to form stable cut slope. Retaining wall of soil bags should be built along slope bottom and bare ground surface should be covered with dense-mesh net. Temporary drainage canals and structures should be built around			

**Table 4-7 Environmental Impacts of He River-lake Connection Subproject and their Mitigation Measures**

Name of subproject	Stage	Activity	Environmentally sensitive spot	Potential impact	Mitigation / control measures	Environmental protection investment (CNY10000)	EA	Supervision agency
					<p>the site. The borrow area should be restored in late construction stage through surface soil backfill and vegetation replanting</p> <p>Structural measures: 11,080 m<sup>3</sup> for surface soil removal, 11,080 m<sup>3</sup> for surface soil backfill, 36.95 hm<sup>2</sup> for land rehabilitation, 3,800 m long brick masonry drainage canal, and 15 brick masonry sedimentation tanks (newly included in the technical design).</p> <p>Greening measures: 36.95 hm<sup>2</sup> for grass planting, planting of 46,187 pines and 92,375 bushes (newly included in the technical design).</p> <p>Temporary measures: 1,000 m long retaining wall for temporary storage site and 36,000 m<sup>2</sup> dense-mesh net (newly included in the</p>			

**Table 4-7 Environmental Impacts of He River-lake Connection Subproject and their Mitigation Measures**

<b>Name of subproject</b>	<b>Stage</b>	<b>Activity</b>	<b>Environmentally sensitive spot</b>	<b>Potential impact</b>	<b>Mitigation / control measures</b>	<b>Environmental protection investment (CNY10000)</b>	<b>EA</b>	<b>Supervision agency</b>
					<p>technical design).</p> <p>(5) Disposal sites</p> <p>Water and soil conservation measures for disposal site are not included in project technical design, which should be a comprehensive system composed of structural measures, planting measures and temporary measures. Surface soil should be removed and be stored in temporary storage site before construction. Retaining wall, masonry drainage canal and various drainage structures should be built around the site. The disposal site should be restored at the end of the construction stage through surface soil backfill and vegetation replanting.</p> <p>Structural measures: 22,200 m<sup>3</sup> for surface</p>			

**Table 4-7 Environmental Impacts of He River-lake Connection Subproject and their Mitigation Measures**

Name of subproject	Stage	Activity	Environmentally sensitive spot	Potential impact	Mitigation / control measures	Environmental protection investment (CNY10000)	EA	Supervision agency
					<p>soil removal, 22,200 m<sup>3</sup> for surface soil backfill, 7.4 hm<sup>2</sup> for land rehabilitation, 150 m long masonry retaining wall, 1,100m long masonry interception/drainage canal, and 4 brick masonry sedimentation tanks (newly included in the technical design).                      Greening measures: 7.4 hm<sup>2</sup> grass planting, planting of 9,250 pines and 18,500 bushes (newly included in the technical design).                      Temporary measures: installation of 2,000 m<sup>2</sup> dense-mesh net (newly included in the technical design).</p> <p>⑥ Mud transfer tank:                      Temporary measures: 21 mud transfer tanks to be provided; 11193m<sup>3</sup> for earthwork excavation and backfill; 861m<sup>3</sup> for fencing and demolition of earth-filled woven bags; 495m for</p>			

**Table 4-7 Environmental Impacts of He River-lake Connection Subproject and their Mitigation Measures**

Name of subproject	Stage	Activity	Environmentally sensitive spot	Potential impact	Mitigation / control measures	Environmental protection investment (CNY10000)	EA	Supervision agency
					temporary drainage ditches.			

**Table 4-8 Environmental Impacts of Huangansi Drainage Canal Integrated Rehabilitation Subproject and their Mitigation Measures**

Name of subproject	Stage	Activity	Environmentally sensitive spot	Potential impact	Mitigation / control measures	Environmental protection investment (CNY10000)	EA	Supervision agency
Huangansi Drainage Canal Integrated Rehabilitation (C-1 Huangansi Drainage Canal Integrated Rehabilitation)	Design stage	Schematic design	Xiyue Street Historical and Cultural Quarter, residential buildings on Badaxi Road, Qianjin Road, Jiangbeizhong Road, Youxing Street and Xiyue Street	Flood risk to the Xiyue Street Historical and Cultural Quarter; impacts of river dredging odor on the residential buildings on Badaxi Road, Qianjin Road,	1. The design boundary is optimized based on the scope of preservation of the Xiyue Street Historical and Cultural Quarter and the area needed to be preserved is avoided. 2. Due to the perennial reception of domestic sewage along He River, Huangansi Drainage Canal is known for its poor water quality and odor sediments.	/	FS unit	/



**Table 4-8 Environmental Impacts of Huangansi Drainage Canal Integrated Rehabilitation Subproject and their Mitigation Measures**

Name of subproject	Stage	Activity	Environmentally sensitive spot	Potential impact	Mitigation / control measures	Environmental protection investment (CNY10000)	EA	Supervision agency
				Jiangbeizhong Road, Youxing Street and Xiyue Street	<p>Since the drainage canal is located in the urban center that is densely populated with limited space for operation, the optimized program chooses the underwater dredging method with suction sludge pump assisted with artificial operation. Water sealing plays a significant role in reducing odor emission and reducing the amount of odor generated from sludge agitation.</p> <p>3. As the optimum choice, No. 1 dewatering site (river shores on the right bank of He River approximately 100m upstream from Lingfeng Bridge) is selected. It is located more than 100m away from the closest sensitive spot, helpful to avoid impacts on the environmentally sensitive sites from temporary storage and dewatering of sludge.</p>			
	Construction	Civil works	Residential	Noises	Requirements included in	3	Construction	Municipal

**Table 4-8 Environmental Impacts of Huangansi Drainage Canal Integrated Rehabilitation Subproject and their Mitigation Measures**

<b>Name of subproject</b>	<b>Stage</b>	<b>Activity</b>	<b>Environmentally sensitive spot</b>	<b>Potential impact</b>	<b>Mitigation / control measures</b>	<b>Environmental protection investment (CNY10000)</b>	<b>EA</b>	<b>Supervision agency</b>
	stage	construction, construction material and earth and aggregate transportation, construction camps, access roads	buildings at Badaxi Road, Qianjin Road, Jianshezhong Road, Youxing Street and Xiyue Street	generated in the operation of excavators, bull dozers, dump trucks and other construction plants used in the construction stage will generate certain impacts on sensitive sites within a distance of 30m in the neighborhood. Dust generated in earthwork excavation, stockpiling, backfill, pedestrian and motor vehicle movement, spillage from earthwork transportation vehicles in the construction	ESMP Annex 1: World Bank Loan Guangxi Hezhou Urban Water Infrastructure and Environment Improvement Project ECOP for Embankment Construction Component		contractor	EPB

**Table 4-8 Environmental Impacts of Huangansi Drainage Canal Integrated Rehabilitation Subproject and their Mitigation Measures**

Name of subproject	Stage	Activity	Environmentally sensitive spot	Potential impact	Mitigation / control measures	Environmental protection investment (CNY10000)	EA	Supervision agency
				stage will generate certain impacts on sensitive sites within a distance of 50m in the neighborhood. Poor management of construction wastes and debris, waste soil generated in the demolition of acquired buildings and construction of new buildings will cause impacts on the environment.				
			Right of way and temporary land use for the Project	Construction activities will result in additional soil erosion of 4.13hm <sup>2</sup> and 143t.	Reusable surface soil in disturbed area should be removed and stored in designated area before construction. Cut slope and land surface with vegetation being removed	3.6	Construction contractor	Municipal WRB

**Table 4-8 Environmental Impacts of Huangansi Drainage Canal Integrated Rehabilitation Subproject and their Mitigation Measures**

Name of subproject	Stage	Activity	Environmentally sensitive spot	Potential impact	Mitigation / control measures	Environmental protection investment (CNY10000)	EA	Supervision agency
					should be covered with dense-mesh net for protection during construction and restored through soil covering and greening in later stage. Structural measures: 6,500 m <sup>3</sup> surface soil backfill (already included in the technical design). Greening measures: 21,528 m <sup>2</sup> greening, and 1,920 m <sup>2</sup> wetland planting (already included in the technical design). Temporary measures: temporary covering by 3,000 m <sup>2</sup> dense-mesh net (newly included in the technical design).			
		Operation of dredging vessel, operation of integrated sludge treatment facility, sludge dewatering	Water system of Huangansi Drainage Canal, areas along the sludge transportation routes	The dredging process will generate temporary disturbances to water systems and result in increased SS concentration	1. Information on the construction plan, the environmental impact descriptions and sludge transportation route should be disclosed in time to the public. 2. The dredging operation should be	5	Construction contractor	Municipal EPB

**Table 4-8 Environmental Impacts of Huangansi Drainage Canal Integrated Rehabilitation Subproject and their Mitigation Measures**

Name of subproject	Stage	Activity	Environmentally sensitive spot	Potential impact	Mitigation / control measures	Environmental protection investment (CNY10000)	EA	Supervision agency
		and onsite dewatering		and possibly fugitive odor in a small amount. Improper management of sludge dewatering or transportation process may cause secondary pollution.	conducted in the low-water season and the construction time should be shortened, if possible, to reduce disturbances to water systems. 3. The dredging method selected for Huangansi Drainage Canal is suction sludge pump plus artificial operation. The dredged sludge with a moisture content of 95% are conveyed through fecal suction truck to No. 1 dewatering site along He River. Interception and diversion + dry dredging method may be used for dredging provided that the construction condition permits (with the required operation space available for inner river interception and diversion) and a sound regional intercepting pipeline network is in place 4. Sludge is dewatered into sludge cakes with a moisture content of less			

**Table 4-8 Environmental Impacts of Huangansi Drainage Canal Integrated Rehabilitation Subproject and their Mitigation Measures**

Name of subproject	Stage	Activity	Environmentally sensitive spot	Potential impact	Mitigation / control measures	Environmental protection investment (CNY10000)	EA	Supervision agency
					<p>than 50%, which are then transported in enclosed vehicles to Hezhou Municipal Domestic Solid Waste Landfill for disposal.</p> <p>5. Construction plants involved in the dredging process must be subject to strict inspection to prevent oil leakage. Sewage and solid wastes must not be cast into the water systems and should, instead, be collected and treated together with the other construction wastes.</p> <p>6. Flood interception ditches should be excavated around the temporary sludge storage tanks on the dewatering site and connected to the wastewater sedimentation tanks.</p> <p>7. Stormwater, tail water from sludge dewatering collected by the flood interception ditches should be discharged into the wastewater sedimentation</p>			

**Table 4-8 Environmental Impacts of Huangansi Drainage Canal Integrated Rehabilitation Subproject and their Mitigation Measures**

Name of subproject	Stage	Activity	Environmentally sensitive spot	Potential impact	Mitigation / control measures	Environmental protection investment (CNY10000)	EA	Supervision agency
					<p>tank for sedimentation before finally discharged into He River.</p> <p>8. The sludge should be dewatered and transported out of site in a timely manner to avoid the generation of leachate due to excessive storage.</p> <p>9. Quick lime and deodorants should be provided for sterilization and deodorization of the dewatering site and labor protection devices such as masks should be provided to the construction workers.</p>			
		Construction of civil works, transportation of construction materials and earth and stone materials	Ancient buildings in the Xiyue Street Historical and Cultural Quarter	No preserved ancient buildings are distributed in the construction area. However, poor construction management and uncivilized construction behaviors may	The construction activities will be carried out in strict accordance with the requirements included in ESMP Annex 4: World Bank Financed Guangxi Hezhou Urban Water Infrastructure and Environment Improvement Project Management Plan of Physical Cultural Resources.	2	Construction contractor	Municipal CPPRFTB

**Table 4-8 Environmental Impacts of Huangansi Drainage Canal Integrated Rehabilitation Subproject and their Mitigation Measures**

Name of subproject	Stage	Activity	Environmentally sensitive spot	Potential impact	Mitigation / control measures	Environmental protection investment (CNY10000)	EA	Supervision agency
				lead to irrevocable consequences such as damage, contamination and even destruction of the preserved ancient buildings and sites.				
		Construction of civil works, transportation of construction materials and earth and stone materials	2 camphor trees and 1 banyan tree at Xinaner Street, 1 camphor tree at Xiyue Street	No famous or ancient trees are found in the project implementation area, but temporary borrow and dump of soil, stockpiling of construction wastes and movement of construction vehicles and plants on the construction sites may affect the normal	<ol style="list-style-type: none"> <li>1. Construction scope should be narrowed and construction period should be shortened as much as possible;</li> <li>2. Tree felling, unlicensed transplanting, bark peeling, root digging and injection of toxic and hazardous substances to trees should be prohibited;</li> <li>3. It is not allowed to</li> </ol>	/	Construction contractor	Municipal MEB



**Table 4-8 Environmental Impacts of Huangansi Drainage Canal Integrated Rehabilitation Subproject and their Mitigation Measures**

Name of subproject	Stage	Activity	Environmentally sensitive spot	Potential impact	Mitigation / control measures	Environmental protection investment (CNY10000)	EA	Supervision agency
				growth of such trees in the vicinity with a distance of less than 50m.	construct buildings or structures, lay pipelines, install power cables, excavate borrow areas, mine sand and stone, flood or seal the ground, emit fumes, discharge wastewater and dump solid wastes, stockpile or dump flammables, explosives or toxic and hazardous substances in the area with a distance of less than 5m from the outer edge of the crown shadow of trees. 4. It is not allowed to engrave, nail, wind, hang or support or stack articles on or around tree trunks; and			

**Table 4-8 Environmental Impacts of Huangansi Drainage Canal Integrated Rehabilitation Subproject and their Mitigation Measures**

Name of subproject	Stage	Activity	Environmentally sensitive spot	Potential impact	Mitigation / control measures	Environmental protection investment (CNY10000)	EA	Supervision agency
					5. Construction vehicles and plants are not permitted to enter or roll the area with a distance of less than 5m from the outer edge of the crown shadow of trees.			
		Excavations during civil works construction	Pipelines at the intersection between Huangansi Drainage Canal and Badaxi Road and Jianshezhong Road	Poor construction management may lead to interruption of underground pipelines.	1. The contractor should further coordinate with municipal and urban development authorities during construction for collection of underground pipeline information including pipeline type, alignment and depth, and establish a pipeline coordination team. Prior approval should be obtained	/	Construction contractor	Municipal HURB

**Table 4-8 Environmental Impacts of Huangansi Drainage Canal Integrated Rehabilitation Subproject and their Mitigation Measures**

Name of subproject	Stage	Activity	Environmentally sensitive spot	Potential impact	Mitigation / control measures	Environmental protection investment (CNY10000)	EA	Supervision agency
					<p>from municipal and urban development authorities for excavation interfering with underground pipelines.</p> <p>2. Construction plan and emergency response plan should be developed based on pipeline alignment and depth to avoid interference with existing underground pipelines as much as possible.</p> <p>3. In the event of interference with existing pipelines, the concerned authority should be informed of particular construction location and schedule</p>			

**Table 4-8 Environmental Impacts of Huangansi Drainage Canal Integrated Rehabilitation Subproject and their Mitigation Measures**

Name of subproject	Stage	Activity	Environmentally sensitive spot	Potential impact	Mitigation / control measures	Environmental protection investment (CNY10000)	EA	Supervision agency
					of excavation activities to be prepared for emergency responses.			
		Borrow fill and waste oil	Borrow area located 1.25km east of Xiadao Bridge in the eastern part of Hezhou Municipality, borrow area located at Hezhou Electronic Technology Ecological Industry Park and the construction waste disposal site located at Gonghe Village, Huangtian of Hezhou Municipality	Borrow fill and waste soil for temporary land use, construction access road and construction camp will result in soil erosion in a total area of 87.72hm <sup>2</sup> and an additional soil erosion of 100058t.	(1) Construction access roads Prior to construction, top soil in the right of way will be removed and stockpiled on a temporary stockpiling site in the construction area of the main stream rehabilitation works of He River. In the meanwhile, temporary drainage and sedimentation measures will be taken on both sides of the road and land rehabilitation and cut-over land restoration will be conducted in the late stage of the Project. Structural measures: top soil removal in a total volume of 41,600m <sup>3</sup> , top soil backfill in a total volume of 41,600 m <sup>3</sup> and land rehabilitation in a total area	1491.16	Construction contractor	Municipal WRB

**Table 4-8 Environmental Impacts of Huangansi Drainage Canal Integrated Rehabilitation Subproject and their Mitigation Measures**

Name of subproject	Stage	Activity	Environmentally sensitive spot	Potential impact	Mitigation / control measures	Environmental protection investment (CNY10000)	EA	Supervision agency
					<p>of 20.82hm<sup>2</sup> (newly included in the technical design);</p> <p>Greening measures: 5.12hm<sup>2</sup> for forest land restoration, 7.04hm<sup>2</sup> for grassland restoration (newly included in the technical design);</p> <p>Temporary measures: 138660m for temporary earth drainage gutter; 139 temporary sedimentation tanks (newly included in the technical design).</p> <p>(2) Construction production and domestic activity areas</p> <p>Prior to construction, top soil in the right of way will be removed and stockpiled on a temporary stockpiling site in the construction area of the main stream rehabilitation works of He River. In the meanwhile, temporary drainage and sedimentation measures will be taken on both sides of the road and land rehabilitation and cut-over land restoration will be</p>			

**Table 4-8 Environmental Impacts of Huangansi Drainage Canal Integrated Rehabilitation Subproject and their Mitigation Measures**

Name of subproject	Stage	Activity	Environmentally sensitive spot	Potential impact	Mitigation / control measures	Environmental protection investment (CNY10000)	EA	Supervision agency
					<p>conducted in the late stage of the Project.</p> <p>Structural measures: top soil removal in a total volume of 9000m<sup>3</sup>, top soil backfill in a total volume of 9000 m<sup>3</sup> and land rehabilitation in a total area of 4.50hm<sup>2</sup> (newly included in the technical design);</p> <p>Greening measures: 0.11hm<sup>2</sup> for garden land restoration, 2.71hm<sup>2</sup> for grassland restoration (newly included in the technical design);</p> <p>Temporary measures: 4685m for temporary earth drainage gutter; 26 temporary sedimentation tanks; 7700m<sup>2</sup> for dense-mesh net (newly included in the technical design).</p> <p>(3) Temporary soil storage site</p> <p>Straw bag stuffed with soil will be placed and temporary drainage and sedimentation structures</p>			

**Table 4-8 Environmental Impacts of Huangansi Drainage Canal Integrated Rehabilitation Subproject and their Mitigation Measures**

Name of subproject	Stage	Activity	Environmentally sensitive spot	Potential impact	Mitigation / control measures	Environmental protection investment (CNY10000)	EA	Supervision agency
					<p>should be built around the site before construction. Temporary soil storage site should be covered during and restored through land rehabilitation and cut-over land restoration at the end of the construction stage.</p> <p>Structural measures: 18.05 hm<sup>2</sup> land rehabilitation (newly included in the technical design).</p> <p>Greening measures: 4.31 hm<sup>2</sup> forest land restoration, 1.38hm<sup>2</sup> garden restoration and 2.22 hm<sup>2</sup> grass land restoration (newly included in the technical design).</p> <p>Temporary measures: installation and removal of 8658 m long temporary straw bag stuffed with soil, 5758m long temporary earth drainage canal, and 53 temporary sedimentation tanks, and 206250 m<sup>2</sup> dense-mesh net (newly included in the technical design).</p>			

**Table 4-8 Environmental Impacts of Huangansi Drainage Canal Integrated Rehabilitation Subproject and their Mitigation Measures**

Name of subproject	Stage	Activity	Environmentally sensitive spot	Potential impact	Mitigation / control measures	Environmental protection investment (CNY10000)	EA	Supervision agency
					(4) Borrow areas Water and soil conservation measures for borrow area are not included in project technical design, which should be a comprehensive system composed of structural measures, planting measures and temporary measures. Surface soil should be removed and be stored in temporary storage site before construction. Excavation during construction should be done from top to bottom and bench by bench to form stable cut slope. Retaining wall of soil bags should be built along slope bottom and bare ground surface should be covered with dense-mesh net. Temporary drainage canals and structures should be built around the site. The borrow area should be restored in late construction stage through			



**Table 4-8 Environmental Impacts of Huangansi Drainage Canal Integrated Rehabilitation Subproject and their Mitigation Measures**

Name of subproject	Stage	Activity	Environmentally sensitive spot	Potential impact	Mitigation / control measures	Environmental protection investment (CNY10000)	EA	Supervision agency
					<p>surface soil backfill and vegetation replanting</p> <p>Structural measures: 11,080 m<sup>3</sup> for surface soil removal, 11,080 m<sup>3</sup> for surface soil backfill, 36.95 hm<sup>2</sup> for land rehabilitation, 3,800 m long brick masonry drainage canal, and 15 brick masonry sedimentation tanks (newly included in the technical design).</p> <p>Greening measures: 36.95 hm<sup>2</sup> for grass planting, planting of 46,187 pines and 92,375 bushes (newly included in the technical design).</p> <p>Temporary measures: 1,000 m long retaining wall for temporary storage site and 36,000 m<sup>2</sup> dense-mesh net (newly included in the technical design).</p> <p>(5) Waste disposal sites</p> <p>Water and soil conservation measures for disposal site are not included in project technical design, which</p>			

**Table 4-8 Environmental Impacts of Huangansi Drainage Canal Integrated Rehabilitation Subproject and their Mitigation Measures**

Name of subproject	Stage	Activity	Environmentally sensitive spot	Potential impact	Mitigation / control measures	Environmental protection investment (CNY10000)	EA	Supervision agency
					<p>should be a comprehensive system composed of structural measures, planting measures and temporary measures. Surface soil should be removed and be stored in temporary storage site before construction. Retaining wall, masonry drainage canal and various drainage structures should be built around the site. The disposal site should be restored at the end of the construction stage through surface soil backfill and vegetation replanting.</p> <p>Structural measures: 22,200 m<sup>3</sup> for surface soil removal, 22,200 m<sup>3</sup> for surface soil backfill, 7.4 hm<sup>2</sup> for land rehabilitation, 150 m long masonry retaining wall, 1,100m long masonry interception/drainage canal, and 4 brick masonry sedimentation tanks (newly included in the</p>			

**Table 4-8 Environmental Impacts of Huangansi Drainage Canal Integrated Rehabilitation Subproject and their Mitigation Measures**

Name of subproject	Stage	Activity	Environmentally sensitive spot	Potential impact	Mitigation / control measures	Environmental protection investment (CNY10000)	EA	Supervision agency
					<p>technical design).</p> <p>Greening measures: 7.4 hm<sup>2</sup> grass planting, planting of 9,250 pines and 18,500 bushes (newly included in the technical design).</p> <p>Temporary measures: installation of 2,000 m<sup>2</sup> dense-mesh net (newly included in the technical design).</p> <p>⑦ Mud transfer tank:</p> <p>Temporary measures: 21 mud transfer tanks to be provided; 11193m<sup>3</sup> for earthwork excavation and backfill; 861m<sup>3</sup> for fencing and demolition of earth-filled woven bags; 495m for temporary drainage ditches</p>			

**Table 4-9 Environmental Impacts of Shizigang Drainage Canal Integrated Rehabilitation Subproject and their Mitigation Measures**

Name of subproject	Stage	Activity	Environmentally sensitive spot	Potential impact	Mitigation / control measures	Environmental protection investment (CNY10000)	EA	Supervision agency
Shizigang Drainage Canal Integrated Rehabilitation (C-2 Shizigang Drainage Canal Integrated Rehabilitation)	Design stage	Schematic design	Residential buildings at Wanquan Street, Zhushan Road, Longxing Road, and Yinhe Street; office building of Hezhou Land and Resources Bureau, office building and staff dormitory building of Guidong Electricity Bureau, residential buildings at Wangjiao Road, Jianshe Road, Longshan Road, Xingguang Road; shops and swimming pool of Hezhou Water Resources Bureau, residential	Dredging odor will generate impacts on residential buildings at Wanquan Street, Zhushan Road, Longxing Road, and Yinhe Street; office building of Hezhou Land and Resources Bureau, office building and staff dormitory building of Guidong Electricity Bureau, residential buildings at Wangjiao Road, Jianshe Road, Longshan Road, Xingguang Road; shops and swimming pool of Hezhou Water Resources Bureau, residential	1. Due to the perennial reception of domestic sewage along He River, Shizigang Drainage Canal is known for its poor water quality and odor sediments. Since the drainage canal is located in the urban center that is densely populated with limited space for operation, the optimized program chooses the underwater dredging method with suction sludge pump assisted with artificial operation. Water sealing plays a significant role in reducing odor emission and reducing the amount of odor generated from sludge agitation. 2. As the optimum choice, No. 1 dewatering site (river shores on the right bank of He River approximately 100m upstream from Lingfeng Bridge) is selected. It is located more	/	FS unit	/

**Table 4-9 Environmental Impacts of Shizigang Drainage Canal Integrated Rehabilitation Subproject and their Mitigation Measures**

Name of subproject	Stage	Activity	Environmentally sensitive spot	Potential impact	Mitigation / control measures	Environmental protection investment (CNY10000)	EA	Supervision agency
			building at Pinganxi Road, office building of Hezhou Health and Family Planning Committee, office building and staff dormitory building of Babu District Transportation Bureau, residential buildings at Jiangbeizhong Road	Longshan Road, Xingguang Road; shops and swimming pool of Hezhou Water Resources Bureau, residential building at Pinganxi Road, office building of Hezhou Health and Family Planning Committee, office building and staff dormitory building of Babu District Transportation Bureau, residential buildings at Jiangbeizhong Road. Blind-to-open canal transformation	than 100m away from the closest sensitive spot, helpful to avoid impacts on the environmentally sensitive sites from temporary storage and dewatering of sludge. 3. Upon transformation of blind canal to open canal, the optimized program considers the construction of one small overbridge each at Yinhe Street, the Land & Resources Bureau and Guidong Electricity Bureau to mitigate impacts on travelling of local residents due to such transformation.			

**Table 4-9 Environmental Impacts of Shizigang Drainage Canal Integrated Rehabilitation Subproject and their Mitigation Measures**

Name of subproject	Stage	Activity	Environmentally sensitive spot	Potential impact	Mitigation / control measures	Environmental protection investment (CNY10000)	EA	Supervision agency
				will generate impacts travelling convenience of residential buildings at Yinhe Street, office building of Hezhou Land & Resources Bureau, office building and staff dormitory building of Guidong Electricity Bureau.				
	Construction stage	Civil works construction, construction material and earth and aggregate transportation, construction camps, access roads	Residential buildings at Wanquan Street, Zhushan Road, Longxing Road, and Yinhe Street; office building of Hezhou Land and Resources Bureau, office building and staff dormitory building of	Noises generated in the operation of excavators, bull dozers, dump trucks and other construction plants used in the construction stage will generate	Requirements included in ESMP Annex 1: World Bank Financed Guangxi Hezhou Urban Water Infrastructure and Environment Improvement Project ECOP for Embankment Construction Component.	10	Construction contractor	Municipal EPB

**Table 4-9 Environmental Impacts of Shizigang Drainage Canal Integrated Rehabilitation Subproject and their Mitigation Measures**

<b>Name of subproject</b>	<b>Stage</b>	<b>Activity</b>	<b>Environmentally sensitive spot</b>	<b>Potential impact</b>	<b>Mitigation / control measures</b>	<b>Environmental protection investment (CNY10000)</b>	<b>EA</b>	<b>Supervision agency</b>
			Guidong Electricity Bureau, residential buildings at Wangjiao Road, Jianshe Road, Longshan Road, Xingguang Road; shops and swimming pool of Hezhou Water Resources Bureau, residential building at Pinganxi Road, office building of Hezhou Health and Family Planning Committee, office building and staff dormitory building of Babu District Transportation Bureau, residential buildings at Jiangbeizhong	certain impacts on sensitive sites within a distance of 30m in the neighborhood. Dust generated in earthwork excavation, stockpiling, backfill, pedestrian and motor vehicle movement, spillage from earthwork transportation vehicles in the construction stage will generate certain impacts on sensitive sites within a distance of 50m in the neighborhood. Poor management of construction				

**Table 4-9 Environmental Impacts of Shizigang Drainage Canal Integrated Rehabilitation Subproject and their Mitigation Measures**

Name of subproject	Stage	Activity	Environmentally sensitive spot	Potential impact	Mitigation / control measures	Environmental protection investment (CNY10000)	EA	Supervision agency
			Road	wastes and debris, waste soil generated in the demolition of acquired buildings and construction of new buildings will cause impacts on the environment.				
			Right of way and temporary land use for the Project	Construction activities will result in additional soil erosion of 13.62hm <sup>2</sup> and 1045t.	Reusable surface soil in disturbed area should be removed and stored in designated area before construction. Cut slope and land surface with vegetation being removed should be covered with dense-mesh net for protection during construction and restored through soil covering and greening in later stage. Structural measures: 3,990	6	Construction contractor	Municipal WRB



**Table 4-9 Environmental Impacts of Shizigang Drainage Canal Integrated Rehabilitation Subproject and their Mitigation Measures**

Name of subproject	Stage	Activity	Environmentally sensitive spot	Potential impact	Mitigation / control measures	Environmental protection investment (CNY10000)	EA	Supervision agency
					m long bio-swale, 2,247 m long covered drainage canal, and 9,000 m <sup>3</sup> surface soil backfill (already included in the technical design). Greening measures: 23,340m <sup>2</sup> three-dimensional geo-technical net embankment slope covered with grass, 30,057 m <sup>2</sup> greening, and 3,990 m <sup>2</sup> wetland planting (already included in the technical design). Temporary measures: temporary covering by 5,000 m <sup>2</sup> dense-mesh net (newly included in the technical design).			
		Operation of dredging vessel, operation of integrated	Water system of Shizigang Drainage Canal, areas along the sludge	The dredging process will generate temporary disturbances to	1. Information on the construction plan, the environmental impact descriptions, dredger operation route and sludge	5	Construction contractor	Municipal EPB

**Table 4-9 Environmental Impacts of Shizigang Drainage Canal Integrated Rehabilitation Subproject and their Mitigation Measures**

Name of subproject	Stage	Activity	Environmentally sensitive spot	Potential impact	Mitigation / control measures	Environmental protection investment (CNY10000)	EA	Supervision agency
		sludge treatment facility, sludge dewatering and onsite dewatering	transportation route	water systems and result in increased SS concentration and possibly fugitive odor in a small amount. Improper management of sludge dewatering or transportation process may cause secondary pollution.	transportation route should be disclosed in time to the public. 2. The dredging operation should be conducted in the low-water season and the construction time should be shortened, if possible, to reduce disturbances to water systems. 3. The dredging method selected for Shizigang Drainage Canal is suction sludge pump plus artificial operation. The dredged sludge with a moisture content of 95% are conveyed through fecal suction truck to No. 1 dewatering site along He River. Interception and diversion + dry dredging method may be used for dredging provided that the construction condition permits (with the required operation space available for inner river interception and diversion) and a sound regional intercepting			

**Table 4-9 Environmental Impacts of Shizigang Drainage Canal Integrated Rehabilitation Subproject and their Mitigation Measures**

Name of subproject	Stage	Activity	Environmentally sensitive spot	Potential impact	Mitigation / control measures	Environmental protection investment (CNY10000)	EA	Supervision agency
					<p>pipeline network is in place.</p> <p>4. Sludge is dewatered into sludge cakes with a moisture content of less than 50%, which are then transported in enclosed vehicles to Hezhou Municipal Domestic Solid Waste Landfill for disposal.</p> <p>5. Construction plants and vessels involved in the dredging process must be subject to strict inspection to prevent oil leakage. Sewage, solid wastes and oily wastewater from vessel cabins must not be cast into the water systems and should, instead, be collected and treated together with the other construction wastes.</p> <p>6. Flood interception ditches should be excavated around the temporary sludge storage tanks on the dewatering site and connected to the wastewater sedimentation</p>			

**Table 4-9 Environmental Impacts of Shizigang Drainage Canal Integrated Rehabilitation Subproject and their Mitigation Measures**

Name of subproject	Stage	Activity	Environmentally sensitive spot	Potential impact	Mitigation / control measures	Environmental protection investment (CNY10000)	EA	Supervision agency
					<p>tanks.</p> <p>7. Stormwater, tail water from sludge dewatering collected by the flood interception ditches should be discharged into the wastewater sedimentation tank for sedimentation before finally discharged into He River.</p> <p>8. The sludge should be dewatered and transported out of site in a timely manner to avoid the generation of leachate due to excessive storage.</p> <p>9. Quick lime and deodorants should be provided for sterilization and deodorization of the dewatering site and labor protection devices such as masks should be provided to the construction workers.</p>			
		Blind-to-open canal transformation	Residential building at Yinhe Street, office building of Hezhou Land & Resources	Interrupted operation of shops at Yinhe Street will generate impacts on	1. Impacts on the normal operation of shops at Yinhe Street, Hezhou Land & Resources Bureau and Guidong Electricity Bureau will be mitigated mainly	/	Construction contractor	MEB

**Table 4-9 Environmental Impacts of Shizigang Drainage Canal Integrated Rehabilitation Subproject and their Mitigation Measures**

Name of subproject	Stage	Activity	Environmentally sensitive spot	Potential impact	Mitigation / control measures	Environmental protection investment (CNY10000)	EA	Supervision agency
			Bureau, office and staff dormitory buildings of Guidong Electricity Bureau	income of business owners. Some parking spaces in Hezhou Land & Resources Bureau will become no longer usable, imposing pressure on office parking for this unit.	through implementation of LAR and compensation measures detailed in the RP. 2. Impacts on the parking lot of the Land & Resources Bureau will be mitigated through diversion of traffic and restriction of access for vehicles of other organizations by diverting them to several parking lots available in the vicinity.			
		Excavations during civil works construction	Pipelines at the intersection between Shizigang Drainage Canal and Guposhan Avenue, Wanquan Street, Zhushan Road, Badaxi Road, Yinhe Street, Jianshezhong Road, Pinganxi Road, Longshan Road, Anshanxi Road, Xingguang Road, Pinganxi	Poor construction management may lead to interruption of underground pipelines.	1. The contractor should further coordinate with municipal and urban development authorities during construction for collection of underground pipeline information including pipeline type, alignment and depth, and establish a pipeline coordination team. Prior approval should be obtained from municipal and urban development authorities for excavation interfering with underground pipelines. 2. Construction plan and	/	Construction contractor	Municipal HURDB

**Table 4-9 Environmental Impacts of Shizigang Drainage Canal Integrated Rehabilitation Subproject and their Mitigation Measures**

Name of subproject	Stage	Activity	Environmentally sensitive spot	Potential impact	Mitigation / control measures	Environmental protection investment (CNY10000)	EA	Supervision agency
			Road and the Transportation Bureau at Jiangbeizhong Road		emergency response plan should be developed based on pipeline alignment and depth to avoid interference with existing underground pipelines as much as possible. 3. In the event of interference with existing pipelines, the concerned authority should be informed of particular construction location and schedule of excavation activities to be prepared for emergency responses.			
		Borrow fill and waste oil	Borrow area located 1.25km east of Xiadao Bridge in the eastern part of Hezhou Municipality, borrow area located at Hezhou Electronic Technology Ecological Industry Park and the construction	Borrow fill and waste soil for temporary land use, construction access road and construction camp will result in soil erosion in a total area of 87.72hm <sup>2</sup> and an additional soil erosion of	(1) Construction access roads Prior to construction, top soil in the right of way will be removed and stockpiled on a temporary stockpiling site in the construction area of the main stream rehabilitation works of He River. In the meanwhile, temporary drainage and sedimentation measures will be taken on both sides of the road and land rehabilitation and cut-over land restoration will be	1491.16	Construction contractor	Municipal WRB

**Table 4-9 Environmental Impacts of Shizigang Drainage Canal Integrated Rehabilitation Subproject and their Mitigation Measures**

Name of subproject	Stage	Activity	Environmentally sensitive spot	Potential impact	Mitigation / control measures	Environmental protection investment (CNY10000)	EA	Supervision agency
			waste disposal site located at Gonghe Village, Huangtian of Hezhou Municipality	100058t.	<p>conducted in the late stage of the Project.</p> <p>Structural measures: top soil removal in a total volume of 41,600m<sup>3</sup>, top soil backfill in a total volume of 41,600 m<sup>3</sup> and land rehabilitation in a total area of 20.82hm<sup>2</sup> (newly included in the technical design);</p> <p>Greening measures: 5.12hm<sup>2</sup> for forest land restoration, 7.04hm<sup>2</sup> for grassland restoration (newly included in the technical design);</p> <p>Temporary measures: 138660m for temporary earth drainage gutter; 139 temporary sedimentation tanks (newly included in the technical design).</p> <p>(2) Construction production and domestic activity areas</p> <p>Prior to construction, top soil in the right of way will be removed and stockpiled on a temporary stockpiling site in the construction area of the main stream rehabilitation</p>			

**Table 4-9 Environmental Impacts of Shizigang Drainage Canal Integrated Rehabilitation Subproject and their Mitigation Measures**

Name of subproject	Stage	Activity	Environmentally sensitive spot	Potential impact	Mitigation / control measures	Environmental protection investment (CNY10000)	EA	Supervision agency
					<p>works of He River. In the meanwhile, temporary drainage and sedimentation measures will be taken on both sides of the road and land rehabilitation and cut-over land restoration will be conducted in the late stage of the Project.</p> <p>Structural measures: top soil removal in a total volume of 9000m<sup>3</sup>, top soil backfill in a total volume of 9000 m<sup>3</sup> and land rehabilitation in a total area of 4.50hm<sup>2</sup> (newly included in the technical design);</p> <p>Greening measures: 0.11hm<sup>2</sup> for garden land restoration, 2.71hm<sup>2</sup> for grassland restoration (newly included in the technical design);</p> <p>Temporary measures: 4685m for temporary earth drainage gutter; 26 temporary sedimentation tanks; 7700m<sup>2</sup> for dense-mesh net (newly included in the technical design).</p>			



**Table 4-9 Environmental Impacts of Shizigang Drainage Canal Integrated Rehabilitation Subproject and their Mitigation Measures**

Name of subproject	Stage	Activity	Environmentally sensitive spot	Potential impact	Mitigation / control measures	Environmental protection investment (CNY10000)	EA	Supervision agency
					<p>(3) Temporary soil storage site</p> <p>Straw bag stuffed with soil will be placed and temporary drainage and sedimentation structures should be built around the site before construction. Temporary soil storage site should be covered during and restored through land rehabilitation and cut-over land restoration at the end of the construction stage.</p> <p>Structural measures: 14.75 hm<sup>2</sup> land rehabilitation (newly included in the technical design).</p> <p>Greening measures: 4.31 hm<sup>2</sup> forest land restoration and 2.42 hm<sup>2</sup> grass land restoration (newly included in the technical design).</p> <p>Temporary measures: installation and removal of 6,985 m long temporary straw bag stuffed with soil, 7,085 m long temporary earth drainage canal, and 47 temporary sedimentation tanks, and</p>			

**Table 4-9 Environmental Impacts of Shizigang Drainage Canal Integrated Rehabilitation Subproject and their Mitigation Measures**

Name of subproject	Stage	Activity	Environmentally sensitive spot	Potential impact	Mitigation / control measures	Environmental protection investment (CNY10000)	EA	Supervision agency
					<p>173,800 m<sup>2</sup> dense-mesh net (newly included in the technical design).</p> <p>(4) Borrow areas</p> <p>Water and soil conservation measures for borrow area are not included in project technical design, which should be a comprehensive system composed of structural measures, planting measures and temporary measures. Surface soil should be removed and be stored in temporary storage site before construction. Excavation during construction should be done from top to bottom and bench by bench to form stable cut slope. Retaining wall of soil bags should be built along slope bottom and bare ground surface should be covered with dense-mesh net. Temporary drainage canals and structures should be built around the site. The</p>			

**Table 4-9 Environmental Impacts of Shizigang Drainage Canal Integrated Rehabilitation Subproject and their Mitigation Measures**

Name of subproject	Stage	Activity	Environmentally sensitive spot	Potential impact	Mitigation / control measures	Environmental protection investment (CNY10000)	EA	Supervision agency
					<p>borrow area should be restored in late construction stage through surface soil backfill and vegetation replanting</p> <p>Structural measures: 11,080 m<sup>3</sup> for surface soil removal, 11,080 m<sup>3</sup> for surface soil backfill, 36.95 hm<sup>2</sup> for land rehabilitation, 3,800 m long brick masonry drainage canal, and 15 brick masonry sedimentation tanks (newly included in the technical design).</p> <p>Greening measures: 36.95 hm<sup>2</sup> for grass planting, planting of 46,187 pines and 92,375 bushes (newly included in the technical design).</p> <p>Temporary measures: 1,000 m long retaining wall for temporary storage site and 36,000 m<sup>2</sup> dense-mesh net (newly included in the technical design).</p> <p>(5) Disposal sites</p> <p>Water and soil conservation measures for</p>			

**Table 4-9 Environmental Impacts of Shizigang Drainage Canal Integrated Rehabilitation Subproject and their Mitigation Measures**

Name of subproject	Stage	Activity	Environmentally sensitive spot	Potential impact	Mitigation / control measures	Environmental protection investment (CNY10000)	EA	Supervision agency
					disposal site are not included in project technical design, which should be a comprehensive system composed of structural measures, planting measures and temporary measures. Surface soil should be removed and be stored in temporary storage site before construction. Retaining wall, masonry drainage canal and various drainage structures should be built around the site. The disposal site should be restored at the end of the construction stage through surface soil backfill and vegetation replanting. Structural measures: 22,200 m <sup>3</sup> for surface soil removal, 22,200 m <sup>3</sup> for surface soil backfill, 7.4 hm <sup>2</sup> for land rehabilitation, 150 m long masonry retaining wall, 1,100m long masonry interception/drainage canal, and 4 brick masonry			

**Table 4-9 Environmental Impacts of Shizigang Drainage Canal Integrated Rehabilitation Subproject and their Mitigation Measures**

Name of subproject	Stage	Activity	Environmentally sensitive spot	Potential impact	Mitigation / control measures	Environmental protection investment (CNY10000)	EA	Supervision agency
					<p>sedimentation tanks (newly included in the technical design).</p> <p>Greening measures: 7.4 hm<sup>2</sup> grass planting, planting of 9,250 pines and 18,500 bushes (newly included in the technical design).</p> <p>Temporary measures: installation of 2,000 m<sup>2</sup> dense-mesh net (newly included in the technical design).</p> <p>⑧ Mud transfer tank:</p> <p>Temporary measures: 21 mud transfer tanks to be provided; 11193m<sup>3</sup> for earthwork excavation and backfill; 861m<sup>3</sup> for fencing and demolition of earth-filled woven bags; 495m for temporary drainage ditches</p>			

**Table 4-10 Environmental Impacts of the Drainage System Improvement Subproject and their Mitigation Measures**

Name of subproject	Stage	Activity	Environmentally sensitive spot	Potential impact	Mitigation / control measures	Environmental protection investment (CNY10000)	EA	Supervision agency
Drainage system improvement (C-3 Jiangnan WWTP and associated pipeline and road construction	Design stage	Schematic design	Sensitive sites around the WWTP, water quality of He River	Impacts on the environmentally sensitive sites from operation of WWTP; impacts on water quality of He River from accidental discharge of WWTP	<p>1. The WWTP siting should be optimized and the area east of the planned Jiangnan District of Hezhou, east of Luo-Zhan Railway, south of He River and west of Songbozhai of Gubai Village is recommended as the WWTP site to reduce resettlement and avoid impacts on environmentally sensitive sites.</p> <p>2. In order to reduce the impacts of noises generated in the operation of the pumps and equipment in the WWTP, well-designed and low-noise mechanical equipment is selected and vibration insulation and control measures are adopted where possible during installation and operation to reduce noise; the robust structure and evenly grouted bases of the pump equipment can absorb vibrations and provide a solid support to the base plate. Through reasonable arrangement of sound absorbing materials and</p>	/	FS unit	/

**Table 4-10 Environmental Impacts of the Drainage System Improvement Subproject and their Mitigation Measures**

Name of subproject	Stage	Activity	Environmentally sensitive spot	Potential impact	Mitigation / control measures	Environmental protection investment (CNY10000)	EA	Supervision agency
					vibration reduction devices, e.g. asbestos boards and shock absorbers, on the inner walls, ceilings, floors and beside the equipment in the pump station helps to effectively control and eliminate spread and reflection of noises. 3. A certain allowance will be considered in the WWTP design to keep a certain buffer in accident state and avoid impacts on the water quality of He River from accidental discharge.			
	Construction stage	Construction of civil works, transportation of construction materials and earth and aggregates, construction camps, access roads, etc.	Residential buildings at Niupailan	Noises generated in the operation of excavators, bull dozers, dump trucks and other construction plants used in the construction stage will generate certain impacts on sensitive sites within a distance of 30m in the	Requirements included in ESMP Annex 3: World Bank Loan Guangxi Hezhou Urban Water Infrastructure and Environment Improvement Project ECOP for Road and Pipeline Construction Component will be implemented.	5	Construction contractor	Municipal EPB

**Table 4-10 Environmental Impacts of the Drainage System Improvement Subproject and their Mitigation Measures**

<b>Name of subproject</b>	<b>Stage</b>	<b>Activity</b>	<b>Environmentally sensitive spot</b>	<b>Potential impact</b>	<b>Mitigation / control measures</b>	<b>Environmental protection investment (CNY10000)</b>	<b>EA</b>	<b>Supervision agency</b>
				<p>neighborhood. Dust generated in earthwork excavation, stockpiling, backfill, pedestrian and motor vehicle movement, spillage from earthwork transportation vehicles in the construction stage will generate certain impacts on sensitive sites within a distance of 50m in the neighborhood. Poor management of construction wastes and debris, waste soil generated in the demolition of acquired buildings and construction of</p>				



**Table 4-10 Environmental Impacts of the Drainage System Improvement Subproject and their Mitigation Measures**

Name of subproject	Stage	Activity	Environmentally sensitive spot	Potential impact	Mitigation / control measures	Environmental protection investment (CNY10000)	EA	Supervision agency
				new buildings will cause impacts on the environment.				
			Right of way and temporary land use for the Project	Construction activities will result in soil erosion in a total area of 34.12hm <sup>2</sup> and an additional soil erosion of 2949t.	(1) Jiangnan WWTP and Associated pipeline networks Surface soil in disturbed area should be removed and stored in designated area before construction. Cut slope and ground surface with vegetation being removed should be covered with dense-mesh net for protection during construction and restored through soil covering and greening in later stage. Temporary drainage canals and other drainage structures should be built on site. Structural measures:	38.36	Construction contractor	Municipal WRB

**Table 4-10 Environmental Impacts of the Drainage System Improvement Subproject and their Mitigation Measures**

Name of subproject	Stage	Activity	Environmentally sensitive spot	Potential impact	Mitigation / control measures	Environmental protection investment (CNY10000)	EA	Supervision agency
					<p>removal of 5,000 m<sup>3</sup> surface soil, 5000 m<sup>3</sup> surface soil backfill and 800 m long stormwater pipelines (already included in the technical design).</p> <p>Greening measures: 0.96 hm<sup>2</sup> landscaping and greening (already included in the technical design).</p> <p>Temporary measures: 880 m long temporary earth drainage canal, 4 temporary sedimentation tanks, and temporary covering by 1,000 m<sup>2</sup> dense-mesh net (newly included in the technical design).</p> <p>(2) Binjiangnan Road Surface soil in disturbed area should be removed and stored in designated area before construction. Cut</p>			

**Table 4-10 Environmental Impacts of the Drainage System Improvement Subproject and their Mitigation Measures**

Name of subproject	Stage	Activity	Environmentally sensitive spot	Potential impact	Mitigation / control measures	Environmental protection investment (CNY10000)	EA	Supervision agency
					<p>slope and ground surface with vegetation being removed should be covered with dense-mesh net for protection during construction and restored through soil covering and greening in later stage. Temporary drainage canals and other drainage structures should be built on site.</p> <p>Structural measures: removal of 99500 m<sup>3</sup> surface soil, 99500 m<sup>3</sup> surface soil backfill and 5,560 m long stormwater pipelines (already included in the technical design).</p> <p>Greening measures: 146126m<sup>2</sup> embankment greening and 21770m<sup>2</sup> road greening (already included in</p>			

**Table 4-10 Environmental Impacts of the Drainage System Improvement Subproject and their Mitigation Measures**

Name of subproject	Stage	Activity	Environmentally sensitive spot	Potential impact	Mitigation / control measures	Environmental protection investment (CNY10000)	EA	Supervision agency
					the technical design). Temporary measures: 11,120 m temporary earth drainage canal, 20 temporary sedimentation tanks, and temporary covering by 5,000 m <sup>2</sup> dense-mesh net (newly included in the technical design).			
		Borrow fill and waste oil	Borrow area located 1.25km east of Xiadao Bridge in the eastern part of Hezhou Municipality, borrow area located at Hezhou Electronic Technology Ecological Industry Park and the construction waste disposal site located at Gonghe Village, Huangtian of	Borrow fill and waste soil for temporary land use, construction access road and construction camps will result in soil erosion in a total area of 87.72hm <sup>2</sup> and an additional soil erosion of 100058t.	(1) Construction access roads Prior to construction, top soil in the right of way will be removed and stockpiled on a temporary stockpiling site in the construction area of the main stream rehabilitation works of He River. In the meanwhile, temporary drainage and sedimentation measures will be taken on both sides of the road and land rehabilitation and cut-over land restoration will be conducted in the late stage of the Project. Structural measures: top soil removal in a total volume of	1491.16	Construction contractor	Municipal WRB

**Table 4-10 Environmental Impacts of the Drainage System Improvement Subproject and their Mitigation Measures**

Name of subproject	Stage	Activity	Environmentally sensitive spot	Potential impact	Mitigation / control measures	Environmental protection investment (CNY10000)	EA	Supervision agency
			Hezhou Municipality		<p>41,600m<sup>3</sup>, top soil backfill in a total volume of 41,600 m<sup>3</sup> and land rehabilitation in a total area of 20.82hm<sup>2</sup> (newly included in the technical design);</p> <p>Greening measures: 5.12hm<sup>2</sup> for forest land restoration, 7.04hm<sup>2</sup> for grassland restoration (newly included in the technical design);</p> <p>Temporary measures: 138660m for temporary earth drainage gutter; 139 temporary sedimentation tanks (newly included in the technical design).</p> <p>(2) Construction production and domestic activity areas</p> <p>Prior to construction, top soil in the right of way will be removed and stockpiled on a temporary stockpiling site in the construction area of the main stream rehabilitation works of He River. In the meanwhile, temporary drainage and sedimentation measures will be taken on</p>			

**Table 4-10 Environmental Impacts of the Drainage System Improvement Subproject and their Mitigation Measures**

Name of subproject	Stage	Activity	Environmentally sensitive spot	Potential impact	Mitigation / control measures	Environmental protection investment (CNY10000)	EA	Supervision agency
					<p>both sides of the road and land rehabilitation and cut-over land restoration will be conducted in the late stage of the Project.</p> <p>Structural measures: top soil removal in a total volume of 9000m<sup>3</sup>, top soil backfill in a total volume of 9000 m<sup>3</sup> and land rehabilitation in a total area of 4.50hm<sup>2</sup> (newly included in the technical design);</p> <p>Greening measures: 0.11hm<sup>2</sup> for garden land restoration, 2.71hm<sup>2</sup> for grassland restoration (newly included in the technical design);</p> <p>Temporary measures: 4685m for temporary earth drainage gutter; 26 temporary sedimentation tanks; 7700m<sup>2</sup> for dense-mesh net (newly included in the technical design).</p> <p>(3) Temporary soil storage site</p> <p>Straw bag stuffed with soil will be placed and temporary</p>			

**Table 4-10 Environmental Impacts of the Drainage System Improvement Subproject and their Mitigation Measures**

Name of subproject	Stage	Activity	Environmentally sensitive spot	Potential impact	Mitigation / control measures	Environmental protection investment (CNY10000)	EA	Supervision agency
					<p>drainage and sedimentation structures should be built around the site before construction. Temporary soil storage site should be covered during and restored through land rehabilitation and cut-over land restoration at the end of the construction stage.</p> <p>Structural measures: 18.05 hm<sup>2</sup> land rehabilitation (newly included in the technical design).</p> <p>Greening measures: 4.31 hm<sup>2</sup> forest land restoration, 1.38hm<sup>2</sup> garden restoration and 2.22 hm<sup>2</sup> grass land restoration (newly included in the technical design).</p> <p>Temporary measures: installation and removal of 8658 m long temporary straw bag stuffed with soil, 5758 m long temporary earth drainage canal, and 53 temporary sedimentation tanks, and 206250 m<sup>2</sup> dense-mesh net (newly included in the technical design).</p>			

**Table 4-10 Environmental Impacts of the Drainage System Improvement Subproject and their Mitigation Measures**

Name of subproject	Stage	Activity	Environmentally sensitive spot	Potential impact	Mitigation / control measures	Environmental protection investment (CNY10000)	EA	Supervision agency
					<p>(4) Borrow sites</p> <p>Water and soil conservation measures for borrow area are not included in project technical design, which should be a comprehensive system composed of structural measures, planting measures and temporary measures. Surface soil should be removed and be stored in temporary storage site before construction. Excavation during construction should be done from top to bottom and bench by bench to form stable cut slope. Retaining wall of soil bags should be built along slope bottom and bare ground surface should be covered with dense-mesh net. Temporary drainage canals and structures should be built around the site. The borrow area should be restored in late construction stage through surface soil backfill and vegetation replanting</p>			



**Table 4-10 Environmental Impacts of the Drainage System Improvement Subproject and their Mitigation Measures**

Name of subproject	Stage	Activity	Environmentally sensitive spot	Potential impact	Mitigation / control measures	Environmental protection investment (CNY10000)	EA	Supervision agency
					<p>Structural measures: 11,080 m<sup>3</sup> for surface soil removal, 11,080 m<sup>3</sup> for surface soil backfill, 36.95 hm<sup>2</sup> for land rehabilitation, 3,800 m long brick masonry drainage canal, and 15 brick masonry sedimentation tanks (newly included in the technical design).</p> <p>Greening measures: 36.95 hm<sup>2</sup> for grass planting, planting of 46,187 pines and 92,375 bushes (newly included in the technical design).</p> <p>Temporary measures: 1,000 m long retaining wall for temporary storage site and 36,000 m<sup>2</sup> dense-mesh net (newly included in the technical design).</p> <p>(5) Waste disposal sites</p> <p>Water and soil conservation measures for disposal site are not included in project technical design, which should be a comprehensive system composed of structural measures, planting measures and</p>			

**Table 4-10 Environmental Impacts of the Drainage System Improvement Subproject and their Mitigation Measures**

Name of subproject	Stage	Activity	Environmentally sensitive spot	Potential impact	Mitigation / control measures	Environmental protection investment (CNY10000)	EA	Supervision agency
					<p>temporary measures. Surface soil should be removed and be stored in temporary storage site before construction. Retaining wall, masonry drainage canal and various drainage structures should be built around the site. The disposal site should be restored at the end of the construction stage through surface soil backfill and vegetation replanting.</p> <p>Structural measures: 22,200 m<sup>3</sup> for surface soil removal, 22,200 m<sup>3</sup> for surface soil backfill, 7.4 hm<sup>2</sup> for land rehabilitation, 150 m long masonry retaining wall, 1,100m long masonry interception/drainage canal, and 4 brick masonry sedimentation tanks (newly included in the technical design).</p> <p>Greening measures: 7.4 hm<sup>2</sup> grass planting, planting of 9,250 pines and 18,500 bushes (newly included in the technical design).</p>			

**Table 4-10 Environmental Impacts of the Drainage System Improvement Subproject and their Mitigation Measures**

Name of subproject	Stage	Activity	Environmentally sensitive spot	Potential impact	Mitigation / control measures	Environmental protection investment (CNY10000)	EA	Supervision agency
					Temporary measures: installation of 2,000 m <sup>2</sup> dense-mesh net (newly included in the technical design). Mud transfer tanks: Temporary measures: 21 mud transfer tanks to be provided; 11193m <sup>3</sup> for earthwork excavation and backfill; 861m <sup>3</sup> for fencing and demolition of earth-filled woven bags; 495m for temporary drainage ditches..			
	Operation stage	WWTP operation	WWTP site and its neighborhood	Impacts generated by odor, noise and sludge generated in the operation of the WWTP	1. Measures of odor collection and biological deodorization will be taken for the key odor-generating structures such as influent pump station, aeration tank, sludge concentration tank, and sludge dewatering workshop. 2. A health protection distance of 100m is set on the periphery of the major odor-generating structures such as influent pump house, aeration tank, sludge concentration tank and sludge dewatering workshop.	30	Operator	Municipal EPB

**Table 4-10 Environmental Impacts of the Drainage System Improvement Subproject and their Mitigation Measures**

Name of subproject	Stage	Activity	Environmentally sensitive spot	Potential impact	Mitigation / control measures	Environmental protection investment (CNY10000)	EA	Supervision agency
					<p>3. Maintenance and servicing of water pumps should be strengthened by means of periodical inspection of electric motor and pump axle concentricity and assuring excellent lubrication of axles so as to reduce wearing of pump parts.</p> <p>4. A greenbelt around the pump house should be constructed through inter-planting trees and bushes to improve landscaping and reduce waste gas, noise and odor impacts on surrounding environment. Tree species with strong pollution resistance should be selected.</p> <p>5. Sludge generated from Jiangnan WWTP is transported to Guangxi Hezhou Sludge Harmless Treatment Project for dewatering and then to Hezhou Solid Waste Landfill for disposal.</p>			
			WWTP staff	In the operating environment, staff of Jiangnan	1. Proper protective clothes, gloves and respiration mask should be provided for	20	Operator	Municipal Occupational

**Table 4-10 Environmental Impacts of the Drainage System Improvement Subproject and their Mitigation Measures**

Name of subproject	Stage	Activity	Environmentally sensitive spot	Potential impact	Mitigation / control measures	Environmental protection investment (CNY10000)	EA	Supervision agency
				WWTP is extensively exposed to wastewater or sludge containing various pathogenic bacteria and parasitic ovum. Mist and vapor generated by wastewater treatment facility could spread bacteria and virus. Exposed to microorganisms in wastewater and sludge, operation staff of WWTP may be infected and catch disease.	WWTP workers. Anti-skid shoes should be provided for transportation workers and steel-toe shoes should be provided for all the workers to prevent foot injury. Workers working near high-noise equipment should be provided with noise protective devices. Workers operating near heavy movable equipment, bucket, crane and transportation vehicle dumping site should be equipped with safety helmet. Guardrails should be installed around all the process containers and water tanks. Lifeline and personal floating device should be available for use when operators are working within the guardrails, to make sure life saving devices being in place in emergencies. 2. Dangerous contact should be reduced through design and development of technical and material			Disease Prevention and Control Center

**Table 4-10 Environmental Impacts of the Drainage System Improvement Subproject and their Mitigation Measures**

Name of subproject	Stage	Activity	Environmentally sensitive spot	Potential impact	Mitigation / control measures	Environmental protection investment (CNY10000)	EA	Supervision agency
					<p>specifications (e.g. ventilation, air conditioning, enclosed conveyor belt, low-load and different heights, anti-skid floor, safety guardrails for stairways and aisles, spill protection and leakage prevention, noise control, dust prevention measures, gas alarm system, fire alarm and control system, and evacuation devices).</p> <p>3. Bathroom and dressing area should be provided for the operators for after-work bath and dressing, and work clothing laundry service should be provided. Additionally, frequent hand washing of WWTP staff should be encouraged.</p> <p>4. Enclosed space access plan conforming to the national requirements and internationally recognized standards should be developed for construction activities in enclosed treatment zone. Ventilation is mandatory before</p>			

**Table 4-10 Environmental Impacts of the Drainage System Improvement Subproject and their Mitigation Measures**

Name of subproject	Stage	Activity	Environmentally sensitive spot	Potential impact	Mitigation / control measures	Environmental protection investment (CNY10000)	EA	Supervision agency
					entering. Operators should be equipped with gas detector and valve connected with process container should be locked to prevent accidental overflow during maintenance. 5. Eating, smoking and water drinking should be banned outside the designated area. 6. Operators should be separated from bacteria spreading channels via mechanical overturning (e.g. use of tractor or front-end loader with enclosed air conditioning or heating driver cab). Ventilation system should be provided in case of manual overturning.			
		Accidental discharge of WWTP	Water quality of He River	In the event of an accidental discharge from Jiangnan WWTP, a 10 m wide and 220 m long area downstream of	1. Emergency response measures against instable water supply caused by various factors should be fully considered in the design to mitigate the adverse conditions. 2. A WWTP operation	20	Operator	Municipal EPB

**Table 4-10 Environmental Impacts of the Drainage System Improvement Subproject and their Mitigation Measures**

Name of subproject	Stage	Activity	Environmentally sensitive spot	Potential impact	Mitigation / control measures	Environmental protection investment (CNY10000)	EA	Supervision agency
				<p>the outlet will experience non-compliant COD discharge higher than the standard by a factor of 15.10. In such an event, the water quality of He River will be affected to a certain extent and such event may even lead to non-compliance in a certain area in the downstream section.</p>	<p>management and accountability system should be set up.</p> <p>3. Management and operation staff training should be organized and technical examination files developed. Those who fail such examination shall not be allowed to take the post. Experienced technical professionals should be employed to be responsible for internal technical management work; professional and technical personnel should be selected to take part in domestic or international technical training.</p> <p>4. Inspection of water conveyance pipelines should be strengthened so that problems are identified and addressed in a timely manner.</p> <p>5. Multiple stand-by equipment should be provided for vulnerable equipment and adequate spare parts required for</p>			



**Table 4-10 Environmental Impacts of the Drainage System Improvement Subproject and their Mitigation Measures**

<b>Name of subproject</b>	<b>Stage</b>	<b>Activity</b>	<b>Environmentally sensitive spot</b>	<b>Potential impact</b>	<b>Mitigation / control measures</b>	<b>Environmental protection investment (CNY10000)</b>	<b>EA</b>	<b>Supervision agency</b>
					<p>maintenance and upgrading should be assured. The mechanical and electronic equipment in the treatment system should at least have one in operation and one stand-by.</p> <p>6. High quality equipment should be selected. The various machines, electrical appliances and instruments in the treatment facilities should be products of high quality and low fault rate that satisfy the design requirements and are suitable to long-term operation and easy maintenance.</p> <p>7. During operation, the on-duty operators must operate in strict accordance with the rules and regulations of the treatment facilities, conduct frequent inspections and carry out timely maintenance and servicing to reduce the fault rate.</p> <p>8. The electrical equipment should follow the requirements of grounding protection specifications and</p>			

**Table 4-10 Environmental Impacts of the Drainage System Improvement Subproject and their Mitigation Measures**

Name of subproject	Stage	Activity	Environmentally sensitive spot	Potential impact	Mitigation / control measures	Environmental protection investment (CNY10000)	EA	Supervision agency
					be equipped with automatic tripping circuit. Operation of key equipment is subject to computer digital monitoring to enable timely alarms and recording of location, nature and time of occurrence of accidents so that timely repair can be organized. The installation protections for all electrical equipment must satisfy the relevant safety requirements for electrical equipment. 9. Dual feed electricity supply should be adopted to assure normal operation of the electricity supply facilities and lines.			
		Accidental leakage due to broken sewage pipeline	Surface water, ground water and soil around the pipelines	As a result of leakage of sewage pipelines, collection of wastewater will become unlikely and untreated wastewater will be discharged into surface waters, causing	1. Upon pipeline design, suitable pipe material should be selected based on the specific conditions and characteristics of the city where they are located and actions should be taken to assure pipeline quality and service life. The groundwork of pipeline drainage works must satisfy the mechanical design requirements, with	10	Operator	Municipal EPB

**Table 4-10 Environmental Impacts of the Drainage System Improvement Subproject and their Mitigation Measures**

Name of subproject	Stage	Activity	Environmentally sensitive spot	Potential impact	Mitigation / control measures	Environmental protection investment (CNY10000)	EA	Supervision agency
				impacts on surface water environment. Wastewater leaked from pipelines will permeate into the ground, not only polluting the soil and sanitation environment, but also generating adverse impacts on water quality of ground water.	corresponding actions taken where such requirements are failed. Such groundwork should be constructed in strict accordance with the width, thickness and strength required in the design drawing for quality assurance. 2. Inspections should be carried out accordingly before pipeline laying. On one hand, pipes delivered to site should be carefully inspected to avoid situations where pipes with cracks or voids are laid in the trenches; on the other hand, centerlines and side lines of pipeline foundation and size and strength of manhole foundation should be carefully checked against the drawings; finally, location and distance of manholes, concrete strength at all locations and mix ratio of waterproof mortar at all junctions must be checked against the national standards. 3. Upon pipeline installation,			

**Table 4-10 Environmental Impacts of the Drainage System Improvement Subproject and their Mitigation Measures**

<b>Name of subproject</b>	<b>Stage</b>	<b>Activity</b>	<b>Environmentally sensitive spot</b>	<b>Potential impact</b>	<b>Mitigation / control measures</b>	<b>Environmental protection investment (CNY10000)</b>	<b>EA</b>	<b>Supervision agency</b>
					<p>cement mortar needed for plaster band should be prepared according to the specified mix ratio. Stand-up seams often occur due to pressing upon the installation of junctions between two drainage pipelines. In order to assure smooth flow of the drainage pipelines, the stand-up seams at the junctions should be handled in time to avoid reduction of flow section, impacts on flow speed and even accumulation of debris in and even obstruction of pipelines.</p> <p>4. Trench backfill should not be conducted until the cradle concrete and plaster band mortar reach a certain strength and direct impact by aggregates on the pipes should be avoided. Large rocks, bricks and hard substances should not be present in the aggregates. Backfill and compaction on both sides of the pipeline should be conducted simultaneously while that on</p>			

**Table 4-10 Environmental Impacts of the Drainage System Improvement Subproject and their Mitigation Measures**

<b>Name of subproject</b>	<b>Stage</b>	<b>Activity</b>	<b>Environmentally sensitive spot</b>	<b>Potential impact</b>	<b>Mitigation / control measures</b>	<b>Environmental protection investment (CNY10000)</b>	<b>EA</b>	<b>Supervision agency</b>
					the top should be conducted in layers to form a mass of integral stress which can disperse and discharge the stress over the crest to protect pipeline safety. 5. In the operation stage of the Project, the EA should set up a sound pipeline management system to enable timely dredging and renewal of pipelines and avoid possible contamination of surrounding waters and ground water from sewage leakage.			

**Table 4-11: Environmental impacts and mitigation measures for the Technical Assistance Management Subproject**

Subproject	Period	Activity	Environmentally sensitive site	Potential impact	Mitigation/prevention measures	Environmental protection investment (CNY10000)	EA	Supervisory agency
Technical assistance management (E-1: River governor system + Internet intelligent management and control system)	Construction stage	Hydrological station construction	/	Noises generated in the operation of excavators, bull dozers, dump trucks and other construction plants used in the construction stage will generate certain impacts on sensitive sites within a distance of 30m in the neighborhood. Dust generated in earthwork excavation, stockpiling, backfill, pedestrian and motor vehicle movement, spillage from earthwork transportation vehicles in the construction stage will generate certain impacts on sensitive sites within a distance of 50m in the	Requirements included in ESMP Annex 2: World Bank Loan Guangxi Hezhou Urban Water Infrastructure and Environment Improvement Project ECOP for Small Waterworks Construction Component will be implemented.	1	Construction contractor	HEPB

**Table 4-11: Environmental impacts and mitigation measures for the Technical Assistance Management Subproject**

Subproject	Period	Activity	Environmentally sensitive site	Potential impact	Mitigation/prevention measures	Environmental protection investment (CNY10000)	EA	Supervisory agency
				neighborhood. Poor management of construction wastes and debris, waste soil generated in the demolition of acquired buildings and construction of new buildings will cause impacts on the environment.				
Technical assistance management (E-2: He River Watershed water environment monitoring, early warning and integrated	Operation stage	Laboratory operation	Around the laboratory	The wastewater containing strong acid, strong alkaline or toxic substances will generate serious environmental pollution if directly discharged into the natural environment. Exhaust gas will cause hazard to laboratory staff while the waste drugs and test	1. The wastewater, exhaust gas and solid wastes in the laboratories must be properly treated according to the national laws and regulations on environmental protection and random dumping, storage and discharge are prohibited. 2. Acid and alkaline waste liquid generated in the process of test and analysis	/	Owner	HEPB

**Table 4-11: Environmental impacts and mitigation measures for the Technical Assistance Management Subproject**

Subproject	Period	Activity	Environmentally sensitive site	Potential impact	Mitigation/prevention measures	Environmental protection investment (CNY10000)	EA	Supervisory agency
management system)				reagents are hazardous wastes to the environment if not properly disposed.	<p>and waste liquid containing highly toxic drugs must be dumped into the waste liquid cylinders for the right classification and delivered to the waste liquid storage room for centralized treatment by a qualified unit.</p> <p>3. Digestion of specimens must be conducted in a ventilated cupboard and all the exhaust gas generated must be discharged at high altitude via the air duct.</p> <p>4. Wastes generated in the process of testing and analysis shall be handled in such a way that intoxic wastes are dumped into the garbage bins, contaminating wastes are collected and delivered to the waste</p>			



**Table 4-11: Environmental impacts and mitigation measures for the Technical Assistance Management Subproject**

Subproject	Period	Activity	Environmentally sensitive site	Potential impact	Mitigation/prevention measures	Environmental protection investment (CNY10000)	EA	Supervisory agency
					<p>storage room for centralized treatment by a qualified unit.</p> <p>5. Proper preventive measures should be taken against fire, burglary and poisoning hazards and risks. Fire protection devices and necessary poison prevention facilities should be provided in the laboratory.</p> <p>6. Flammables, explosives and toxic substances must be properly stored, claimed and registered according to the respective stipulations.</p> <p>7. Smoking, laundry, cooking and storage of personal food in the refrigerators are prohibited in the laboratory. Loud noises and frolic are banned during test operation.</p>			

**Table 4-11: Environmental impacts and mitigation measures for the Technical Assistance Management Subproject**

Subproject	Period	Activity	Environmentally sensitive site	Potential impact	Mitigation/prevention measures	Environmental protection investment (CNY10000)	EA	Supervisory agency
					8. The codes of operation should be strictly followed.			

**Table 4-12: Summary of LAR and Social Impacts and Mitigation Measures**

Type of impact	Degree of impact	Eligible beneficiary of compensation	Compensation policy and standard	Responsible agency
Permanent land acquisition	State-owned land: 47.13 mu Floodplain: 34.57 mu	All affected families (AFs) will receive cash compensation.	1. State-owned floodplain land involves no compensation as the implementation of the Project will not lead to any changes of the nature and ownership relationship of such land. 2. State-owned allocated land will be replaced with state-owned land of the corresponding area to be allocated in the vicinity under the Project. 3. Young crop compensation per mu of floodplain land: CNY 2100 /mu	PMO, Owner, HDAO
	3713.28 mu collective land in total, including 972.08mu for paddy field, 1249.93 mu for dry land, 533.52 mu for forest land and 957.75mu for other types of land. AFs: 759; affected persons (AP): 4563.	4563 persons from 759 households	1. Land acquisition compensation: CNY 60,500 per mu of paddy field; CNY 51,800 per mu of dry land; CNY 47,000 per mu of forest land. To be prudent, the compensation criteria for other types of land is set at CNY 47,000 /mu. 2. Crop compensation: CNY 1600-2100/mu depending on the crop types. 3. Compensated land: the planned industrial land equal to 10% of acquired agricultural land will be allocated to the affected rural collective economy organizations. 4. All APs will receive: i) employment and revenue generation opportunities during project implementation; ii) free employment supports and vocational training.	PMO, Owner, HDAO

**Table 4-12: Summary of LAR and Social Impacts and Mitigation Measures**

Type of impact	Degree of impact	Eligible beneficiary of compensation	Compensation policy and standard	Responsible agency
			5. Registered population at or above the age of 16 entitled to rural collectively-owned land contracting at the time of land acquisition will receive subsidies for rural pension insurance to the farmers who lost their land. Such subsidies will be calculated based on the number of people affected by, and the frequency and scope of land acquisition. The minimum subsidy for each land acquisition equals 60% of the average wage of workers employed by urban units in the region in the previous year times the per capita area of land acquired from local farmers. Where the per capita area of land acquired from local farmers exceeds 8 mu after one or multiple land acquisitions, the surplus part will not receive any pension insurance subsidy. Where a farmer household whose land is totally acquired and the per capita area of land acquired from the affected HHs is less than 1 mu, the subsidy will be calculated on the basis of 1 mu.	
Temporary land occupation	Total land occupation: 1045.67 mu, including 434.96 mu paddy field, 423.58mu dry land; 187.13mu forest land; AFs: 307; AP: 1849.	1849 persons from 307 households	Compensation for temporary land occupation: CNY 3900 per mu of paddy field; CNY 3400 per mu of forest land	PMO, Owner; HDAO
Residential houses and ancillary and temporary structures	1. Demolition of urban residential houses: 37465.31m <sup>2</sup> , brick and concrete structure; AFs: 317; APs: 1268. 2. Demolition of urban temporary houses: 18689.74 m <sup>2</sup> .	1268 persons from 317 households	1. The PMO provides two types of resettlement for households affected by housing acquisition to choose from at free will: monetary compensation and property right replacement. 2. Monetary resettlement: monetary compensation (generally higher than the replacement price) is provided for all persons whose houses are demolished. Such compensation includes housing compensation and housing decoration compensation after assessment. Housing compensation and housing decoration compensation: The assessment is conducted by an intermediary agency with good credit-standing and good reputation commissioned under joint agreement by the demolishing party and the affected party and the compensation is effected based on the assessed price.	PMO, Owner; HDAO

**Table 4-12: Summary of LAR and Social Impacts and Mitigation Measures**

Type of impact	Degree of impact	Eligible beneficiary of compensation	Compensation policy and standard	Responsible agency
			<p>3. Property right replacement: built housing is provided and housing decoration is compensated. Provision of built housing in the ratio of 1:1. If the area of built housing is greater than the demolished area, the relocated family needs to buy the exceeding area at market price. Provision of housing decoration compensation. The construction unit and the relocated family will commission independent qualified intermediaries to assess the value of decoration, based on which monetary compensation will be provided.</p> <p>4. Provision of relocation subsidy and temporary housing subsidy at a rate of CNY 10 / m<sup>2</sup> or provision of public housing.</p> <p>5. Provision of CNY 5,000/family as an one-off incentive to those who sign the LAR compensation agreement and hand over the housing within the specified deadline.</p> <p>6. Cash compensation will be made for urban temporary housing at a price assessed based on market price by an independent and qualified intermediary commissioned jointly by the construction unit and the relocated household.</p>	
	<p>1. Demolition of rural residential houses: 55742.29 m<sup>2</sup>; brick and concrete structure; AFs: 373; APs: 1837.</p> <p>2. Demolition of rural ancillary houses: 30588.89 m<sup>2</sup>.</p>	1837 persons from 373 households	<p>1. The PMO provides two types of resettlement for households affected by housing acquisition to choose from at free will: monetary compensation and homestead replacement.</p> <p>2. Monetary compensation is made based on the housing replacement price of CNY 1000 to 1300/m<sup>2</sup> for brick structure. For households choosing monetary replacement for their main houses, compensation on the main house homestead will be made at the assessed land price for reallocation of resettlement homestead.</p> <p>3. Homestead resettlement: Each household is entitled to one homestead and each demolished homestead will be compensated with one resettlement homestead in an area of no more than 120m<sup>2</sup>; the inadequate part will be compensated at the assessment price. The main house to be demolished will</p>	

**Table 4-12: Summary of LAR and Social Impacts and Mitigation Measures**

Type of impact	Degree of impact	Eligible beneficiary of compensation	Compensation policy and standard	Responsible agency
			<p>be compensated for at the replacement price of the same standard as for monetary compensation of CNY 1000 to 1300 for brick structures. The government will be responsible for providing water supply, power supply, access road and site leveling for the resettlement area as well as the supporting public infrastructures such as schools and hospitals; water and electricity will be delivered to the gate of each household and then connected by the household into their houses.</p> <ol style="list-style-type: none"> <li>4. Provision of relocation subsidy and temporary housing subsidy at a rate of CNY 10 / m<sup>2</sup>.</li> <li>5. Provision of CNY 5,000/family as a one-off incentive to those who sign the LAR compensation agreement and hand over the housing within the specified deadline.</li> <li>6. Monetary compensation will be provided for rural ancillary housing unexceptionally at a standard of CNY 100-700/m<sup>2</sup> depending on the building structure. Compensation for the acquired land will be made at the standard for acquisition of rural homesteads.</li> </ol>	

**Table 4-12: Summary of LAR and Social Impacts and Mitigation Measures**

Type of impact	Degree of impact	Eligible beneficiary of compensation	Compensation policy and standard	Responsible agency
Government, public institutions and enterprises	Totally 11 government, public institutions and enterprises will be affected with a demolition area of 14249.54 m <sup>2</sup>	Hezhou Municipal Land Resources Bureau (LRB), Health and Family Planning Commission, Hezhou WRB, Transportation Bureau of Babu District, Guangxi Guidong Electric Power Limited Company, Yingshi Primary School of Huangshi Town, Xiadao Power Station of Hezhou Pengyuan Hydropower Development Limited Company, Fanglin Hydropower Station of Hezhou Minfeng Industrial Limited Company, Hezhou Huangshi Power Station Limited Company	Relocation and reconstruction of Hezhou Health and Family Planning Commission and Babu District Transportation Bureau. Hezhou WRB and LRB choose monetary compensation for the demolished buildings. Guidong Electric Power Limited Company: monetary compensation for its office building to be demolished at assessed value and new office building will be constructed. Yingshi Primary School and Xiadao Primary School: relocation. Hezhou Minfeng Industrial Limited Company and Hezhou Huangshi Power Station Limited Company: monetary compensation for the production losses due to stoppage during project construction.	PMO, Owner; HDAO
Shops	Demolition of shops: 7458.93m <sup>2</sup> ; AFs: 124; APs: 527	527 persons from 124 affected shop tenants.	Compensation for the business losses and relocation cost to be made on the basis of replacement price ratified according to the relevant compensation standard.	PMO, Owner; HDAO
Land attachments	Sewers: 220 m; Tombs: 53; power poles: 42; communication poles: 22; bamboo: 26489; wall: 700m <sup>2</sup> ; trees: 15162; transformer: 1 set.	All APs or owners will receive equivalent cash compensation. The land attachments planted or constructed after the cut-off date will not be compensated.	The APs will receive cash compensation. Sewage pipe: CNY 300/m; power pole: CNY 150 each; communication pole: CNY 150 each; wall: CNY 70 /m <sup>2</sup> ; bamboo: CNY 1-4 / per bamboo; trees: CNY 10-180 / tree; graves: CNY 5500 each. The trees described above will be compensated at the actual assessed value on the basis of the guiding price.	PMO, Owner; HDAO

**Table 4-12: Summary of LAR and Social Impacts and Mitigation Measures**

Type of impact	Degree of impact	Eligible beneficiary of compensation	Compensation policy and standard	Responsible agency
Vulnerable group	83HH, 273 persons	All affected vulnerable groups	<ul style="list-style-type: none"> <li>(1) The local Civil Affairs Bureau and the Labor and Social Security Bureau will be responsible for including these families in the social security schemes.</li> <li>(2) Provision of pension insurance.</li> <li>(3) Provision of new rural cooperative medical insurance paid by the collective unit.</li> <li>(4) The local rural credit cooperatives and banks can provide the vulnerable groups with small loans.</li> <li>(5) Provision of project-related employment opportunities.</li> <li>(6) Provision of project-related vocational trainings to vulnerable groups.</li> </ul>	PMO, Owner; HDAO
Female		4148 persons	<ul style="list-style-type: none"> <li>(1) Create employment and livelihood opportunities for women.</li> <li>(2) Ensure women participation.</li> <li>(3) The local government and resettlement office shall ensure the female has the same rights as male in terms of land property.</li> <li>(4) Gender discrimination shall be eliminated to encourage women to create their own business.</li> </ul>	PMO, Owner; HDAO

**Table 4-13 Dam Safety Action Plan and Rehabilitation Program**

<b>SN</b>	<b>Reservoir/Dam</b>	<b>Requirement for Follow-up Actions</b>	<b>Rehabilitation Program</b>
1	Guishi Reservoir Dam in Hezhou City	Reservoir risk elimination and rehabilitation was inspected and accepted by Guangxi Autonomous Region Water Resources Department in 2015. The reservoir has gone through extremely heavy flood in 2015 and is under safe operation. Issues include unclear responsibility allocated for auxiliary dam management, lack of observation data processing and analysis capacity by dam safety monitoring staff, and need for landslide mass treatment at Wugong Mountain. Follow-up action plan is required.	<ul style="list-style-type: none"> <li>(1) Diversion of seepage collected from gallery top drain to discharge channel to keep gallery dry;</li> <li>(2) Closer coordination with Fuchuan Water Resources Bureau for clear responsibility allocation for safety management of auxiliary dam;</li> <li>(3) Provision of professional training on observation data analysis for dam safety monitoring staff;</li> <li>(4) Analysis of observation data of the last 5 years;</li> <li>(5) Development of automatic dam safety monitoring system;</li> <li>(6) Study on extent of impact on facility safety by scouring pit behind overflow dam; and</li> <li>(7) Special geo-investigation and design necessary for treatment of Wugong Mountain landslide mass.</li> </ul> <p>Completion time: 31 December 2021 Cost estimate: CNY 13 million</p>
2	Chayuan Reservoir Dam in Zhongshan County	Technical design of Chayuan Reservoir risk elimination and rehabilitation in 2011 generally meets requirements of applicable standards and the construction quality meets the design requirements. The reservoir has been under normal operation for 6 years. Issues include 3m wide dam crest not in compliance with	<ul style="list-style-type: none"> <li>(1) Restoration/new construction of channel connecting with discharge culvert;</li> <li>(2) Adding dam seepage monitoring facilities;</li> </ul>



**Table 4-13 Dam Safety Action Plan and Rehabilitation Program**

SN	Reservoir/Dam	Requirement for Follow-up Actions	Rehabilitation Program
		criteria and artificial damage to right retaining wall of discharge culvert channel. Follow-up action plan is required.	<p>(3) Change of existing drainage channel downstream from draining prism to seepage collection channel and construction of measuring weir for seepage observation;</p> <p>(4) Increasing the thickness of downstream slope of the dam to widen the dam crest to 4 meters.</p> <p>(5) Improving the flood control emergency response plan.</p> <p>Completion time: 31 December 2021</p> <p>Cost estimate: CNY 2.5 million</p>
3	Junchong Reservoir Dam in Zhongshan County	Technical design of Junchong Reservoir risk elimination and rehabilitation in 2010 generally meets requirements of applicable standards and the construction quality meets the design requirements. The reservoir has been under normal operation for 7 years. Issues include 3m wide dam crest not in compliance with criteria and absence of seepage interception channel next to the draining prism. Follow-up action plan is required.	<p>(1) Removing/trimming of weed on downstream slope and downstream draining structure as early as possible;</p> <p>(2) Adding dam seepage monitoring facilities;</p> <p>(3) Change of existing drainage channel next to draining prism to seepage collection channel for seepage observation; and</p> <p>(4) Widening downstream slope of the dam to widen dam crest to 4 meters.</p> <p>(5) Improving the flood control emergency response plan.</p> <p>Completion time: 31 December 2021</p> <p>Cost estimate: CNY 2 million</p>
4	Luojiu Reservoir Dam in Zhongshan County	Technical design of Luojiu Reservoir risk elimination and rehabilitation in 2014 generally meets requirements of applicable standards and the construction quality meets the design	<p>(1) Installation of reservoir water gauge for water level observation; and</p> <p>(2) Adding dam seepage monitoring facilities;</p>

**Table 4-13 Dam Safety Action Plan and Rehabilitation Program**

<b>SN</b>	<b>Reservoir/Dam</b>	<b>Requirement for Follow-up Actions</b>	<b>Rehabilitation Program</b>
		requirements. The reservoir has been under normal operation for 3 years. Issues include absence of reservoir water level observation, and absence of seepage collection channel downstream from the draining prism. Follow-up action plan is required.	(3) Construction of seepage collection channel next to draining prism and installation of measuring weir for seepage observation; (4) Improving the flood control emergency response plan. Completion time: 31 December 2019 Cost estimate: CNY 30,000
5	Hongshuiping Reservoir Dam in Fuchuan County	Technical design of Hongshuiping Reservoir risk elimination and rehabilitation in 2012 generally meets requirements of applicable standards and the construction quality met design requirements. The reservoir has been under normal operation for 5 years. Issues include absence of reservoir water level observation, weed growing at right jetty head, and inadequate facilities. Follow-up action plan is required.	(1) Enhancement of daily operation management, and weeding on right jetty head; and (2) Installation of water gauge for reservoir. (3) Improving the flood control emergency response plan. Completion time: 31 December 2019 Cost estimate: CNY 100,000
6	Shalongchong Reservoir Dam in Fuchuan County	Technical design of Shalongchong Reservoir risk elimination and rehabilitation in 2011 generally meets requirements of applicable standards and the construction quality meets the design requirements. The reservoir has been under normal operation for 6 years. Issues include absence of upstream and downstream slope clean-up and maintenance for a long time, and damage of dam top road. Follow-up action plan is required.	(1) Weeding on upstream and downstream slope, restoration of dam top road as early as possible to restore dam appearance. (2) Adding dam seepage monitoring facilities; (3) Improving the flood control emergency response plan. Completion time: 31 December 2019 Cost estimate: CNY 300,000

**Table 4-13 Dam Safety Action Plan and Rehabilitation Program**

<b>SN</b>	<b>Reservoir/Dam</b>	<b>Requirement for Follow-up Actions</b>	<b>Rehabilitation Program</b>
7	Shidong Reservoir Dam in Pinggui District	Technical design of Shidong Reservoir risk elimination and rehabilitation in 2010 generally meets requirements of applicable standards and the construction quality meets the design requirements. The reservoir has been under normal operation for 7 years. Issues include absence of seepage collection channel downstream from the draining prism, absence of monitoring capacity of reservoir staff, and absence of emergency response program. Follow-up action plan is required.	<ul style="list-style-type: none"> <li>(1) Improving seepage collection channel next to the draining prism for seepage observation;</li> <li>(2) Provision of professional training on use of dam safety monitoring equipment and preliminary information processing; and</li> <li>(3) Improving flood control emergency response program.</li> </ul> <p>Completion time: 31 December 2019</p> <p>Cost estimate: CNY 200,000</p>
8	Huashan Reservoir Dam in Pinggui District	Technical design of Huashan Reservoir risk elimination and rehabilitation in 2010 generally meets requirements of applicable standards and the construction quality meets the design requirements. The reservoir has been under normal operation for 7 years. Issues include dam crest width of around 3.5 m that is not in compliance with criteria, absence of seepage collection channel downstream from the draining prism, absence of reservoir staff on duty in non-rainy season, and absence of emergency response program. Follow-up action plan is required.	<ul style="list-style-type: none"> <li>(1) Construction of seepage collection channel next to draining prism for seepage observation;</li> <li>(2) Adding dam seepage monitoring facilities;</li> <li>(3) Widening downstream slope of the main and auxiliary dam to widen dam crest to 4 meters to meet criteria requirement;</li> <li>(4) Arrangement of reservoir staff in non-flood season and making sure reservoir staff on duty throughout the year; and</li> <li>(5) Improving flood control emergency response program.</li> </ul> <p>Completion time: 31 December 2021</p> <p>Cost estimate: CNY 3 million</p>
9	Pangu Reservoir Dam in Pinggui District	Technical design of Pangu Reservoir risk elimination and rehabilitation in 2010 generally meets requirements of applicable standards and the construction quality meets the design	<ul style="list-style-type: none"> <li>(1) Construction of seepage collection channel next to slope draining structure for seepage observation;</li> <li>(2) Adding dam seepage monitoring facilities ;</li> </ul>

**Table 4-13 Dam Safety Action Plan and Rehabilitation Program**

SN	Reservoir/Dam	Requirement for Follow-up Actions	Rehabilitation Program
		requirements. The reservoir has been under normal operation for 7 years. Issues include dam top width of 3.5 m that is not in compliance with criteria, absence of seepage collection channel downstream from the draining prism, and absence of emergency response program. Follow-up action plan is required.	(3) Improving flood control emergency response program; and (4) Widening downstream slope of the dam to widen dam crest to 4 meters.  Completion time: 31 December 2021 Cost estimate: CNY 2 million
10	Dachong Reservoir Dam in Pinggui District	Technical design of Dachong Reservoir risk elimination and rehabilitation in 2012 generally meets requirements of applicable standards and the construction quality meets the design requirements. The reservoir has been under normal operation for 5 years. Issues include absence of reservoir water level observation, absence of seepage collection channel downstream from the draining prism, absence of reservoir staff on duty in non-rainy season, and absence of emergency response program. Follow-up action plan is required.	(1) Installation of reservoir water gauge for water level observation; construction of seepage collection channel next to draining prism for observation of dam seepage; (2) Adding dam seepage monitoring facilities ; (3) Extension of new discharge culvert pipe, and new construction of diversion channel; (4) Improving flood control emergency response program; and (5) Arrangement of reservoir staff in non-flood season and making sure reservoir staff on duty throughout the year.  Completion time: 31 December 2019 Cost estimate: CNY 400,000
11	Dayao Reservoir Dam in Pinggui District	Technical design of Dayao Reservoir risk elimination and rehabilitation in 2011 generally meets requirements of applicable standards and the construction quality meets the design requirements. The reservoir has been under normal operation for 6 years. Issues include absence of reservoir water level observation, absence of reservoir staff on duty in non-rainy	(1) Installation of reservoir water gauge for water level observation; (2) Adding dam seepage monitoring facilities ; (3) Arrangement of reservoir staff in non-flood season and making sure reservoir staff on duty throughout the year; and (4) Improving flood control emergency response program.  Completion time: 31 December 2019

**Table 4-13 Dam Safety Action Plan and Rehabilitation Program**

<b>SN</b>	<b>Reservoir/Dam</b>	<b>Requirement for Follow-up Actions</b>	<b>Rehabilitation Program</b>
		season, and absence of emergency response program. Follow-up action plan is required.	Cost estimate: CNY 300,000
12	Guishan Reservoir Dam in Pinggui District	Technical design of Guishan Reservoir risk elimination and rehabilitation in 2010 generally meets requirements of applicable standards and the construction quality meets the design requirements. The reservoir has been under normal operation for 7 years. Issues include absence of reservoir water level observation, absence of seepage collection channel downstream from the draining prism, absence of reservoir staff on duty in non-rainy season, and absence of emergency response program. Follow-up action plan is required.	(1) Installation of reservoir water gauge for water level observation; (2) Adding dam seepage monitoring facilities ; (3) Weeding within 20 m of the dam, improvement of seepage collection channel next to draining prism for observation of dam seepage; (4) Arrangement of reservoir staff in non-flood season and making sure reservoir staff on duty throughout the year; and (5) Improving flood control emergency response program. Completion time: 31 December 2019 Cost estimate: CNY 300,000
13	Changtang Reservoir Dam in Pinggui District	Technical design of Changtang Reservoir risk elimination and rehabilitation in 2011 generally meets requirements of applicable standards and the construction quality meets the design requirements. The reservoir has been under normal operation for 6 years. Issues include absence of reservoir water level observation, absence of seepage collection channel downstream from the draining prism, absence of reservoir staff on duty in non-rainy season, and absence of emergency response program. Follow-up action plan is required.	(1) Installation of reservoir water gauge for water level observation; (2) Adding dam seepage monitoring facilities (3) Improvement of seepage collection channel next to draining prism for observation of dam seepage; (3) Arrangement of reservoir staff in non-flood season and making sure reservoir staff on duty throughout the year; and (4) Improving flood control emergency response program. Completion time: 31 December 2019 Cost estimate: CNY 350,000

**Table 4-13 Dam Safety Action Plan and Rehabilitation Program**

SN	Reservoir/Dam	Requirement for Follow-up Actions	Rehabilitation Program
14	Luoxi Reservoir Dam in Pinggui District	Technical design of Luoxi Reservoir risk elimination and rehabilitation in 2011 generally meets requirements of applicable standards and the construction quality meets the design requirements. The reservoir has been under normal operation for 6 years. Issues include absence of seepage collection channel downstream from the draining prism, absence of reservoir staff on duty in non-rainy season, and absence of emergency response program. Follow-up action plan is required.	<p>(1) Change of drainage ditch next to draining prism of main dam to seepage collection channel; installation of long culvert pipe linking auxiliary dam discharge culvert pipe and channel, and change of existing drainage ditch to seepage collection channel; observation of main and auxiliary dam seepage.</p> <p>(2) Adding dam seepage monitoring facilities ;</p> <p>(3) Arrangement of reservoir staff in non-flood season and making sure reservoir staff on duty throughout the year.</p> <p>(4) Improving flood control emergency response program;</p> <p>Completion time: 31 December 2019</p> <p>Cost estimate: CNY 400,000</p>
15	Huimiandu Reservoir Dam in Pinggui District	Dam safety assessment was done by design institute hired by Pinggui District Water Resources Bureau in February 2014. Design for reservoir risk elimination and rehabilitation was approved by Guangxi Autonomous Region Water Resource Bureau in November 2015. Construction commenced in August 2016 and is in progress. Technical design meets requirements of applicable standard, and construction quality will be assessed once finished. Currently no follow-up actions are required.	
16	Guangming Reservoir Dam in Pinggui District	Technical design of Guangming Reservoir risk elimination and rehabilitation in 2013 generally meets requirements of applicable standards and the construction quality meets the design	(1) Change of drainage channel to seepage collection channel for seepage observation of the dam;

**Table 4-13 Dam Safety Action Plan and Rehabilitation Program**

SN	Reservoir/Dam	Requirement for Follow-up Actions	Rehabilitation Program
		requirements. The reservoir has been under normal operation for 4 years. Issues include absence of seepage collection channel next to draining prism, inaccuracy of dam top elevation, and absence of emergency response program. Follow-up action plan is required.	(2) Adding dam seepage monitoring facilities ; (3) Confirmation of dam top elevation and dam crest width; and (4) Improving flood control emergency response program; Completion time: 31 December 2019 Cost estimate: CNY 300,000
17	Guanyawo Reservoir Dam in Pinggui District	Technical design of Guanyawo Reservoir risk elimination and rehabilitation in 2012 generally meets requirements of applicable standards and the construction quality meets the design requirements. The reservoir has been under normal operation for 5 years. Issues include absence of seepage collection channel next to draining prism, absence of reservoir staff on duty in non-rainy season, and absence of emergency response program. Follow-up action plan is required.	(1) Adding dam seepage monitoring facilities ; (2) Arrangement of reservoir staff in non-flood season and making sure reservoir staff on duty throughout the year. (2) Construction of seepage collection channel for seepage observation of the dam and the closed old culvert; (3) Improving flood control emergency response program; Completion time: 31 December 2019 Cost estimate: CNY 300,000
18	Zhemu Reservoir Dam in Pinggui District	Technical design of Zhemu Reservoir risk elimination and rehabilitation in 2012 generally meets requirements of applicable standards and the construction quality meets the design requirements. The reservoir has been under normal operation for 5 years. Issues include absence of reservoir water level observation, absence of seepage collection channel next to draining prism, absence of reservoir staff on duty in non-rainy	(1) Installation of reservoir water gauge for water level observation; (2) Adding dam seepage monitoring facilities ; (3) Change of drainage ditch downstream from the draining prism to seepage collection channel, and installation of measuring weir for dam seepage observation; (4) Improving flood control emergency response program; (5) Widening downstream slope of the dam to widen dam crest to 4 meters; and

**Table 4-13 Dam Safety Action Plan and Rehabilitation Program**

SN	Reservoir/Dam	Requirement for Follow-up Actions	Rehabilitation Program
		season, and absence of emergency response program. Follow-up action plan is required.	<p>(6) Arrangement of reservoir staff in non-flood season and making sure reservoir staff on duty throughout the year.</p> <p>Completion time: 31 December 2021</p> <p>Cost estimate: CNY 1.5 million</p>
19	River Dam of Xiadao Power Station in Hezhou City	Dam safety specialists have been employed for safety assessment of hub facility, and safety assessment report is expected to be available by the end of October.	<p>(1) A dam and workshop safety monitoring system will be constructed in accordance with the requirements of the “Technical Specifications on Safety Monitoring of Concrete Dams (DL/T5178-2003)” and in association with the actual situations of the Project so as to monitor the gate dam and horizontal and vertical displacement, inclination, pier joint and crack opening and closing degree and foundation uplift pressure, leakage.</p> <p>(2) A separate circuit breaker and protection circuit will be added to ensure the safe operation of booster station.</p> <p>(3) The left gate of the overflow gate dam will be repaired to assure safe operation of the barrage dam.</p> <p>Pier joint and crack opening and closing degree</p> <p>Uplift pressure of foundation</p> <p>Leakage volume</p> <p>Completion time: 31 December 2021;</p> <p>Cost estimate: CNY 500,000</p>



**Table 4-13 Dam Safety Action Plan and Rehabilitation Program**

<b>SN</b>	<b>Reservoir/Dam</b>	<b>Requirement for Follow-up Actions</b>	<b>Rehabilitation Program</b>
20	River Dam of Fanglin Hydropower Station/Hejiang Power Station in Hezhou City	Dam safety specialists have been employed for safety assessment of hub facility, and safety assessment report is expected to be available by the end of October.	
21	River Dam of Huangshi Power Station in Hezhou City	Dam safety specialists have been employed for safety assessment of hub facility, and safety assessment report is expected to be available by the end of October.	

## **5. Environmental monitoring plan**

### **5.1 Objectives of environmental monitoring**

Environmental monitoring covers the construction stage and the operation stage of the Project and aims to acquire full and timely information on the pollution conditions of the proposed project, the degree of changes made and scope of impacts brought by the project construction to and on the environment quality of the project area as well as the status of environmental quality in the operation stage so as to give timely feedbacks to the competent authority and provide a scientific basis for the environment management work of the Project.

### **5.2 Environment monitoring agency**

Environmental monitoring in the construction stage and the operation stage is undertaken by a qualified monitoring agency entrusted by and on behalf of the project contractor or operator. The undertaking agency should be certified in the national environmental quality certification program, have complete equipment and strong technical competence and are able to carry out the respective environmental monitoring task in a satisfactory manner.

Sensitive and concerned spots that probably involve significant pollution as shown in the projection results of environment impacts are chosen as the monitoring spots to follow up with the pollution status of the monitored items in the construction stage and the operation stage. Noise, ambient air and surface water that involve significant environmental impacts are chosen as the monitoring contents. The monitoring factors are determined based on the pollution characteristic factors of the Project. The monitoring and analysis method for the respective items specified in the Technical Specifications on Environmental Monitoring promulgated by MoEP is chosen and the national standards confirmed in the EIA of each subproject are adopted as the assessment standard.

### **5.3 Environmental monitoring plan and budget**

The environmental monitoring plan and budget for the construction stage and operation stage of each subproject is shown in Table 5-1 in detail. The requirements of the monitoring plan of the linked projects are shown in Table 5-2 while the water and soil conservation monitoring program is shown in Table 5-3.

**Table 5-1 Environment Monitoring Plan**

Period	Monitoring object	Monitoring item	Subproject	Monitoring site	Monitoring frequency	Cost per monitoring (CNY)	Total cost (CNY 10000)	Monitoring agency	Client agency	Applicable standards and specifications
Construction stage	Ambient air	TSP	A-1He River Integrated Rehabilitation (Huangshi Hydropower Station - Guangming Bridge)	Shangsong Village, Hezhou Institute, Hezhou Experimental Middle School, Laozengwu	2 periods / year, 2 days / period, 1 time / day. The aforesaid frequency should be followed throughout the construction stage.	2400	2.88	Qualified monitoring agency	Construction contractor	“Ambient air quality standard” (GB3095-2012) ; Class II
			A-2He River Integrated Rehabilitation (Guangming Bridge - Lingfeng Bridge)	Xialiang Village		600	0.72			
			A-3 He River Integrated Rehabilitation (Lingfeng Bridge – Xiadao Hydropower Station)	Diandengzhai, Xiadao Primary School		1200	1.44			
			A-4 East Trunk Canal Integrated Rehabilitation and Mawei River Connection	Xianghuadao		600	0.72			
			A-5 Xiadao Hydropower Station Integrated Rehabilitation	Jichitan		600	0.72			
			B-1 Huangansi Drainage Canal Pump Station	Residential building at Xiyue Street		600	0.72			
			B-2 Shizigang Drainage Canal Pump Station	Dormitory building of Transportation		600	0.72			

**Table 5-1 Environment Monitoring Plan**

Period	Monitoring object	Monitoring item	Subproject	Monitoring site	Monitoring frequency	Cost per monitoring (CNY)	Total cost (CNY 10000)	Monitoring agency	Client agency	Applicable standards and specifications
				Bureau						
			B-3 Lining River Integrated Rehabilitation	Lining Village, Yingshi Primary School		1200	1.44			
			B-4 Changlong River Integrated Rehabilitation	Changlong Village		600	0.72			
			B-5 Huangtian Branch Canal Integrated Rehabilitation	Pinggui No. 3 Middle School, Huangtian Town		1200	1.44			
			B-6 Guposhan Drainage Canal Integrated Rehabilitation	Baijiazhai		600	0.72			
			B-7 East No. 5 Branch Canal Integrated Rehabilitation	Xiwanzhen		600	0.72			
			C-1 Huangansi Drainage Canal Integrated Rehabilitation	Residential buildings at Badaxi Road and Youxing Street		1200	1.44			
			C-2 Shizigang Drainage Canal Integrated Rehabilitation	Residential buildings at Wanquan Street and Yinhe Street		1200	1.44			
			C-3 Jiangnan WWTP associated pipeline networks and road	Residential buildings at Niupailan		600	0.72			

**Table 5-1 Environment Monitoring Plan**

Period	Monitoring object	Monitoring item	Subproject	Monitoring site	Monitoring frequency	Cost per monitoring (CNY)	Total cost (CNY 10000)	Monitoring agency	Client agency	Applicable standards and specifications
			improvement							
		H <sub>2</sub> S, NH <sub>3</sub> , odor concentration	C-1 Huangansi Drainage Canal Integrated Rehabilitation	Residential buildings at Badaxi Road, Youxing Street and Xiyue Street along Huangansi Drainage Canal	4 periods / year, 1 day / period, 4 times / day, The aforesaid frequency should be followed throughout the dredging stage.	7920	3.17	Qualified monitoring agency	Construction contractor	Design hygiene standard for industrial enterprises (TJ 36-79); maximum allowable concentration for residential areas; "Odor Pollutant Emission Standard" (GB14554-93)
			C-2 Shizigang Drainage Canal Integrated Rehabilitation	Residential buildings at Wanquan Street, Yinhe Street and Xingguang Street and Jiangbeizhong Road along Shizigang Drainage Canal		10560	4.22			
		COD, BOD <sub>5</sub> , SS, petroleum, NH <sub>3</sub> -N, TP	A-4 East Trunk Canal Integrated Rehabilitation and Mawei River Connection	Cross sections at the starting and ending points of East Trunk Canal Rehabilitation Section, cross section 500m ahead of the confluence point of Mawei River	2 periods / year, 2 days / period, 1 time / day The aforesaid frequency should be followed throughout	3000	3.6	Qualified monitoring agency	Construction contractor	"Surface Water Environmental Quality Standard" (GB3838-2002) ; Class III for Mawei River and Class IV for East Trunk Canal

**Table 5-1 Environment Monitoring Plan**

Period	Monitoring object	Monitoring item	Subproject	Monitoring site	Monitoring frequency	Cost per monitoring (CNY)	Total cost (CNY 10000)	Monitoring agency	Client agency	Applicable standards and specifications
				and East Trunk Canal	the construction stage.					
			A-5 Xiadao Hydropower Station Integrated Rehabilitation	He River Xiadao Hydropower Station cross section		1000	1.2			“Surface Water Environmental Quality Standard” (GB3838-2002) ; Class III
			A-6 Fanglin Hydropower Station Integrated Rehabilitation	He River Fanglin Hydropower Station cross section		1000	1.2			
			A-7 Huangshi Hydropower Station Integrated Rehabilitation	He River Huangshi Hydropower Station cross section		1000	1.2			
			A-8 He River (Huangshi Hydropower Station - Xiadao Hydropower Station) Dredging Works	Wastewater discharge outlets of sediment dewatering sites at Fanglin Bridge and Lingfeng Bridge		1000	1.2			GB 8978-1996 “Integrated wastewater discharge standard” Class I
			B-3 Lining River Rehabilitation	Lining River Rehabilitation Section starting and ending		2000	2.4			“Surface Water Environmental Quality Standard” (GB3838-2002) ; Class IV

**Table 5-1 Environment Monitoring Plan**

Period	Monitoring object	Monitoring item	Subproject	Monitoring site	Monitoring frequency	Cost per monitoring (CNY)	Total cost (CNY 10000)	Monitoring agency	Client agency	Applicable standards and specifications
				cross sections						
			B-4 Changlong River Rehabilitation	Changlong River Rehabilitation Section starting and ending cross sections		2000	2.4			
			B-5 Huangtian Branch Canal Rehabilitation	Huangtian Branch Canal Rehabilitation Section starting and ending cross sections		2000	2.4			
			B-6 Guposhan Drainage Canal Rehabilitation	Guposhan Drainage Canal Rehabilitation Section starting and ending cross sections		2000	2.4			
			B-7 East No. 5 Branch Canal Rehabilitation	East No. 5 Branch Canal Rehabilitation Section starting and ending cross sections		2000	2.4			
			C-1 Huangansi Drainage Canal Rehabilitation	Huangansi Drainage Canal Rehabilitation Section starting		2000	2.4			

**Table 5-1 Environment Monitoring Plan**

Period	Monitoring object	Monitoring item	Subproject	Monitoring site	Monitoring frequency	Cost per monitoring (CNY)	Total cost (CNY 10000)	Monitoring agency	Client agency	Applicable standards and specifications
				and ending cross sections						
			C-2 Shizigang Drainage Canal Rehabilitation	Shizigang Drainage Canal Rehabilitation Section starting and ending cross sections		2000	2.4			
	Noise	dB (A)	A-1 He River Integrated Rehabilitation (Huangshi Hydropower Station - Guangming Bridge)	Shangsong Village, Hezhou Institute, Hezhou Experimental Middle School, Laozengwu	2 periods / year, 2 days / period, 2 times / day(one time each day and night) The aforesaid frequency should be followed throughout the construction stage.	960	0.29	Qualified monitoring agency	Construction contractor	“Sound environment quality standard” (GB3096-2008) ; Class II
			A-2 He River Integrated Rehabilitation (Guangming Bridge - Lingfeng Bridge)	Xialiang Village		240	0.58			
			A-3 He River Integrated Rehabilitation (Lingfeng Bridge – Xiadao Hydropower Station)	Diandengzhai, Xiadao Primary School		480	0.29			
			A-4 East Trunk Canal Integrated Rehabilitation and Mawei River Connection	Xianghuadao		240	0.29			
			A-5 Xiadao Hydropower Station Integrated Rehabilitation	Jichitan		240	0.29			



**Table 5-1 Environment Monitoring Plan**

Period	Monitoring object	Monitoring item	Subproject	Monitoring site	Monitoring frequency	Cost per monitoring (CNY)	Total cost (CNY 10000)	Monitoring agency	Client agency	Applicable standards and specifications
			B-1 Huangansi Drainage Canal Pump Station	Residential building at Xiyue Street		240	0.29			
			B-2 Shizigang Drainage Canal Pump Station	Dormitory building of Transportation Bureau		240	0.58			
			B-3 Lining River Integrated Rehabilitation	Lining Village, Yingshi Primary School		480	0.29			
			B-4 Changlong River Integrated Rehabilitation	Changlong Village		240	0.58			
			B-5 Huangtian Branch Canal Integrated Rehabilitation	Pinggui No. 3 Middle School, Huangtian Town		480	0.29			
			B-6 Guposhan Drainage Canal Integrated Rehabilitation	Baijiazhai		240	0.29			
			B-7 East No. 5 Branch Canal Integrated Rehabilitation	Xiwan Town		240	0.58			
			C-1 Huangansi Drainage Canal Integrated Rehabilitation	Residential buildings at Badaxi Road and Youxingxiang Street		480	0.58			

**Table 5-1 Environment Monitoring Plan**

Period	Monitoring object	Monitoring item	Subproject	Monitoring site	Monitoring frequency	Cost per monitoring (CNY)	Total cost (CNY 10000)	Monitoring agency	Client agency	Applicable standards and specifications
			C-2 Shizigang Drainage Canal Integrated Rehabilitation	Residential buildings at Wanquan Street and Yinhe Street		480	0.29			
			C-3 Jiangnan WWTP associated pipelines and road improvement works	Residential building at Niupailan		240	0.29			
	Sludge dewatering cake	Moisture content	A-4 East Trunk Canal Integrated Rehabilitation and Mawei River Connection	Sludge dewatering site	Once a week during dredging; 5 samples per monitoring	20	1.0	Qualified monitoring agency	Construction contractor	The moisture content should be lower than 50%.
			A-8 He River (Huangshi Hydropower Station – Guangming Bridge) Dredging							
			B-5 Huangtian Branch Canal Rehabilitation							
			B-6 Guposhan Drainage Canal Integrated Rehabilitation							

**Table 5-1 Environment Monitoring Plan**

Period	Monitoring object	Monitoring item	Subproject	Monitoring site	Monitoring frequency	Cost per monitoring (CNY)	Total cost (CNY 10000)	Monitoring agency	Client agency	Applicable standards and specifications
			C-1 Huangansi Drainage Canal Integrated Rehabilitation							
			C-2 Shizigang Drainage Canal Integrated Rehabilitation							
Operation stage	Exhaust gas	H <sub>2</sub> S, NH <sub>3</sub> , odor concentration	C-3 Jiangnan WWTP associated pipelines and road improvement works	Upwind and downwind of the boundary of Jiangnan WWTP	4 periods / year, 1 day / period, 4 times / day; until project account closure	5280	10.56	Qualified monitoring agency	Project Owner	“Pollutant Discharge Standards for Municipal Wastewater Treatment Plants” (GB18918-2002)
	Surface water	COD, BOD <sub>5</sub> , SS, petroleum, NH <sub>3</sub> -N, TP	C-1 Huangansi Drainage Canal Integrated Rehabilitation	200m ahead of the confluence of Huangansi Drainage Canal into He River	4 periods / year, 2 days / period, 1 time / day; until project account closure	1000	2	qualified monitoring agency	Project Owner	“Surface Water Environmental Quality Standard” (GB3838-2002) ; Class IV
			C-2 Shizigang Drainage Canal Integrated Rehabilitation	200m ahead of the confluence of Shizigang Drainage Canal into He River		1000	2			
			C-3 Jiangnan WWTP associated pipelines and	500m upstream and downstream		2000	4			“Surface Water Environmental Quality

**Table 5-1 Environment Monitoring Plan**

Period	Monitoring object	Monitoring item	Subproject	Monitoring site	Monitoring frequency	Cost per monitoring (CNY)	Total cost (CNY 10000)	Monitoring agency	Client agency	Applicable standards and specifications
			road improvement works	of the discharge outlet of Jiangnan WWTP into He River						Standard” (GB3838-2002) ; Class III
	Wastewater	COD, BOD <sub>5</sub> , SS, petroleum, NH <sub>3</sub> -N, TP	C-3 Jiangnan WWTP associated pipelines and road improvement works	Discharge outlet of Jiangnan WWTP	4 periods / year, 2 days / period, 1 time / day; until project account closure	1000	2			“Pollutant Discharge Standards for Municipal Wastewater Treatment Plants” (GB18918-2002) ; Class 1A
	Site boundary noise	dB (A)	C-3 Jiangnan WWTP associated pipelines and road improvement works	On the eastern, southern, western and northern boundaries of Jiangnan WWTP	4 periods / year, 2 days / period, 2 times / day(one time each day and night); until project account closure	960	1.92	Qualified monitoring agency	Project Owner	“Ambient Noise Emission Standard on the Boundary of Industrial Enterprises” (GB12348-2008) ; Class II

**Table 5-2: Environment monitoring plan of linked projects**

Linked projects	Monitoring element	Monitoring item	Monitoring site	Monitoring frequency	Monitoring agency	Client agency	Applicable standard
Hezhou WWTP	Wastewater	COD, NH3-N	Discharge outlet of Hezhou WWTP	Surveillance monitoring, 2 periods / year, 1 day / period, 4 times / day	Qualified monitoring agency	Project owner	“Municipal WWTP pollutant discharge standard” (GB18918-2002) ; Class 1A
		pH value, COD, BOD-5, NH3-N, SS, animal and vegetable oils, petroleum, anionic surfactants, total nitrogen, total phosphorus, chrome, fecal coliform, total mercury, alkyl mercury, total cadmium, total chromium, hexavalent chromium, total arsenic, total lead					
		COD, NH3-N	Discharge outlet of Hezhou WWTP	Online monitoring comparison, 4 periods / year, 1 day / period, 3 times / day	Qualified monitoring agency		
	Exhaust gas	hydrogen sulfide, ammonia, odor concentration	Upwind and downwind of the site boundary of Hezhou WWTP	2 periods / year, 2 days / period, 4 times / day	Qualified monitoring agency		“Municipal WWTP pollutant discharge standard” (GB18918-2002)
	Site boundary noise	dB (A)	On the eastern, southern, western and northern boundaries of Hezhou WWTP	2 periods / year, 2 days / period, 2 times / day(one time each day and night)	Qualified monitoring agency		“Ambient Noise Emission Standard on the Boundary of Industrial Enterprises” (GB12348-2008) ; Class II
Hezhou Sludge Harmless Treatment	Exhaust gas	hydrogen sulfide, ammonia, odor concentration	Upwind of the site of Hezhou Sludge Harmless Treatment Project, outlet of the exhaust pipe of the deodorization workshop	2 periods / year, 2 days / period, 4 times / day	Qualified monitoring agency	Project owner	“Odor Pollutant Emission Standard” (GB14554-1993) ; Class II

**Table 5-2: Environment monitoring plan of linked projects**

Linked projects	Monitoring element	Monitoring item	Monitoring site	Monitoring frequency	Monitoring agency	Client agency	Applicable standard
	Wastewater	COD, BOD-5, NH3-N, SS	Outlet of self-built wastewater treatment system of Hezhou Sludge Harmless Treatment Project	2 periods / year, 2 days / period, 4 times / day	Qualified monitoring agency		“Integrated wastewater discharge standard” (GB8987-1996) ; Class I
	Site boundary noise	dB (A)	On the eastern, southern, western and northern boundaries of Hezhou Sludge Harmless Treatment Project	2 periods / year, 2 days / period, 2 times / day(one time each day and night)	Qualified monitoring agency		“Ambient Noise Emission Standard on the Boundary of Industrial Enterprises” (GB12348-2008) ; Class II
	Ground water	pH value, turbidity, Permanganate index, nitrate nitrogen, nitrite nitrogen, NH3-N, chloride, lead, mercury, cadmium, hexavalent chromium, arsenic, total coliforms, total bacteria	1 observation well in and 2 observation wells downstream the site of Hezhou Sludge Harmless Treatment Project	2 periods / year, 2 days / period, 1 time / day, for a monitoring period of 2 years	Qualified monitoring agency		“Ground water quality standard” (GB/T 14848-93) ; Class III
	Soil	Cadmium, mercury, arsenic, copper, lead, chromium, zinc, nickel	Farmland downstream of the flow direction of ground water inside the site and area of Hezhou Sludge Harmless Treatment Project	1 period / year, 1 day / period	Qualified monitoring agency		“Soil Environment Quality Standard” (GB1518-1995) ; Class II

**Table 5-2: Environment monitoring plan of linked projects**

Linked projects	Monitoring element	Monitoring item	Monitoring site	Monitoring frequency	Monitoring agency	Client agency	Applicable standard
Hezhou Domestic Solid Waste Landfill	Exhaust gas	Total SS, hydrogen sulfide, ammonia, odor concentration	Upwind and downwind of Hezhou Domestic Solid Waste Landfill	2 periods / year, 2 days / period, 4 times / day	Qualified monitoring agency	Project owner	“Odor Pollutant Emission Standard”（GB14554-1993）；Class II
	Wastewater	pH value, chrome, COD, BOD-5, SS, NH3-N, total phosphorus, total nitrogen, fecal coliform, total mercury, total cadmium, total chromium, hexavalent chromium, total arsenic, total lead	Outlet of leachate treatment station	2 periods / year, 2 days / period, 4 times / day	Qualified monitoring agency		“Pollution control standard for domestic solid waste landfills”（GB16889-2008）；Class II
	Site boundary noise	dB（A）	On the eastern, southern, western and northern boundaries of Hezhou Domestic Solid Waste Landfill	2 periods / year, 2 days / period, 2 times / day(one time each day and night)	Qualified monitoring agency		“Ambient Noise Emission Standard on the Boundary of Industrial Enterprises”（GB12348-2008）；Class II
	Groundwater	pH value, Total hardness, permanganate index, NH3-N, nitrate, nitrite, sulfate, chloride, volatile phenols, cyanide, fluoride, arsenic, mercury, hexavalent chromium, copper, zinc, lead , Cadmium, iron, manganese, total coliforms	5 upstream and downstream monitoring wells of ground water	2 periods / year, 2 days / period, 1 time / day	Qualified monitoring agency		“Ground water quality standard”（GB/T14848-1993）；Class III
The monitoring plan required in the EIA of the linked projects should be incorporated into this ESMP and its monitoring report should be submitted on a periodical basis as one of the reports due under the Project.							

**Table 5-3 Water and soil conservation monitoring plan**

Period	Monitoring area	Monitoring contents and monitoring methods	Monitoring frequency	Total cost (CNY 10000)	Monitoring agency	Client agency
Construction stage	Flood risk control subproject area	(1) Pre-construction soil erosion status and background value; (2) Using survey method and remote sensing method to monitor changes of terrain and landform, disturbance of surface and vegetation and number of damaged water and soil conservation facilities; (3) Using survey method to monitor volume of earthwork excavation and fill and transportation under the Project; (4) Using sedimentation tank method to monitor volume of soil erosion; (5) Using survey method to monitor status of protection and effectiveness of operation of the water and soil conservation measures.	Monitoring period: The monitoring period starts in June 2018 in the construction preparation stage and ends in December 2024 in the year of design level. Monitoring frequency: Stockpiling volume of the temporary stockpiling sites in use	15	Qualified monitoring agency	Construction contractor
	Urban drainage Rehabilitation subproject area	(1) Pre-construction soil erosion status and background value; (2) Using survey method and remote sensing method to monitor changes of terrain and landform, disturbance of surface and vegetation and number of damaged water and soil conservation facilities; (3) Using survey method to monitor volume of earthwork excavation and fill and transportation under the Project; (4) Using sedimentation tank method to monitor volume of soil erosion; (5) Using survey method to monitor status of protection and effectiveness of operation of the water and soil conservation measures.	and the implementation status of the water and soil conservation measures in effect shall be monitored and recorded at least once every 10 days; area of disturbed surface, retaining and fencing effect of water and soil conservation	24	Qualified monitoring agency	Construction contractor
	Water quality improvement subproject area	(1) Pre-construction soil erosion status and background value; (2) Using survey method and remote sensing method to monitor changes of terrain and landform, disturbance of surface and vegetation and number of damaged water and soil conservation facilities; (3) Using survey method to monitor volume of earthwork excavation and fill and transportation under the Project; (4) Using sedimentation tank method to monitor volume of soil	measures shall be monitored and recorded at least once every month; Since rainfall in the Project area mainly occurs in the months of April to September, routine	10	Qualified monitoring agency	Construction contractor



**Table 5-3 Water and soil conservation monitoring plan**

Period	Monitoring area	Monitoring contents and monitoring methods	Monitoring frequency	Total cost (CNY 10000)	Monitoring agency	Client agency
		erosion; (5) Using survey method to monitor status of protection and effectiveness of operation of the water and soil conservation measures, and survival rate, coverage and growth status of trees and grass for water and soil conservation.	monitoring should be conducted in these months at the monitoring frequency indicated in the previous table. In the months of October to March the next year, no fixed site monitoring shall be conducted and only site inspections will be arranged.			
	Temporary works area	(1) Using survey method and remote sensing method to monitor changes of terrain and landform, and the height, slope length and land occupation of stockpiles of the temporary stockpiling sites; (2) Using sedimentation tank method to monitor volume of soil loss; (3) Using survey method to monitor the implementation status and benefits of temporary measures.	The other monitoring activities shall be conducted once every 3 months. In the event of any rain storms or heavy winds, 1 to 2 additional monitoring should be arranged in time.	7	Qualified monitoring agency	Construction contractor

## **6. Capacity development and training**

### **6.1 Capacity development and training requirements**

The key objects of environmental capacity development are the environment managers and construction supervision engineers, training for whom is one of the key component of technical supports under the Project. In order to assure smooth and effective implementation of the ESMP, it is necessary to provide training on ESMP and other relevant knowledge and skills to the staff of the Project Owner / EA, the operator, the contractor, the supervision engineer, the local PMOs and other stakeholders and also provide different training to staff on different job positions. Training on social issues should also be organized for public subject to social impacts from land acquisition and resettlement, etc.

### **6.2 Contents and cost estimate of capacity development and training**

#### **(1) Environment Managers and Construction Supervision Engineer**

The training will be organized by the PMO and conducted by the Environment Technology Specialist one year before the implementation of the Project for the full-time environment management personnel of the PMO, the full-time environment management coordinators of the subprojects and the construction supervision engineers.

#### **(2) Contractor and Construction Workers**

The training will be organized by the PMO or the subproject contractors in the project area prior to the implementation of the Project and may be specifically implemented by the Environment Management Specialist or trained full-time environment management staff of the enterprises.

#### **(3) Operator**

The training will be organized by the PMO or the Employer in the project area before the Project is put into operation and may be specifically implemented by the Environment Management Specialist or trained full-time environment management staff of the enterprises.

#### **(4) Groups involved in the LAR process**

The training will be organized by the PMO or the Employer in the project area before the LAR process comences and may be specifically implemented by the PMO or the Social Specialist employed by the PMO.

#### **(5) Vulnerable groups such as women, children and poor households**

The training will be organized by the PMO or the Employer in the project area before the Project is put into operation and may be specifically implemented by the PMO or the Social Specialist employed by the PMO.

Details of the contents, trainees, time table and estimated budget of the training are shown in Table 6-1 and Table 6-2.

**Table 6-1 Sample Training Schedule for Environmental Training**

Subproject	Training stage	Training objects	No. of trainees	Training duration	Training time	Total cost (*CNY10000)	IA	Supervision Agency
<b>1. He River Flood Risk Resilience Improvement Subproject</b>								
Main Watercourse Widening and Flood Discharge A-1 – A-3	Construction stage	Full-time environment management personnel, full-time environment management coordinator, construction supervision engineer	3	3 days	Prior to implementation of the construction plan	0.6	PMO and its Environment Specialist	World Bank
Trunk Canal Flood Diversion A-4	Construction stage	Full-time environment management personnel, full-time environment management coordinator, construction supervision engineer	3	3 days	Prior to implementation of the construction plan	0.6	PMO and its Environment Specialist	World Bank
Water Conservancy Infrastructure Improvement A-5 – A-7	Construction stage	Full-time environment management personnel, full-time environment management coordinator, construction supervision engineer	9	3 days	Prior to implementation of the construction plan	1.35	PMO and its Environment Specialist	World Bank
	Operation stage	Operation agency	3	2 days	Prior to official operation of the Project	0.3	PMO and its Environment Specialist	World Bank
Dredging Works A-8	Construction stage	Full-time environment management personnel, full-time environment management coordinator, construction supervision engineer	9	3 days	Prior to implementation of the construction plan	1.35	PMO and its Environment Specialist	World Bank
<b>2. Urban Drainage and Sewage Management</b>								

**Table 6-1 Sample Training Schedule for Environmental Training**

Subproject	Training stage	Training objects	No. of trainees	Training duration	Training time	Total cost (*CNY10000)	IA	Supervision Agency
<b>Subproject</b>								
Water Conservancy Infrastructure Development B-1 – B-2	Construction stage	Full-time environment management personnel, full-time environment management coordinator, construction supervision engineer	3	3 days	Prior to implementation of the construction plan	0.6	PMO and its Environment Specialist	World Bank
	Operation stage	Operation agency	3	2 days	Prior to official operation of the Project	0.3	PMO and its Environment Specialist	World Bank
River-lake Connection B-3 – B-9	Construction stage	Full-time environment management personnel, full-time environment management coordinator, construction supervision engineer	24	3 days	Prior to implementation of the construction plan	3.6	PMO and its Environment Specialist	World Bank
Huangansi Drainage Canal Integrated Rehabilitation C-1	Construction stage	Full-time environment management personnel, full-time environment management coordinator, construction supervision engineer	6	3 days	Prior to implementation of the construction plan	0.6	PMO and its Environment Specialist	World Bank
Shizigang Drainage Canal Integrated Rehabilitation C-2	Construction stage	Full-time environment management personnel, full-time environment management coordinator, construction supervision engineer	6	3 days	Prior to implementation of the construction plan	0.6	PMO and its Environment Specialist	World Bank
Drainage System Improvement C-3	Construction stage	Full-time environment management personnel, full-time environment management coordinator, construction supervision engineer	6	3 days	Prior to implementation of the construction plan	0.6	PMO and its Environment Specialist	World Bank
	Operation	Operation agency	3	2 days	Prior to official	0.3	PMO and its	World Bank

**Table 6-1 Sample Training Schedule for Environmental Training**

Subproject	Training stage	Training objects	No. of trainees	Training duration	Training time	Total cost (*CNY10000)	IA	Supervision Agency
	stage				operation of the Project		Environment Specialist	
Ecological Landscaping Improvement D-2	Construction stage	Full-time environment management personnel, full-time environment management coordinator, construction supervision engineer	3	3 days	Prior to implementation of the construction plan	0.6	PMO and its Environment Specialist	World Bank
<b>3. Institutional Capacity Building and Project Management</b>								
Hydrological Monitoring Station E-1	Construction stage	Full-time environment management personnel, full-time environment management coordinator	2	2 days	Prior to implementation of the Project	0.2	PMO and its Environment Specialist	World Bank
	Operation stage	Operation agency	2	2 days	Prior to official operation of the Project	0.2	PMO and its Environment Specialist	World Bank
Environmental Monitoring Station Development E-2	Construction stage	Full-time environment management personnel, full-time environment management coordinator	2	2 days	Prior to implementation of the Project	0.2	PMO and its Environment Specialist	World Bank
	Operation stage	Operation agency	2	2 days	Prior to official operation of the Project	0.2	PMO and its Environment Specialist	World Bank

**Table 6-2 Sample Training Schedule for Social Training**

<b>Content</b>	<b>Trainees</b>	<b>Number of persons</b>	<b>Training duration</b>	<b>Training time</b>	<b>Total cost (CNY10000)</b>	<b>Implementation body</b>	<b>Supervisory body</b>
Training on LAR policies	Groups affected by LAR	100	1 day	Before LAR	3	PMO and its social specialist	World Bank
Knowledge training on water environment protection and urban development	Vulnerable groups such as women, children in the project area	50	1 day	Before formal operation of the Project	2	PMO and its social specialist	World Bank
Employment skill training for vulnerable groups	Vulnerable groups such as women and poor households	50	3 days	Before formal operation of the Project	5	PMO and its social specialist	World Bank

## **7. Reporting mechanism**

### **7.1 Information exchange**

Environment management requires necessary exchange of information among the PMO, the Project Owner, the Contractor, the Operator and the different departments and jobs in the organization and also requires disclosure of relevant information to the external parties (stakeholders, general public, etc.).

Internal information exchange may be implemented in diversified forms, such as meetings, internal briefings, but at least 1 formal meeting must be organized each month. All information exchange should be recorded and archived. External information exchange is implemented on a half-year or one-year basis. For information exchange with the cooperative units, meeting minutes shall be developed and put into archives.

### **7.2 Record mechanism**

In order to assure the effective operation of the environment management system, the organization must set up a sound record system and keep records in the following aspects:

- (1) Laws and regulations;
- (2) Government permits;
- (3) Environmental factors and the relevant EIA documents and ESMP reports;
- (4) Training records;
- (5) Records of inspections, calibrations and maintenance activities;
- (6) Monitoring data;
- (7) Effectiveness of corrective and preventive measures;
- (8) Information of stakeholders; grievance redress procedure and records of results;

In addition, the aforesaid records shall be subject to necessary control, including identification, collection, cataloging, archiving, storage, management, maintenance, inquiry, retention life and disposal of records.

### **7.3 Reporting mechanism**

The Contractor, the Operator, the Monitoring Agency, the construction supervision engineer and the PMO shall keep records of project progress, ESMP execution status, environmental monitoring results throughout the implementation of the Project and report in a timely manner to the concerned departments. Monitoring records of the operation status of the solid waste landfills and WWTPs involved in the linked projects and the due diligence study shall also be acquired and collected on a periodical basis. The relevant requirements shall be incorporated into the monitoring plan, which mainly



consist of the six aspects as follows:

- (1) The construction supervision engineer of the Project shall keep detailed records of the execution status of the ESMP on a monthly basis and submit the monthly report to the Project Owner and the Municipal PMO in a timely manner. The weekly and monthly reports should include information on the execution status of the environmental protection measures, and the progress and data of environmental monitoring.
- (2) The Contractor and Operator shall keep detailed records of the progress of the Project and the execution status of the ESMP on a quarterly basis and submit the quarterly report to the PMO in a timely manner, with a copy to Hezhou Municipal EPB.
- (3) The Monitoring Agency shall submit the monitoring report to the Contractor (Operator) and the construction supervision engineer in a timely manner after the monitoring assignment is carried out.
- (4) The Contractor and the Operator shall submit the Environmental Monitoring Report of the Project to Hezhou Municipal EPB, Babu District EPB and Hezhou Municipal PMO in a timely manner. Hezhou Municipal PMO shall submit the monthly report, the quarterly report and the yearly report on the progress and effectiveness of the execution of the ESMP of the Project to Hezhou Municipal EPB and the relevant organizations and, when necessary, to the World Bank.
- (5) In the event of any specific non-compliances in terms of environmental protection, the construction supervision engineer and the PMO shall submit a report to the local competent authority of environmental protection and to the superior levels if necessary.
- (6) 2 ESMP Execution Reports should be submitted each year to the World Bank. The ESMP Execution Report may include the following contents:
  - a. Project implementation progress, e.g. construction progress and length of sections completed in the embankment works, the river rehabilitation works, the pavement works and the pipeline works;
  - b. Execution status of the environmental protection measures of the Project;
  - c. Implementation status and key results of environmental monitoring;
  - d. Implementation status of the training program;
  - e. Information of continuous public participation; public complaints and the records of key contents, solution and public satisfaction of such complaints, if any;
  - f. Existing problems and solutions;
  - g. ESMP Execution Plan for the second half of the year.

## 8. Grievance redress mechanism

The grievance redress mechanism of the Project covers all stages of implementation of the Project, including resettlement, resident disturbance in the construction stage and supervision of the operation stage.

- (1) Public complaints on resettlement issues: The affected persons will sign the agreement to confirm their rights and entitlements if they are satisfied with the proposed compensation. A procedure for information disclosure in the process of resettlement is helpful to increase the transparency of the Project. Through information disclosure, the APs will be informed of the multiple complaint channels (including village committees, departments, PMO, land acquisition and demolition office, external monitoring agency, government petition office, and court) and a variety of ways (such as petition and telephone) to express complaints and appeal.

In the process of development and implementation of the RP of the Project, great attention will be paid to the participation of affected persons and a grievance redress mechanism will be established to handle complaints and appeals from the APs in the following procedure:

Stage 1: If not satisfied with the resettlement plan, the APs can express their complaints to the village committees in oral or written form; oral complaints must be handled and recorded in writing by the village committees or street offices / town or township authorities. Such complaints shall be addressed within one week by the project group at village level, village committee, or street / township authorities.

Stage 2: If the APs are still not satisfied with the resolutions made in Stage 1, an appeal can be filed to the PMO after such resolution is received and the PMO shall make a further resolution within 2 weeks.

Stage 3: If the APs are still not satisfied with the resolutions made in Stage 2, an appeal can be filed to the LAO after such resolution is received and the LAO shall make a further resolution within 2 weeks.

Stage 4: If the APs are still not satisfied with the resolutions made in Stage 3, an appeal can be filed to the External Monitoring Agency after such resolution is received and the External Monitoring Agency shall make a further resolution within 2 weeks. All the complaints and appeals (in oral or written form) shall be reported to the World Bank in the resettlement monitoring report.

Stage 5: If the APs are still not satisfied with the resolution made in Stage 4, an appeal may be filed to the government petition office after such resolution is received. The petition office shall make a further resolution within 2 weeks.

The APs may directly file a lawsuit to the civil court if he / she is not satisfied with the existing GRM procedures or resolutions made in any of the above stages.

- (2) Public grievances in the construction period: The Contractor of the Project and the Municipal PMO and Municipal EPB shall follow up with the progress of the Project in a timely manner to learn about inconveniences brought to the local

people in the construction of the Project. The construction contractor shall make public the responsible person's name and contact information for the sake of public supervision and complaint. The Municipal PMO and the Municipal EPB shall set up a special reception window and assign special personnel to collect the public opinions in a timely manner. Public opinion books should be provided so that records are kept of telephone calls or personal visits, including the name and contact information of the callers and visitors, impacts from project implementation and their opinions. Such records shall be archived and reported in a timely manner and questions raised by the public shall be replied within three working days and a solution shall be proposed and implemented within 10 to 15 working days depending on the level of difficulty. The final results of the process of implementation and coordination and resolution shall be added into the Public Opinion Book. In order to better address the inconveniences brought by the construction of the Project to the daily life of local people, the Contractor and the external monitoring agency are required to submit the Public Opinion Book to Hezhou Municipal EPB at the end of each month so that such opinions are handled in time under the supervision of Hezhou Municipal EPB. If the complainant remains dissatisfied with the resolution made the Municipal PMO or EPB, he / she may, upon receipt of such resolutions, file a lawsuit at the local people's court according to the Civil Procedure Law of the People's Republic of China.

- (3) Operation stage supervision: The public may raise any questions in the operation stage directly to the Municipal PMO or Hezhou Municipal EPB (EP complaint hotline: 12369), which shall record, study and discuss and respond to such questions within 3 working days and propose and implement a solution within 10 to 15 working days depending on the level of difficulty. If the complainant remains dissatisfied with the resolution made the Municipal PMO or EPB, he / she may, upon receipt of such resolutions, file a lawsuit at the local people's court according to the Civil Procedure Law of the People's Republic of China.

The aforesaid channels of grievance redress shall be made public via meetings or by other means to enable the public to be fully aware of their rights to complain. In addition, the public media shall be utilized for extensive advertisement. The grievance redress institution shall handle the complaints free of charge and all expenses incurred therefrom shall be disbursed as a part of the contingency fee by the Municipal PMO.

## 9. Investment estimation for environmental protection

Table 9-1 shows the estimated investment required for the aforesaid additional environmental measures needed in the design stage, construction stage and operation stage of the Project.

**Table 9-1: Investment Estimation for Environmental Protection of the Project**

SN	Stage	Cost description	Estimated investment (CNY10000)
1	Design stage	EIA	200
		<b>Subtotal</b>	<b>200</b>
2	Construction stage	Additional environmental protection measures	141
3		Additional water and soil conservation measures	1657.67
4		Environment monitoring	56
5		Water and soil conservation monitoring and supervision	91
6		Implementation of Dam Safety Action Plan	2655
7		Operation of external monitoring agency	24
8		Staff training in the construction stage	11
		Training on LAR policies	3
		<b>Subtotal</b>	<b>4638.67</b>
9	Operation stage	Final acceptance of environmental protection	80
10		Environment monitoring	23
11		Operation of external monitoring agency	20
12		Staff training in the operation stage	2
		Knowledge training on water environment protection and city development	3
		Training on employment skills of vulnerable groups	5
		<b>Subtotal</b>	<b>133</b>
		<b>Total</b>	<b>4970.67</b>

**Annex I : ECOP for Dike Construction**

**World Bank Financed Guangxi Hezhou  
Urban Water Infrastructure and  
Environment Improvement Project**

**Dike Construction**

**Environmental Codes of Practice**

Hezhou World Bank Loan Project Management Office  
Guangxi Zhengze Environmental Protection Technology Co., Ltd.

November 2017

# Contents

<b>1. General .....</b>	<b>1</b>
1.1. Project background .....	1
1.2 Relevant laws and regulations and World Bank safeguard policies .....	1
1.2.1 Relevant laws and regulations of China .....	1
1.2.2 World Bank safeguard policies and the Environment, Health and Safety Guidelines of international financial institutions .....	2
1.3 Key project components .....	2
1.4 Objectives of Environmental Codes of Practice (ECOP) .....	4
1.5 Applicability .....	4
<b>2. ECOP management system .....</b>	<b>5</b>
2.1. Establishment of the ECOP management system .....	5
2.2. Responsibilities and staffing of agencies involved the environment management system .....	8
2.3. Environment management tasks in each stage of the Project .....	11
2.4. Work flowchart of agencies implementing ECOP in the construction stage .....	11
2.5. ECOP file fanagement .....	12
<b>3. General requirements of ECOP .....</b>	<b>14</b>
3.1. Implementation of environmental measures during construction drawing design and tendering document preparation .....	14
3.2 Preparations before construction .....	15
3.3 Environment management in the construction stage .....	16
3.3.1 Full-process construction supervision .....	16
3.3.2 Environmental protection unit supervision and public opinion .....	17
3.4 Corrective measures to non-conformities to the ECOP requirements .....	18
<b>4. Environmental codes of practice in the stage of construction site preparation .....</b>	<b>19</b>
<b>5. Environmental codes of practice for management of construction sites .....</b>	<b>19</b>
5.1. Construction areas .....	19
5.2. Construction access roads .....	20
<b>6. Environmental Codes of Practices for construction camps .....</b>	<b>21</b>
<b>7. Environment quality management .....</b>	<b>22</b>
7.1. Water environment quality management .....	22
7.2 Acoustic environment quality management .....	23
7.3 Ambient air quality management .....	24
7.4 Solid waste management .....	25
<b>8. Soil erosion control .....</b>	<b>25</b>
8.1. Temporary stockpiling sites .....	25
8.2 Quarries and borrowing sites .....	26
8.3 Waste disposal sites .....	27
<b>9. Ecological protection management .....</b>	<b>27</b>

<b>10. Social environment management .....</b>	<b>28</b>
<b>11. Risk control measures .....</b>	<b>29</b>
11.1. Flood season construction risk control measures .....	29
11.2. Flood control, waterlogging prevention .....	30
11.3. Construction safety.....	30
<b>12. Public participation .....</b>	<b>31</b>
<b>13. Construction traffic management .....</b>	<b>31</b>
<b>14. Supervision plan.....</b>	<b>32</b>
14.1. Scope of construction supervision .....	32
14.2. Contents of construction supervision .....	32
14.3. Terms of reference for construction supervision.....	33
<b>15. Construction safety and health .....</b>	<b>33</b>
<b>16. Traffic safety .....</b>	<b>34</b>
<b>17. Environmental protection training and education .....</b>	<b>35</b>
<b>Annex Table 1: Summary of Environmental Protection Measures .....</b>	<b>36</b>
<b>Annex Table 2: Construction Site Checklist Prior to Mobilization .....</b>	<b>47</b>
<b>Annex Table 3: Checklist for Environment Protection Inspection on Construction Sites.....</b>	<b>49</b>
<b>Annex Table 4: Instruction on Environmental Protection Corrections.....</b>	<b>65</b>
<b>Annex Table 5: Checklist of Environmental Protection Inspection Prior to Project Completion and Hand-over.....</b>	<b>66</b>

# **1. General**

## **1.1. Project background**

World Bank Financed Guangxi Hezhou Urban Water Infrastructure and Environment Improvement Project aims to implement integrated improvement of water environment and construction of urban infrastructure under the guidelines of development, livelihood and innovation and following the standards of “green water service, eco-friendly water service and storm and flood safety”. The Project will be helpful to safeguarding regional flood protection and waterlogging drainage, improving regional water environment and building high-standard and modernized urban infrastructure and public facilities; it will provide powerful support and assurance to the sustainable economic development of Hezhou City to promote the level of sustainable urban development and realize the integration of reform and innovation.

The Project is classified as a Category A through environmental screening of the category, location, sensitivity and scale of the Project as well as the characteristics and scale of potential environmental impacts based on the requirements of environmental screening and categorization specified in the World Bank safeguard policies on environmental assessment (OP4.01) and requires the development of Environmental Codes of Practice (ECOP). This report is the Environmental Codes of Practice for the Dike Construction and is applicable to the slope protection works to be constructed under the He River Rehabilitation Subproject and Huang’ansi and Shizigang Flood diversion channels rehabilitation subprojects located in Babu District and Pinggui District of Hezhou City. The dike construction works consists of flood dikes and flood diversion channels rehabilitation subprojects. The key contents of the ECOP include project introduction, establishment of environment management system, implementation plan of environment protection measures, construction supervision plan and reporting mechanism and file management.

## **1.2 Relevant laws and regulations and World Bank safeguard policies**

### **1.2.1 Relevant laws and regulations of China**

- (1) Environmental Protection Law of the People’s Republic of China (amended in Year 2014);
- (2) Law of the People’s Republic of China on Environmental Impact Assessment (amended in Year 2016);
- (3) Law of the People’s Republic of China on Prevention and Control of Air Pollution (amended in Year 2015)
- (4) Law of the People’s Republic of China on Prevention and Control of Water Pollution (amended in Year 2008)
- (5) Law of the People’s Republic of China on Prevention and Control of Noise Pollution (amended in Year 1997)
- (6) Law of the People’s Republic of China on Prevention and Control of Environmental Pollution of Solid Wastes (amended in Year 2014);



- (7) Water and Soil Conservation Law of the People's Republic of China (amended in Year 2011)
- (8) Flood Control Law of the People's Republic of China (amended in Year 2015);
- (9) Law of the People's Republic of China on Protection of Cultural Relics (4<sup>th</sup> amendment on April 24, 2015)
- (10) Law of the People's Republic of China on Wildlife Protection (Nov. 8, 1988);
- (11) Regulations of the People's Republic of China on Protection of Wild Plants (2<sup>nd</sup> amendment on July 2, 2016);
- (12) Law of the People's Republic of China on Urban and Rural Planning (January 1, 2008);
- (13) Interim Methods for Public Participation in Environmental Impact Assessment (SEPA Huanfa Circular No. 2006[28], Feb. 14, 2006);
- (14) Methods for Public Participation in Environmental Protection (MoEP Decree No. (2015)35);
- (15) Notice on Strengthening Management of Environmental Impact Assessment on Construction Projects Utilizing Loans from International Financial Institutions (Huanjian Circular No. [1993]324);
- (16) Notice by the National Development and Reform Commission on Further Strengthening Management of Projects Utilizing Loans from International Financial Institutions (NDRC Foreign Investment Circular No. [2008]1269);
- (17) Management Catalogue of Environmental Impact Assessment Categories of Construction Projects (Sept. 1, 2017);
- (18) Notice by the State Council on Printing and Issuing the Action Plan on Prevention and Control of Water Pollution (State Council Circular No. [2015]17).
- (19) Law of the People's Republic of China on Protection of Minors (Oct. 26, 2012);
- (20) Stipulations on Prohibition of Use of Child Labour (Issued in 1991 by the State Council);
- (21) Law of the People's Republic of China on Protection of Women's Rights and Interests (Aug. 28, 3005);
- (22) Labor Law of the People's Republic of China (Aug. 27, 2009).

### **1.2.2 World Bank safeguard policies and the Environment, Health and Safety Guidelines of international financial institutions**

This Environmental Codes of Practice is developed in accordance with the Operational Policies on Environmental Assessment as a part of the World Bank safeguard policies (OP4.01) which requires environmental assessment of Category A projects, and the Environment, Health and Safety Guidelines of international financial institutions, which requires the development of an Environmental & Social Management Plan before and during the construction stage as well as the implementation of such Environmental & Social Management Plan and monitoring of the mitigation measures implemented during the construction stage.

## **1.3 Key project components**

Table 1.1-1 shows the key construction activities of the dike construction works.

**Table 1.1-1: Key Construction Works of the Dike Construction**

S.N	Project activity	Description
A-1	He River (Huangshi Hydropower Station – Guangming Bridge) Section Integrated Rehabilitation Works	Length of section to be rehabilitated: 12.66km; new dike to be constructed: 15.2km long; new plank road to be constructed: 1.7km long; new dike culverts: 2 Nos.; Total dike crest width: 7.0m
A-2	He River (Guangming Bridge - Lingfeng Bridge) Section Integrated Rehabilitation Works	Length of section to be rehabilitated: 2.1km; new dike to be constructed: 3.99km long; river widening: 20 – 30m (existing dike distance: 86m – 220m; planned control distance: 120m); left-bank dike for the section from Guangming Bridge to Babu Bridge will be increased to a height of 2.8m to 3.0m.  Babu Bridge: Two spans (Span 1 and Span 2) on the left side to be opened, with a bridge hole of 7.3m and 8m respectively, and flow rate is to be increased after such rehabilitation.
A-3	He River (Lingfeng Bridge – Xiadao Hydropower Station) Section Integrated Rehabilitation Works	Length of section to be rehabilitated: 6.9km; new dike to be constructed: 5.89km long; new dike culverts: 2 Nos.; Total dike crest width: 7.0m  River widening: 30 – 30m (existing dike distance: 90m – 180m; planned control dike distance: 120m; left-bank new dike (mainly adopting the eco-revetment model with earth dike plus waterfront terrace).
C-1	Huang'ansi Drainage Canal Integrated Rehabilitation Works	Length of section to be rehabilitated: 1.23km, starting at Yongfeng Lake and ending at the estuary. This project component aims to rehabilitate the river channel through river-lake connection and riverside sewage interception improvement in order to promote the ecological landscape of the upstream river section and preserve the existing cultural street blocks in the downstream section. New dike to be constructed: 1.0km; landscape bridges and culverts: 4. The sewage interception pipeline will be laid along the river, with a left-bank length of 927m and a right-bank length of 751m.
C-2	Shizigang Flood Channel Integrated Rehabilitation Works	Length of section to be rehabilitated: 3.72km; new dike to be constructed will have a total length of 7.5km combining the left and right bank. 1 check valve, 1 estuary pump station and 13 river-crossing bridges and culverts will be constructed. The design riverbed drop is 0.8‰ and the design river width is 20 – 30m. The upstream section of the river will be connected to Yongfeng Lake via a gas shield dam. The culvertized street will be demolished and the blind channels will be changed into open channels. The sewage interception pipelines will be laid along the river starting at Zhushan Road and with a designed left-bank length of 3134m and a right-bank length of 3034m.

## 1.4 Objectives of ECOP

The ECOP is developed to present a set of detailed, technically feasible, and financially sustainable and operable environmental measures regarding to the inevitable and potential negative environmental impacts involved in the dike construction works, identify the measures and arrangements of environmental pollution mitigation, environment management and institutional building to be implemented by the project construction contractors, supervision engineers, operators and environment management bodies in the construction and operation stages of the Project so as to eliminate or remedy and reduce the adverse environmental and social impacts to an acceptable level. The specific objectives of the ECOP include:

- (1) Identifying the obligations of environment management of the construction contractors and operators

The project management unit, the project owner, the design unit and the EIA consultant should carry out a detailed on-site review and verification of the environmental protection objectives involved in the project area and develop, in association with the local environmental characteristics and project features, and include practical and feasible environmental protection and pollution prevention and mitigation measures into the project design.

In the tendering stage of the Project, it should be explicitly specified that it is an obligation of the bid winner to implement the requirements included in the ECOP, which should be incorporated into the actual activities of engineering design and construction of the Project.

- (2) Serving as the operational guidelines of environment management

The construction supervision plan proposed in the ECOP for the pre-construction stage and the construction stage as well as the reporting mechanism and the file management procedure can assure the effective implementation of the environmental pollution mitigation measures. To be provided as environmental protection documents to the construction supervision unit, the environmental monitoring unit and other relevant agencies, these documents will specify the responsibilities and roles of the relevant functional departments and management bodies as well as the channels and means of communication between these departments and bodies to effectively assure the smooth implementation of the environmental pollution mitigation measures.

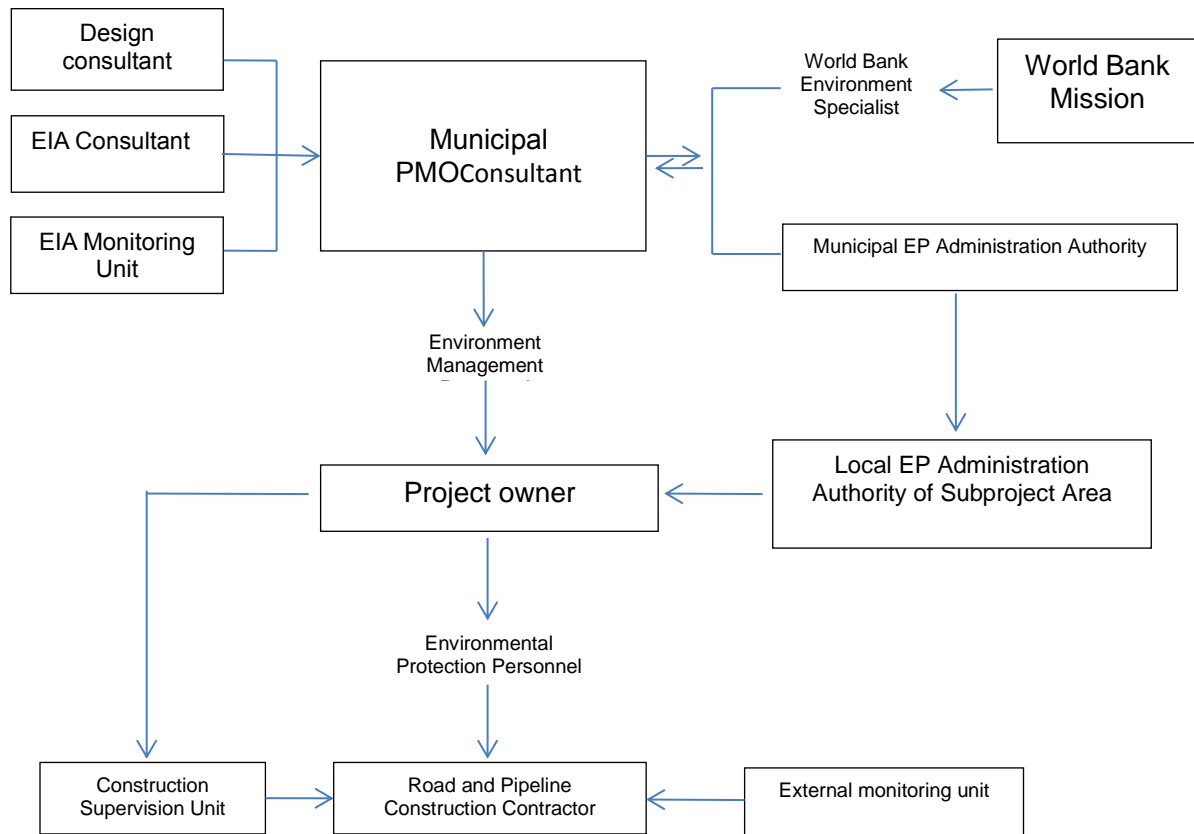
## 1.5 Applicability

This ECOP is applicable to the dike construction works of He River rehabilitation and Huang'ansi and Shizigang drainage channel rehabilitation and aims to provide the environment management agencies, construction supervision agencies and construction contractors with guidelines on the various measures for mitigation and monitoring of adverse environmental impacts in the process of project implementation and operation.

## **2. ECOP management system**

### **2.1. Establishment of the ECOP management system**

In order to respect the relevant stipulations and accommodate the actual needs of the Project and better realize the demonstrative effect of the Project, the Project Management Offices (PMOs) at each level will assign a special personnel to be responsible for the environment management work and an environment management system will be established to cover the supervision unit, the implementation unit and the consultant service unit in addition to the regulatory functions performed by the environment protection authorities by law. See Figure 2.1-1 and Table 2.1-1 for detail.



**Table 2.1-1 Agencies Involved in the Environment Management System**

Nature of unit	Name of unit	Tasks assigned to the unit
Management unit	Municipal PMO	A special environment manager is assigned to be responsible for environmental protection work in the planning, design and implementation stages of the Project, assuring that the work procedures satisfy the domestic and WB requirements of EIA and environment management and that the environmental protection measures specified in the ECOP are smoothly implemented. See “2.2 Responsibilities and staffing of agencies involved the environment management system” for detail.
	Owner	A special environmental protection officer is assigned to be mainly responsible for assuring that the ECOP is effectively implemented in the project implementation and operation stages, the adverse environmental impacts of the Project are minimized or reduced to an acceptable degree and the environmental benefits of the Project are fully realized, the various fund needed for the environmental protection work of the Project are made available and also responsible for processing and archiving of the relevant documents. See “2.2 Responsibilities and staffing of agencies involved the environment management system” for detail.
Supervision unit	WB mission	An environmental technology specialist is assigned to monitor and inspect the implementation status of the ECOP. See “2.2 Responsibilities and staffing of agencies involved the environment management system” for detail.
	EP authorities at all levels	Performing the role of a government administrative supervision and management unit to supervise and inspect and make sure that the work procedures of the Project satisfy the requirements of environment management in China and the pollution control measures in the implementation process meet the needs of environmental protection in China. See “2.2 Responsibilities and staffing of agencies involved the environment management system” for detail.
Implementation unit	Contractor of road and pipeline network construction works	A site environment engineer is assigned to be responsible for implementing the environmental protection measures in the ECOP according to the requirements of environmental protection of the World Bank and the local EP authorities bodies and preparing and submitting monthly environment reports in the construction stage. See “2.2 Responsibilities and staffing of agencies involved the environment management system” for detail.

Consultant service unit	EIA consultant	Preparing, with authorization, the ECOP of the road and pipeline network construction works. See “2.2 Responsibilities and staffing of agencies involved the environment management system” for detail.
	Design consultant	Authorized and responsible for preparing FSR and construction design proposal and assuring the incorporation of the measures and proposals in the ECOP into the outcomes. See “2.2 Responsibilities and staffing of agencies involved the environment management system” for detail.
	Construction supervision unit	Responsible for supervising and managing the routine production activities of the construction contractor. See “2.2 Responsibilities and staffing of agencies involved the environment management system” for detail.
	External monitoring unit	Responsible for inspecting the implementation status of environmental protection measures in each subproject and implementing environmental monitoring activities in the construction stage with the authorization by the owner. See “2.2 Responsibilities and staffing of agencies involved the environment management system” for detail.

## 2.2. Responsibilities and staffing of agencies involved the environment management system

The environment management system of Guangxi Hezhou Urban Water Infrastructure and Environment Improvement Project includes the project management agency, the supervision agency, the implementation agency and the consultant service unit. These agencies constitute an integral project environment management system, but each undertaking different assignments and different responsibilities. The Project will be implemented under the leadership of the Project Management Office of World Bank Financed Guangxi Hezhou Urban Water Infrastructure and Environment Improvement Project (hereinafter abbreviated as the “Municipal PMO”) and the administrative agencies of the Municipal Government to assure that the Project complies with the requirements of China and the World Bank in terms of work procedure and implementation of the pollution control measures. See Table 2.2-1 as below for responsibilities and staffing of agencies involved in the Project.

**Table 2.2-1 Responsibilities and staffing of agencies involved the environment management system**

Name of unit	Type of unit	Staffing	Responsibilities of unit
1. EP authorities at all levels	Supervision unit	1 person	1. Conducting full-process environment supervision and management of the Project, including approving EIA report of the Project (including EIA of subprojects) and environment supervision and management in the construction and operation stages of the Project.
2. Municipal PMO	Management unit	1 person	1. Supervising the implementation of the ECOP; 2. Assuring and coordinating the implementation of the domestic and World Bank requirements of environment management; 3. Submitting to the World Bank half-year reports on the implementation progress of the ESMP and other relevant reports; 4. Inspecting the environment management work of each subproject; 5. Coordinating the other relevant authorities to address significant environmental issues; 6. Authorizing external environment monitoring agencies to carry out inspections of the Project.
3. Owner	Management unit	1 person	1. Supervising the implementation of the environment management rules and regulations in the subprojects; 2. Incorporating the environmental protection measures in the ESMP into the construction contracts; 3. Recruiting, supervising and coordinating the work of the construction supervision unit (qualifications, responsibilities and management); 4. Organizing the implementation of the environment management training plan; 5. Organizing theme studies or relevant surveys; 6. Keeping and processing records of complaints raised in the construction and operation processes of the Project, explaining the results of resolution to the public and addressing issues of public complaints; 7. Reviewing the construction supervision and environment consulting reports; 8. Submitting quarterly reports (or statements) to the Municipal PMO; 9. Signing for acceptance of site check lists submitted by the construction contractor and the supervision unit, reviewing and verifying environmentally-sensitive issues and putting them into archives; 10. Accepting inspections of environmental



			work (including inspections by the World Bank mission).
4. World Bank	Supervision unit	1 person	<ol style="list-style-type: none"> <li>1. World Bank mission is assigned on a yearly basis to conduct special inspection of project implementation;</li> <li>2. Inspecting the status of execution of the loan agreement as well as implementation of ECOP in the Project.</li> </ol>
5. EIA consultant	EIA consultant	6 persons	<ol style="list-style-type: none"> <li>1. Carrying out site visit to and environment assessment of each subproject;</li> <li>2. Responsible for preparing the contents of ECOP.</li> </ol>
6. Construction supervision unit (responsible for environment supervision)	Consultant service unit	1-2 person	<ol style="list-style-type: none"> <li>1. The construction supervision engineer is assigned separately by the municipal PMO;</li> <li>2. Supervising and inspecting the domestic sewage treatment, industrial wastewater treatment, soil erosion prevention measures and exhaust gas, dust and noise control measures as well as domestic and industrial solid wastes and health management and epidemic prevention activities on the construction sites;</li> <li>3. Preparing on a periodical basis the various checklists of environment management in the annexes of the ECOP;</li> <li>4. Proposing and following up with corrective measures by the construction contractors to relevant environmental protection issues encountered in the construction activities, including issuing instructions and checklists of corrective measures and archiving inspection documents;</li> <li>5. Reporting project implementation status on a weekly basis to the municipal PMO.</li> </ol>
7. Environment monitoring	External monitoring unit	1-2 persons	<ol style="list-style-type: none"> <li>1. Assisting the municipal PMO in inspecting the environmental protection work of each subproject, preparing the execution progress report of the ESMP and relevant reports and submitting such reports to the municipal PMO on a half-year basis;</li> <li>2. Inspecting the implementation status of the environmental protection measures on the construction site and of the contractor, preparing and submitting reports to the municipal PMO and making recommendations and comments on implementation of environmental protection activities.</li> </ol>
8. Construction contractor	Implementation unit	A few	<ol style="list-style-type: none"> <li>1. Developing environmental protection measures in the construction stage;</li> <li>2. Accepting the supervision and inspection of environmental protection by the</li> </ol>

			<p>construction supervision engineer, the World Bank and the EP authorities at all levels;</p> <p>3. Setting up a feedback mechanism and carrying out the corrections within 3 working days as of the receipt of the instructions on corrective measures (or within 10 days where coordination from the administration agencies is required);</p> <p>4. Completing together with the construction supervision unit and submitting the construction site checklist to the municipal PMO before construction;</p> <p>5. The construction contractor reports on a weekly basis the project implementation status to the construction supervision engineer.</p>
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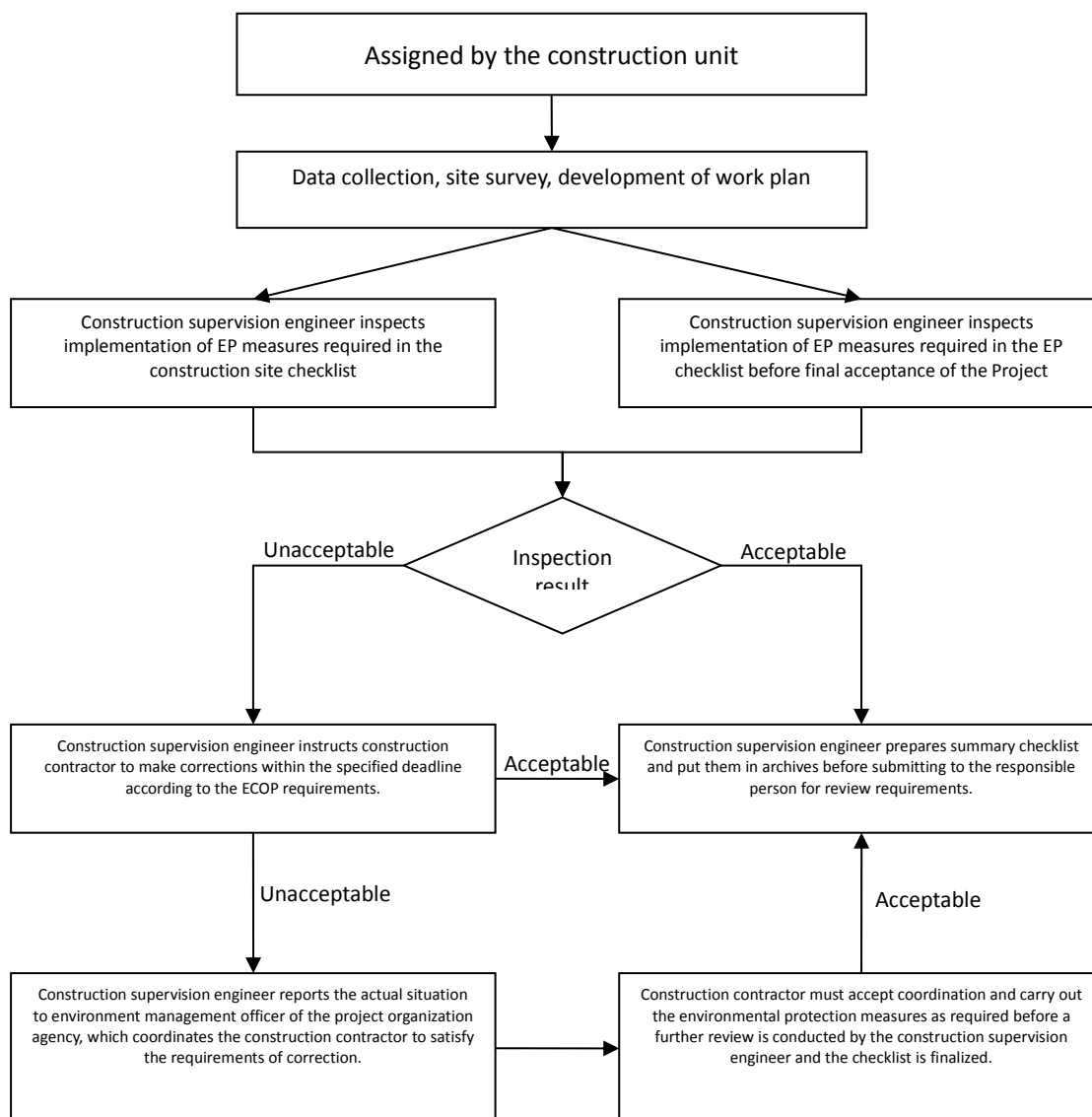
## 2.3. Environment management tasks in each stage of the Project

For different stages of project implementation, the ECOP contains different assignments.

The most important task of the ECOP is to assure that the various environmental protection measures as proposed are effectively implemented, including: (1) incorporating the ECOP environmental protection measures into the project design, tendering and construction contracts; (2) inspecting the effectiveness and implementation status of environmental protection measures through the supervision by the construction supervision engineer over the implementation of the environmental protection measures in the construction stage of the Project; (3) inspection, reporting and archiving mechanisms of the ECOP to reflect the time effectiveness of work through inspections of routine work activities.

## 2.4. Work flowchart of agencies implementing ECOP in the construction stage

In the construction process of the Project, the task of the construction supervision engineer is to check whether the environmental protection measures taken during construction meet the requirements included in the ECOP. The construction supervision engineer should conduct construction site inspections at least once a week and prepare and put into archives the environmental protection checklist for the construction stage, propose and follow up with the implementation of corrective measures to any environmental problems existing in the construction activities of the construction contractor and submit monthly environment management progress reports to the environment officer of the municipal PMO. The work flowchart of the construction supervision engineer in the construction period is shown in Figure 2.4-1 as follows.



**Figure 2.4-1** Work Flowchart of Construction Supervision Engineer in the Construction Stage

## 2.5. ECOP file management

In the implementation process of the ECOP, the World Bank, the municipal PMO, the owner, the monitoring unit, the EIA consultant, the construction supervision unit and the construction contractor should all be engaged in management of the respective files and documents. Requirements of file management for each of these agencies are described in detail in Table 2.5-1.

Table 2.5-1 Requirements of file management for each unit

Name of unit	File management
(1) Construction contractor	<ol style="list-style-type: none"> <li>1. Recording, archiving and reporting to the construction supervision engineer on a weekly basis the implementation status of the construction activities;</li> <li>2. Completing together with the construction supervision engineer and archiving the construction site checklist prior to construction and submitting a report to the municipal PMO;</li> <li>3. Recording, archiving and reporting to the construction supervision engineer the implementation status in case of an emergency and unanticipated event;</li> <li>4. Carrying out the corrections within 3 working days as of the receipt of an instruction on corrective measures (or within 10 working days if coordination with the management unit is required) and putting the respective files and documents into archives.</li> </ol>
(2) Construction supervision unit	<ol style="list-style-type: none"> <li>1. Recording, archiving and reporting to the municipal PMO on a weekly basis information reported by the construction contractor;</li> <li>2. Completing together with the construction contractor and archiving the construction site checklist prior to construction and submitting a report to the municipal PMO;</li> <li>3. Recording, archiving and reporting to the municipal PMO the specific implementation plan of the construction contractor in case of an emergency and unanticipated event;</li> <li>4. Recommending and following up with the implementation of a corrective solution to any environmental protection issues encountered by the construction contractor in the construction activities, including issuing instructions on corrective measures and correction checklist and archiving the inspection files and documents.</li> </ol>
(3) EIA consultant	<ol style="list-style-type: none"> <li>1. Preparing the contents of the ECOP and putting the first draft, the draft for review and the final draft for approval into archives.</li> </ol>
(4) Monitoring unit	<ol style="list-style-type: none"> <li>1. Implementing the monitoring plan in the ESMP and submitting the monitoring report at the earliest possible date after the monitoring is completed to the contractor (or operator) and the construction supervision engineer;</li> <li>2. Including the monitoring report into the Project Progress Report, putting it into archives and submitting it in a timely manner to the PMO and respective management authorities (EPB) to enable these agencies to be aware of the execution status and effectiveness of the environmental protection measures in a timely manner.</li> </ol>

(5) Owner	<ol style="list-style-type: none"> <li>1. Preparing, implementing and putting into archives the rules and regulations on environment management for subprojects;</li> <li>2. Putting into archives the final draft and the approval document of the domestic EIA report of subprojects;</li> <li>3. Preparing, implementing and putting into archives the environment management training plan;</li> <li>4. Organizing theme studies or relevant studies and managing and archiving the work documents of such workshops and studies;</li> <li>5. Maintaining, processing and putting into archives records of complaints raised in the construction and operation processes of the Project;</li> <li>6. Summarizing and putting into archives on a monthly basis the environment management monthly report submitted by the construction supervision engineer and submitting a report (or statement) to the municipal PMO;</li> <li>7. Receiving construction site checklists submitted by the construction contractor and the supervision engineer, reviewing and verifying environmentally-sensitive issues and putting such documents into archives;</li> <li>8. Managing and putting into archives the submitted instructions on corrective measures.</li> </ol>
(6) Municipal PMO	<ol style="list-style-type: none"> <li>1. Supervising the implementation of the ECOP and reviewing and archiving on a monthly basis the environment management monthly report submitted by each owner;</li> <li>2. Summarizing reports from the municipal project leading group and the PMO and submitting to the World Bank and archiving relevant reports on a half-year basis;</li> <li>3. Coordinating with the concerned authorities to address major environmental issues and recording and archiving the specific measures.</li> </ol>
(7) World Bank	<ol style="list-style-type: none"> <li>1. Reviewing and archiving on a half-year basis the ESMP execution progress report submitted by the municipal PMO;</li> </ol>

### 3. General requirements of ECOP

In the construction process of the Project, the contractor of the road and pipeline network component will play a critical role in implementing the environment management, pollution control and prevention measures. In order to assure the execution of the ECOP, the contents included in this Section are general requirements and measures applicable to the major agencies involved in the construction process of the Project and the construction contractor should enforce the environment management measures proposed in the ECOPs under the coordination and supervisory management of the various management agencies.

#### 3.1. Implementation of environmental measures during construction drawing design and tendering document preparation

As the Project enters the implementation stage, relevant procurement activities will be

implemented according to the Procurement Guidelines of the World Bank.

The tendering document preparation unit and the construction design unit are required to include the mitigation measures proposed in the ECOP against any potential adverse environmental impacts into the technical specifications of the tendering documents and the construction design of different stages under the coordination, guidance and supervision of the municipal PMO. The tendering documents need to require the tenderer to make commitments on the following environment management requirement in the bid document and incorporate such contents into the construction contract.

- (1) The construction design unit should propose measures to mitigate potential adverse environmental impacts in the construction design of different stages. In the feasibility study stage, the environmental impacts should be analyzed and assessed and ECOP should be developed; in the preliminary design stage, the environmental protection measures proposed in the EIA and ECOP should be implemented; in the construction design stage, environmental protection engineering design should be produced based on the comments of ratification of the preliminary design.
- (2) The contractor of the Dike Construction is required to provide 1 to 2 site environment engineers on each construction site responsible for implementing the environmental protection measures throughout the construction stage to assure that the construction activities of the contractor and its subcontractors ( if any ) satisfy the various requirements of this ECOP and necessary environmental protection measures are taken in the construction process.
- (3) The contractor of the Dike Construction must include the “Site Environmental & Social Management Plan” in its construction program after the contract is signed and before the commencement of the construction works.
- (4) The contractor of the Dike Construction must respect the local construction safety and civilization requirements.
- (5) The contractor of the Dike Construction and the construction supervision unit must receive training on environmental protection and environment management before the commencement of the construction works.
- (6) The contractor of the Dike Construction should include a security deposit in terms of environment management at a percentage of around 3% in its yearly budget of the contract expenditures of the Project.

### **3.2 Preparations before construction**

After the contract award and before commencement of the dike construction works, the ECOP document should be provided by the Municipal PMO to the dike construction contractor and the construction supervision unit should be determined.

After the tendering process is ended and a contract is signed with the dike construction works contractor, the contractor should conduct a visit to the construction site to identify environmental restriction factors in the project area. Prior to the commencement of the dike construction works, a construction site checklist should be prepared and

completed to inspect the sensitivity of the various environmental elements on site to provide an important basis for environmental protection of the dike construction works in the future.

The purpose of the construction site checklist is to identify the relevant issues of environmental safety and identify and screen environmentally sensitive issues needing special protection measures.

Based on the results of construction site inspection, the dike construction works contractor should prepare the “Site Environmental & Social Management Plan”, which should incorporate the requirements of the ECOP and get approval by the construction supervision unit.

### **3.3 Environment management in the construction stage**

During the construction of the dike construction works, the dike construction contractor should accept the supervision by the construction supervision unit commissioned by the owner.

The contractor of the Dike Construction should implement the various environmental protection measures based on the requirements of environment management in the construction contract and the “Site Environmental & Social Management Plan” approved by the construction supervision unit. The construction supervision unit should carry out direct full-process supervision over the implementation of the environmental protection measures taken by the contractors while the local environmental protection administrative authority and its environmental surveillance agency and the public stakeholders in the project area should conduct external environment management monitoring.

Throughout the construction stage, the contractor of the Dike Construction should actively coordinate with the construction supervision unit and the environmental monitoring unit to perform their duties as detailed in “2.2 Responsibilities and Staffing of Agencies involved in the Environment Management System”.

The construction contractor should coordinate closely with the local government departments and other authorities to assure full compliance with the requirements of the laws and regulations of China.

#### **3.3.1 Full-process construction supervision**

The key assignments of the construction supervision unit include:

- (1) Mainly responsible for supervising the construction activities of the contractor and other relevant activities, e.g. land occupation and compensation, etc. to assure that the aforesaid activities comply with the requirements, investment and objectives of environmental protection; responsible for coordinating the relationship between the land administration authority and the environmental monitoring authority on the construction site;
- (2) Responsible for supervising and guiding on a regular basis the contractor's

environmental behaviors and assuring that the requirements of ECOP are satisfied;

- (3) Responsible for review and approval of the “Site Environmental & Social Management Plan” of the contractor
- (4) Following up with and monitoring the implementation status of measures taken by the contractor in environmental protection and avoiding and mitigation of adverse environmental impacts;
- (5) Monitoring and checking whether the construction behaviors of the contractor comply with the requirements of this ECOP;
- (6) Making sure that an investigation should be immediately conducted and a report submitted to the municipal PMO or local environmental protection administration authority for a solution in case of any non-compliance with the environmental protection requirements or any adverse environmental impacts or any complaints from local residents on environmental protection in the project area; issuing simultaneously to the contractor an Instruction on Environmental Protection Corrections and making sure the corrective measures are taken by the contractor under supervision.
- (7) Stopping any activities or behaviors by the contractor violating the environmental protection requirements;
- (8) Providing on-the-job training to the contractor to avoid and abate possible adverse impacts on the local environment;
- (9) Conducting site environment inspections on a weekly basis and preparing, archiving and incorporating the Environmental Protection Checklist in the Construction Stage into the “Site Inspection Report” for monthly submission to the Owner;
- (10) Conducting a further site environment inspection prior to the environmental protection acceptance upon the completion of the construction works and preparing and putting into archives the Environmental Protection Acceptance Checklist.

### **3.3.2 Environmental protection unit supervision and public opinion**

The construction contractors should coordinate closely with the local governments and other authorities throughout the construction stage to assure full compliance with this ECOP and provide adequate information to the affected public, in particular information on construction behaviors affecting public safety, matters infringing upon public interests and sensitive areas and temporary stockpiling sites, etc. The local EPB should carry out sample inspections over the environmental protection measures taken by the construction contractors, receive site inspection reports submitted by the owner and the municipal PMO and carry out its administrative duties based on the reported information and make arrangements for emergency responses to any abnormal environmental conditions arising in the construction process.

The contractors will assure that information to be disclosed to the public is posted at sites in the vicinity of local residential buildings in the project area, including name of



contractor, name and telephone number of environment management coordinators, environmental impacts likely to arise in the construction process and preventive measures to be taken as well as the estimated duration of such impacts. In the meanwhile, the contractor needs to provide an open and transparent way of public participation and hotline telephone number and complaint handling office to receive public consultation and advices. Environmental issues reflected in the public feedback should be immediately investigated and addressed within the shortest possible time.

### **3.4 Corrective measures to non-conformities to the ECOP requirements**

The contractor and subcontractors (if any) of the dike construction works must respect the requirements included in the ECOP and upon the occurrence of any pollution accidents (or events) due to failure in respecting the environmental protection measures specified in the ECOP:

- (1) The Contractor of the dike construction works should take immediate measures and trigger the emergency response plan of environmental pollution accidents to eliminate the pollution sources and control the resulted environmental pollution.
- (2) The contractor of the Dike Construction should immediately notify the construction supervision unit and the project management unit while the construction supervision unit and the project management unit should provide assistance and guidance to the construction contractor to take remedial measures to reduce or eliminate environmental impacts. A report should be delivered within 24 hours to the local environmental protection administration authority (or local environment monitoring authority) for inspection and guidance to minimize the impact.
- (3) The contractor of the Dike Construction should keep record of the implementation status of the pollution control measures and propose and submit corrective measures to the construction supervision unit and the owner. Such records should be put into archives and registration by the construction supervision unit and the municipal PMO and the implementation status of such remedial measures will be reported by the owner to the municipal PMO.
- (4) The contractor of the Dike Construction should conduct an in-depth analysis of the causes of environmental pollution and develop preventive measures and improve the construction design proposal to prevent recurrence of similar accidents. The preventive measures developed by the contractor should be approved, archived and registered by the construction supervision unit and the municipal PMO.
- (5) The owner should take disciplinary and punishment actions to the contractor of the Dike Construction according to the stipulations in the contract based on the nature, scope and degree of impact of the pollution accident and the implementation status of the contractor's remedial measures and report the results of such actions to the local environmental protection administration authority.

## **4. ECOP in the stage of construction site preparation**

This section presents the environmental protection measures that the civil works contractors should take in the construction of Dike Construction, mainly including environmental management of construction sites, control of dust pollution, control of hazardous gases, control of water pollution, control of noise pollution, control of construction wastes and soil erosion, etc..

The general requirements of the ECOP of the construction stage include:

- (1) Effective measures for prevention and control of air, water, noise, solid waste pollution and soil erosion and improvement of environmental sanitation should be included in the construction organization design of the Project.
- (2) The environmental protection measures included in the construction organization design should be implemented in the construction process to assure that the quality of the ambient air, surface water and acoustic and ecological environment in the project area satisfies the requirements of the functional zone and is subject to supervision by the environment supervision unit and management unit.
- (3) Environmental protection and environmental sanitation management and inspection system must be set up on the construction sites and inspection records should be properly maintained.
- (4) The construction contractor should take effective measures for prevention and control of occupational diseases and provide the operators with necessary protective devices and organize physical examination and training for workers engaged in operations involving hazards of occupational diseases (at least once a year).
- (5) The construction contractors should take account of the seasonal characteristics and take effective actions to properly implement activities of food hygiene assurance, hot weather and cold weather protection and epidemic prevention.
- (6) Education and training and assessment for operators on construction sites should include contents of laws and regulations related to environmental protection and environmental health.
- (7) Construction contractors should develop public health emergency response plans for the construction sites in accordance with the respective laws and regulations.

## **5. ECOP for management of construction sites**

### **5.1. Construction areas**

- (1) The construction area on the construction site should be clearly separated from

the office area and the living area with corresponding separating measures and should be kept tidy and in good order.

- (2) Facilities of environmental protection or measures for mitigating environmental impacts should be provided in the construction area and the living area. For example, in the construction area, wastewater sedimentation tanks and measures for dust prevention and noise reduction should be provided; in the office and living areas, facilities for treatment of domestic sewage, canteen wastewater and domestic solid wastes should be available.
- (3) Company name or company logo should be displayed at the entrance and exit of the construction sites. A project introduction bulletin board should be set up at obvious positions at the main entrance and exit and the general layout map of the construction site as well as bulletin boards introducing the rules and regulations on production safety, fire and security protection, environmental protection and civilized construction should be erected inside the main gate.
- (4) A public announcement should be posted at least five days in advance at the construction site as well as the premises of affected households and enterprises to notify the public of the beginning and ending time of any possible suspension of municipal services (including water supply, power supply, telephone and bus service) needed for the implementation of the construction works.
- (5) Existing buildings and infrastructures should be utilized as a priority on the construction sites. If new temporary buildings are needed, land use should be optimized to occupation of land resources. Use of clay bricks in construction of temporary facilities on construction sites is prohibited and the safety and fire protection requirements and relevant national regulations should be respected.
- (6) Staff dormitories must not be located in buildings under construction.
- (7) All temporary facilities should be demolished within one month as of the completion of the construction works.

## **5.2. Construction access roads**

The Dike Construction is located in the urban area of Hezhou and enjoys very convenient traffic conditions, thus requiring no construction of temporary access roads. However, if construction access road is needed where there are no existing roads, the construction access road to be involved in the Dike Construction should have a length of 39.6km, including permanent road in a total length of 25.2km, and the pavement should have a width of 3 to 4m and adopt a macadam stone slag structure. The following measures should be taken to avoid possible adverse environmental impacts generated by the construction access roads:

- (1) Pollution control measures against dust generated from road surfaces:  
Pavement of new access roads and hardening of sites should be handled based on the design usage. For example, reusable load-bearing bricks (components) may be used for access roads allowing heavy-duty vehicles while reusable seepage bricks may be used for pavement of ordinary footpaths.

The access roads should be maintained and cleaned every day and dust-prone sections should be sprayed with water for dust suppression.

(2) Noise pollution control measures:

The construction contractor must select construction equipment and machinery and transportation vehicles conforming to the relevant national standards and select, if possible, low-noise construction plants.

Maintenance and servicing of the various construction equipment should be strengthened to keep them in fine operation to fundamentally reduce the intensity of noise and vibration sources.

(3) Ecological impact control measures:

Before the construction works is completed, construction access roads used as permanent roads should be maintained with greater efforts; newly constructed temporary access roads should be ecologically restored to at least the pre-construction state.

Arable top soil stripped during the construction should be stockpiled temporarily on a relatively flat area on the construction site and fenced up with bagged earth cofferdam. Temporary gutters and sand sedimentation measures should be provided around the stockpiles. The stockpiled top soil should be covered with dust prevention nets and reused for ecological restoration upon completion of the construction activities.

Occupied or damaged local roads should be relocated or subject to protective treatment such as pavement rehabilitation and landscaping.

## **6. ECOPs for construction camps**

- (1) The construction area on the construction site should be clearly separated from the office area and the living area with corresponding separating measures and should be kept tidy and in good order.
- (2) Facilities of environmental protection or measures for mitigating environmental impacts should be provided in the construction area and the living area. For example, in the construction area, wastewater sedimentation tanks and measures for dust prevention and noise reduction should be provided; in the office and living areas, facilities for treatment of domestic sewage, canteen wastewater and domestic solid wastes should be available. Oil traps and septic tanks and enclosed garbage stations should be provided and used and measures should be available for timely removal of solid wastes.
- (3) Company name or company logo should be displayed at the entrance and exit of the construction sites. A project introduction bulletin board should be set up at obvious positions at the main entrance and exit and the general layout map of the construction site as well as bulletin boards introducing the rules and regulations on production safety, fire and security protection, environmental protection and civilized construction should be erected inside the main gate.
- (4) A public announcement should be posted at least five days in advance at the

construction site as well as the premises of affected households and enterprises to notify the public of the beginning and ending time of any possible suspension of municipal services (including water supply, power supply, telephone and bus service) needed for the implementation of the construction works.

- (5) Existing buildings and infrastructures should be utilized as a priority on the construction sites. If new temporary buildings are needed, land use should be optimized to occupation of land resources. Use of clay bricks in construction of temporary facilities on construction sites is prohibited and the safety and fire protection requirements and relevant national regulations should be respected.
- (6) A special storage space should be provided for oils and chemical solvents and other substances stored in the construction sites. Warning signs should be erected; floor should be subject to anti-seepage treatment and absorbing bags, sand and chips among other emergency response materials should be prepared.
- (7) Staff dormitories must not be located in buildings under construction.
- (8) All temporary facilities should be demolished within one month as of the completion of the construction works.

## **7. Environment quality management**

### **7.1. Water environment quality management**

The impacts of the dike construction works on the surface water along the river mainly include impacts of the dredging process on the water quality of surface water and the impact of domestic sewage of the construction camps and oil and grease leakage of construction plants as well as the stockpiling of building materials and earthwork on the water environment.

In order to mitigate the impacts of the construction works on the water environment, this ECOP mainly proposes the following measures of environmental protection:

- (1) Construction and production areas, construction camps, access roads and Soil-spoiling and waste disposal sites should be located as far as possible away from surface waters.
- (2) It is recommended that water-related operations, such as dike construction, river dredging, dike rehabilitation, are implemented in low-water season and the construction time should be shortened where possible to reduce disturbance of the water systems.
- (3) Since the dike construction works involved in this Project are mainly located in the vicinity of the built urban area, it is suggested that the public toilets in the nearby villages are used for the construction camps. If the existing public toilets cannot be used, it is suggested that a centralized public toilet is constructed for the construction camps and septic tanks are provided for treatment of

wastewater before reuse in farmland irrigation.

- (4) A sedimentation tank should be provided at the washing site of mixers, concrete pumps and transport vehicles and the wastewater must not be directly discharged into the river and should, instead, reused or used for dust suppression after secondary sedimentation.
- (5) Materials spilled on the construction sites should be cleaned in time and measures should be taken for protecting the materials stockpiled on site from storm water scours and drenching and avoid possible pollution of water systems.
- (6) Oily wastewater of the construction plants should be collected in time for treatment and should not be discharged into rivers and water systems. Construction must be suspended in rainy days and the earthwork fill must be covered to avoid possible rainwater scours and pollution of water systems.

## **7.2 Acoustic environment quality management**

Many construction plants and transportation vehicles are needed in the construction process of the dike construction, which will radiate strong noises. Some equipment even generates vibration influencing the local residents and schools and other sensitive sites. The main construction plants include excavators, bulldozers, loaders and rollers while the transportation vehicles mainly include various trucks and dump trucks. In order to mitigate the impacts of the dike construction works on the acoustic environment, the following environmental protection measures are taken in this ECOP:

- (1) Low-noise equipment should be selected to the best possibility in terms of equipment selection and the power and mechanical equipment should be repaired and serviced on a periodical basis.
- (2) Scientific construction plans should be developed and reasonable construction time should be scheduled to best avoid simultaneous use of a large number of high noise equipment. In addition, the construction time of high-noise equipment (e.g. excavators, mixers, etc.) should be arranged in daytime and nighttime construction should be avoided (22:00 to 06:00) .
- (3) Handling and transportation of in-situ concrete and bulk materials should be reduced in night time. If continuous operation is needed on special occasions such as dike construction, measures of noise reduction should be taken and the local residents should be notified of the construction time and place and a report submitted to the EPB before the construction proceeds.
- (4) Mobile sound barriers should be provided by the construction contractors at noise sensitive sites to reduce the impacts of construction noises.
- (5) The mechanical equipment should be operated according to the respective stipulations and the codes of operation should be followed in the process of baffle and rack removal. Upon material loading and unloading, noise of collision should be reduced.

- (6) To avoid excessively high noise level at a certain spot, actions should be taken to avoid the arrangement of a large number of power and mechanical equipment at the same site.
- (7) The executive unit should coordinate with the local residents together with the construction contractor and disclose information on the construction timetable. A prior notice should be given to the affected organizations and residents before the operation starts and information on the construction progress as well as measures taken during construction for reducing noise should also be provided to them to obtain mutual understanding. In addition, complaint hotlines should be set up during the construction process to handle and respond positively to complaints about noise disturbances.

### **7.3 Ambient air quality management**

Pollutants generating impacts on the ambient air quality in the construction stage of the Project mainly include dust from site leveling, lime soil mixing and transportation vehicles as well as odor from dredging process. In order to mitigate the impacts on ambient air environment from the dike construction works, the following environmental protection measures are proposed in the ECOP:

- (1) Sediments, earthwork, debris and construction wastes must be transported in enclosed vehicles and vehicle washing facilities must be provided at entrances and exits of construction sites to make sure the vehicles are washed and cleaned to avoid possible take-away of mud and debris out of the site.
- (2) Effective measures of covering, hardening, landscaping and water spraying should be taken on the construction sites; dust generated on construction sites and roads should be prevented and controlled through water spraying and cleaning.
- (3) Cement and other fugitive fine-particle construction materials should be stored in an enclosed space and lime and sand on the construction sites should be stockpiled on a centralized site and properly covered.
- (4) Backfill and transfer of sediments and earth and other construction activities likely to cause dust pollution should not be conducted in days with a wind scale of Grade 4 or above.
- (5) Vegetation should be restored on temporarily occupied land parcels at the end of the temporary occupation to prevent soil erosion.
- (6) Construction plants and vehicles with low energy consumption and low pollutant emission should be selected where possible and tail gas purification devices should be installed for vehicles with non-compliant tail gas emission. Management and maintenance of machinery and vehicles should be strengthened to reduce air pollution caused by poor performance of machinery and vehicles.

## **7.4 Solid waste management**

Wastes generated in the process of dike construction mainly comprise of ordinary solid wastes and hazardous solid wastes. Included in the ordinary wastes are mainly garbage, sludge and domestic wastes from the riverway while the major hazardous waste is waste oil. In order to avoid secondary pollution of solid wastes, this ECOP proposes the following measures of environmental protection:

- (1) The waste soil contains a certain portion of mellow soil, which should be used in wasteland reclamation and forestation of the project area. The remaining soil may be used as subgrade fill of the dike construction works and bedding fill on both sides of channels in the vicinity.
- (2) Removal of construction wastes should be carried out with a closed container and random casting is prohibited. The construction wastes should be stored by type in accordance with the relevant classification management requirements of municipal wastes and should be cleared and digested in a timely manner.
- (3) Construction wastes (including excavation earth) should be transported to a designated waste disposal site for storage and disposal.
- (4) Domestic wastes should be collected in the garbage bins and bags provided on the construction sites and then transported to a designated waste disposal site for storage and disposal;
- (5) Burning of toxic and hazardous substances is not permitted on construction sites. Toxic and hazardous substances should be disposed according to the relevant requirements and stipulations.
- (6) Material transportation should avoid the peak traffic hours at the sensitive sites and appropriate protection measures should be taken to alleviate traffic pressure and reduce material spillage and leakage and possible secondary dust pollution resulting from material transportation.

## **8. Soil erosion control**

The soil and water conservation measures to be taken in the Dike Construction should adhere to the principle that "soil and water conservation will be associated with the main works of the Dike Construction and equal importance will be attached to the main works, the auxiliary works and the temporary works" and the guideline that "simultaneous efforts will be made in both prevention and control to not only achieve comprehensive management but also tackle the problem of soil erosion both superficially and fundamentally". The soil and water conservation facilities should be rationally arranged to not only cater for the local conditions, but also aim at practical effectiveness. Efforts of soil and water conservation in the construction stage will be highlighted and serious attention will be paid to the landscaping and restoration of borrowing sites and Soil-spoiling and waste disposal sites for the Dike Construction. The Soil-spoiling and waste disposal sites will be fenced up before abandoned.

### **8.1. Temporary stockpiling sites**



- (1) Temporary stockpiling sites in the construction process should be located on the land occupation area on the river banks where possible to minimize occupation of land in other locations.
- (2) Such temporary stockpiling sites should be located on waste and poor land and far away from villages and sensitive objects and riverway to minimize impacts on water quality of the rivers.
- (3) Upon completion of the construction works, surfacing clearing should be carried out and soil and water conservation measures should be taken for the temporary stockpiling sites, which may be restored into greenbelts after soil improvement;
- (4) The existing riverside roads should be utilized where possible. If it is necessary to open new access roads, heavy excavation and fill should be avoided and efforts should be made in soil and water conservation to reduce soil erosion and ecological damages.
- (5) Trees and grasses should be planted upon the completion of the construction works;
- (6) Damages to surface vegetation should be minimized and the construction sites should be leveled properly;
- (7) Fences, drainage gutters and other measures effectively preventing and controlling soil erosion should be implemented for the temporary stockpiling sites of earthwork and aggregates;
- (8) Earth stockpiles should be covered with tarpaulins or plastic film, where possible, for prevention of stormwater scours and also control of dust pollution;
- (9) The soil and water conservation measures should be implemented simultaneously with the other measures to achieve the desired effect;
- (10) Upon completion of the construction works, top soil should be leveled in time and surface vegetation restored to reduce the excavated area.

## **8.2 Quarries and borrowing sites**

Sand and gravels needed for the construction works are usually sourced from qualified quarries. In this Project, sand and gravels needed for the construction works are purchased from quarries with official business licenses in the region where this project is located, but strict actions should be taken to manage and control noises and dust generated in the course of loading and unloading and transportation of such materials as well as the stockpiling process in the construction sites.

Since this component mainly comprises of rehabilitation of existing dike, based on the engineering characteristics of the project component and the environmental characteristics of the project area, a borrowing site with a land area of 16.85hm<sup>2</sup> located 1000m east of Hezhou Electronic Technology Ecological Industrial Park is to be utilized. The borrowing site belongs to the low-hill terrain and the landform types

mainly include grassland and eucalyptus forest land.

Attention should be paid to dust suppression through water spraying in the operation process of the borrowing site to reduce dust pollution caused by earthwork excavation. Necessary interception and drainage facilities should be constructed in advance before the operation of the borrowing site. Top soil generated from excavation should be preserved and used for land rehabilitation. Such top soil should be stockpiled temporarily on a relatively flat area on the construction site and fenced up with bagged earth cofferdam. Temporary gutters and sand sedimentation measures should be provided around the stockpiles. The stockpiled top soil should be covered with dust prevention nets and reused for borrowing site restoration upon completion of the construction activities.

### **8.3 Soil-spoiling and waste disposal sites**

Construction wastes and debris generated in the construction process mainly include construction wastes and waste soil (including some mellow soil). The construction wastes will be utilized in a comprehensive way together with the simultaneously implemented dike and road and pipeline construction works. A waste disposal site will be provided 500m south of Guang-He Expressway to the southwest of Donglu Village with a total land occupation area of 7.40hm<sup>2</sup>. This site will be mainly used for stockpiling of residual top soil, unusable earthwork and stone materials, soft soil and construction debris. The residual waste soil from the small waterworks construction component will be transported to this waste disposal site for disposal.

Windproof and stormproof measures should be taken on temporary waste (debris) disposal sites, which, when necessary, should be fenced up and sprayed with water periodically for dust suppression and covered with tarpaulins in bad weathers. Waste soil (debris) eligible for comprehensive utilization should be utilized in time and the residual waste soil (debris) should be removed out of site in time. Waste soil (debris) during transportation should be covered with tarpaulins and transported along planned routes and at scheduled time to minimize environmental impacts on sensitive spots (areas).

## **9. Ecological protection management**

- (1) A reasonable construction organization plan should be developed for the construction works at each river section so that the construction activities are implemented and phased on a section-by-section basis and cumulative impacts arising from simultaneous construction on multiple construction sites can be avoided. Industrial and domestic wastewater generated from the construction process should be subject to necessary treatment for compliant discharge; cleaning and maintenance of construction plants should be strengthened to avoid pollution of water systems.
- (2) Construction materials outsourced for the construction works, such as stone, sand, cement, etc., should be transported on a demand-driven basis to minimize land occupation and vegetation damage. Upon completion of the construction works, the construction sites should be cleaned and landscaped

in time to restore damaged vegetation to the maximum extent.

- (3) Occupation of river banks should be subject to strict control and construction camps and construction material stockpiling sites must not be located on river banks.
- (4) Upon the completion of the dike reinforcement and revetment works, landscaping of dike and revetment should be considered with priority and should be reasonably combined with cement concrete and masonry works. An ecological corridor should be developed through the integration of revetment landscaping and river bank landscaping.
- (5) Temporary interception ditches should be constructed on the construction site to provide a flood diversion canal for the surface runoff passage damaged by the Project so as to divert flood formed in rain season and avoid runoff scours.
- (6) The construction contractor should minimize the duration of temporary land occupation and control the earthwork construction time provided that the construction quality is assured and a stable excavation and fill slope should be maintained to reduce impacts on areas outside the construction area of the Project.
- (7) Restoration of the construction sites should be carried out prior to the final acceptance of the Project.
- (8) In order to reduce impacts of the construction operations on fish, specialists of the respective disciplines or local fishermen with practical experiences should be employed at the consent of local fishery administration authority to provide on-site guidance prior to the commencement of the construction works.
- (9) Stipulations on protection of aquatic organisms should be developed to assure that the construction workers respect the respective requirements of ecological protection. The construction workers should be strictly prohibited to fish or engage in other activities affecting ecological environment and fish protection in the river sections related to the construction works of the Project.

## **10. Social environment management**

In order to mitigate the impacts on the livelihood of local residents due to construction of the small waterworks component, the following environmental impact control measures should be taken:

- (1) The various LAR subsidies should be allocated to the concerned village groups and individuals based on the compensation standards of Guangxi and Hezhou City, the local circumstances and the agreements signed with the LAR affected households. The various compensations should be reasonably allocated and utilized through full promotion of democracy and respect of the basic citizen rights; the arable land and labor force should be reasonably adjusted through full enforcement of the relevant policies.
- (2) Local roads occupied or damaged in the construction stage should be relocated or subject to protective treatment such as pavement rehabilitation

and landscaping. In addition, compensation of a certain amount should be paid to local governments to safeguard the righteous interests of local governments and residents. Gravel roads occupied by the sewage pipeline construction works should be restored upon completion of the respective works. Upon the completion of the sewage pipelines along the river, the occupied gravel roads should be restored.

- (3) Construction and transportation vehicles should avoid the peak hours of local roads to prevent traffic congestion and accidents.
- (4) Prior to the completion and operation of the Project, connections with the existing roads should be implemented and safety signs erected.

## **11. Risk control measures**

The primary risk of dike construction works is construction safety of water-related construction activities. Therefore, the flood season risk control measures and technical codes of construction and operation safety for water-related construction works should be developed and implemented to put hazardous factors likely to arise in the water-related construction works under strict control and assure construction safety of the water related construction works.

### **11.1. Flood season construction risk control measures**

- (1) On the premise that organizational assurances are available, the importance of flood control should be highly recognized and strong efforts of advertisement and safety education should be made to a depth where typhoon and flood risks are controlled and to enable the construction workers to be seriously aware of and act as a group to truly enforce and implement the various flood prevention and control measures.
- (2) In the flood season, staffing arrangements should be made to assure 24-hour non-interrupted on-duty operation and specific personnel should be assigned to listen to weather forecasts so that flood control actions are immediately mobilized and effective measures are taken when any rainstorm, floods or disastrous weathers are forecasted to assure the safety of the construction works, the construction equipment and personal life and properties.
- (3) Records should be properly kept during rainstorms or floods and close attention should be paid to water level and possible impacts on the Project.
- (4) The construction activities should be immediately stopped 2 days ahead of the forecast date of flood arrival and the construction equipment on site should be evacuated to get fully prepared for the coming flood.
- (5) A telecommunication system mainly comprising of mobile and fixed telephones should be set up and all participating staff of the construction works must keep mobile phones accessible 24 hours.
- (6) Woven bags, excavators, power generators, water pumps, dump trucks, life jackets and waterproof flashlights and other respective flood control and

rescue materials and devices should be provided.

## **11.2. Flood control, waterlogging prevention**

- (1) Weather forecast, hydrological forecast and water level monitoring mechanisms should be established as a part of the construction and operation management system of the Project so that physical and human resources needed for flood control and rescue are prepared in time. The flood control and rescue activities in the rescue process should be well implemented according to the professional and technical requirements.
- (2) In the non-flood season, the overflow dam involves a big water depth and improvement of the river water environment will also increase the level of participation in the river. Therefore, safety guardrails and the warning signs should be set up to improve the capacity of drowning prevention. In extreme weathers, local residents should be evacuated within the forecast period.
- (3) A reasonable layout plan should be developed for the construction areas and diesel, engine oil, lubricants, paint and similar materials stored in the construction production areas should be kept far away from the river and appropriate isolation measures should be taken to prevent leakage in the flood season.

## **11.3. Construction safety**

- (1) The construction contractors responsible for construction of flood control and diversion facilities in the flood season should develop and submit to the designated authority specified in the construction contract for approval the respective construction program based on design requirements and engineering needs, which shall be submitted by the EA to the competent department of flood control for approval.
- (2) Dike construction workers and operators should wear protective gloves and other necessary labor protection devices. Construction workers on site must wear safety helmets and those working on the revetment slope must wear safety ropes. Safety fences should be erected on the levee crest to prevent possible falls.
- (3) In the event of an overstandard flood, the emergency response plan should be triggered and emergency response actions taken in a timely manner.
- (4) Operators on the construction vessels should strictly abide by the national laws, regulations and standards on water operations.
- (5) Actions should be taken to assure stability of pit walls during earth excavation; and bottom digging should be banned during facade excavation.
- (6) Production safety advertisement boards and signs and marks should be erected on construction sites. Safety signs warning against “Deep Water, No Swimming, Drowning Danger” and other dangers and risk and construction

road signs should be provided at obvious locations around water pits generated from dike foundation pits that are not backfilled in time.

## **12. Public participation**

The construction contractors should provide adequate information to the public in the affected area, in particular, local residents likely to be directly affected by the construction activities in the project area. Key measures to be taken include:

- (1) Setting up a bulletin board at the entrance of the construction site to disclose information such as project name, key construction works, construction time as well as the contact person and contact information for complaints and advices;
- (2) Making arrangements for site environment engineer to answer questions from the public on environmental protection;
- (3) Fulfilling the relevant formalities for and disclose to the local residents information on any nighttime construction required for the sake of construction technology and workmanship. Information to be disclosed in such cases include beginning and ending time of as well as the permit granted by the environmental protection authority in nighttime construction.
- (4) A public announcement should be posted at least five days in advance at the construction site as well as the premises of affected households and enterprises to notify the public of the beginning and ending time of any possible suspension of municipal services (including water supply, power supply, telephone and bus service) needed for the implementation of the construction works.
- (5) All feedbacks, comments and questions from the public should be recorded and archived. Questions raised by the public should be answered and responded in a timely manner, with the results of answers and responses recorded and archived for future inspection by the supervision unit.

## **13. Construction traffic management**

Temporary increase of traffic caused by the construction activities will bring noise impacts and daily life inconvenience for local residents along the transportation routes. Therefore, the following construction traffic management measures are proposed in this ECOP.

- (1) A reasonable construction schedule should be developed to shorten the time of temporary land occupation.
- (2) Enclosed transportation vehicles must be used for transportation of earth, debris and construction wastes.
- (3) Transportation of construction materials at night time should be prohibited on

any construction access road with a centralized area of residence in a distance of less than 50m.

- (4) Construction and transportation vehicles should avoid the peak hours of local roads to prevent traffic congestion and accidents.
- (5) Construction vehicles should travel along designated routes and unauthorized change of routes is prohibited to avoid possible damages to farmland and forest land.

## **14. Supervision plan**

Responsibilities of construction supervision should be incorporated into the environment supervision of the Dike Construction to implement total quality management of the Project following the requirements of both construction quality and environment quality.

### **14.1. Scope of construction supervision**

Areas of and along the Project, mainly construction sites, borrowing sites and concrete mixing plants causing environmental pollution to the surrounding environment due to production and construction.

### **14.2. Contents of construction supervision**

- (1) Reviewing and verifying whether the environmental protection measures proposed in this ECOP are incorporated in the design proposal and the construction drawing design;
- (2) Assisting the executive unit in organizing environmental protection training for construction and management staff;
- (3) Reviewing clauses on environmental protection in the project contract;
- (4) Carrying out the supervision of water, sound and air environment quality in the construction process, the environmental impact mitigation measures and the environmental protection works and organizing staged acceptance based on the respective standards;
- (5) Keeping systematic records of the environmental impacts of the construction activities, effects of the environmental protection measures and the implementation status of the environmental protection activities;
- (6) Giving timely feedbacks to the construction supervision team on the relevant environmental protection measures and any unanticipated issues arising in the construction process and recommending solutions;
- (7) Responsible for preparing the construction supervision plans and summary reports.

### **14.3. Terms of reference for construction supervision**

- (1) A sound and robust safeguard system should be set up for construction supervision.

It is required that a full-time environmental protection personnel should be assigned in the construction supervision team to conduct total quality management in accordance with the construction quality and environmental quality requirements. The environmental protection and construction supervision work of the Project will be supervised by the Municipal PMO, environmental specialist and the environmental protection bureau.

- (2) Environmental protection management methods as well as their detailed rules of implementation should be developed.

Environmental protection regulations, such as environmental protection management methods and the detailed rules of implementation of the environmental protection work should be developed based on the specific characteristics of the Project.

- (3) A sound work procedure for construction supervision should be established.

- a) Work record system, i.e. the "Supervision Diary", which describes the results of inspection, environmental problems and cause analysis and responsible units as well as the preliminary solution, etc.
- b) The various environmental protection checklists specified in the ECOP annexes should be prepared on a periodical basis.
- c) Corrective measures should be proposed to any environmental problems existing in the construction activities of the construction contractor and their implementation status should be followed up with, including issuing notices of corrective actions, checklists and archiving of inspection documents.
- d) Reports on the implementation status of the Project should be submitted to the Owner on a weekly basis.

## **15. Construction safety and health**

The construction contractor is obliged to respect all national and local safety requirements and take other measures to avoid accidents and assure the safety and health of the construction workers.

- (1) The construction contractor should ensure that qualified first aid is available. Appropriate first aid devices should be provided at the construction sites and documented emergency handling procedure should be developed for remote sites so that the patient can be transferred to a suitable medical institution;
- (2) Occupational health and safety training should be provided all newly recruited construction workers to introduce to them basic work rules on the construction site, rules of personal protection and how to prevent the other staff members from being injured;
- (3) Warning signs should be attached on all powered electric devices and wires; all



electricity wires, cables and electric tools on hand should be checked for any damaged or exposed wires and the maximum permissible operating voltage of tools on hand should be determined in accordance with the manufacturer's recommendations. All electrical equipment operating in humid (or possibly humid) environment should be double-insulation / grounded;

- (4) Appropriate eye protection devices (such as welding goggles and / or masks) should be provided for all operators participating or assisting in the welding operations.
- (5) Guardrails (with middle and peripheral baffles) should be installed at the edge of all vulnerable and dangerous areas. In addition, the construction workers should be provided with fall prevention devices (including safety belts and distance limiting ropes).
- (6) The construction contractor should determine and provide the construction workers with appropriate personal protective devices that can adequately protect the workers themselves, other workers and occasional visitors and should not bring unnecessary inconvenience to the user.
- (7) Health education should be provided to construction workers, e.g. implementing information communication strategies, enhancing face-to-face counseling, addressing systemic problems that affect individual behavior and encouraging individuals to take protective measures and use condoms to avoid spreading diseases to others; in addition, the construction workers should be encouraged to use insect repellent, clothing, mosquito nets and other blocking methods to avoid disease spreading via mosquito bites.

## **16. Traffic safety**

The project staff must maintain traffic safety while traveling and leaving the workplace and operating the project equipment on free roads or public roads. The security measures to prevent and control the injury and death of traffic accidents should be designed to protect project workers and road users and victims of road traffic accidents. Based on the size and nature of the project activities, the following safety actions should be taken:

- (1) Safety education and training should be organized on a periodical basis to particularly make the drivers aware of the importance of safe driving.
- (2) To avoid fatigue driving, actions should be taken to limit driving time and make sure drivers drive in turns. To minimize traffic accidents, driving on dangerous roads and time periods should be avoided.
- (3) Vehicles should be regularly maintained using manufacturer-approved spare parts, which should be purchased in a timely manner to prevent possible serious accidents due to equipment faults or premature failure of spare parts.
- (4) Separation of pedestrian and motor vehicles should be realized.
- (5) Traffic safety control measures should be taken and road signs and signal should be used to warn pedestrians and vehicles of any traffic dangers; road signs may be improved through cooperation with the local community and the competent authorities improve visibility of road signs and enhance traffic safety in an all-around way.
- (6) Traffic safety and pedestrian safety education should be conducted in the communities in the vicinity of the project area and schools.

- (7) To assure that appropriate first aid is provided in case of any accidents, communications should be kept with the emergency response workers.
- (8) Locally purchased materials should be used where possible to minimize transportation distance;
- (9) Driving techniques should be improved and it must be regarded as a mandatory requirement that drivers must hold licenses.

## **17. Environmental protection training and education**

- (1) Prior to the commencement of the Project, the Municipal PMO should assign an environmental specialist to provide environmental protection training for the contractors and construction supervision agencies of the Dike Construction;
- (2) Prior to the commencement of the Dike Construction, the contractor should organize training and examinations for the operators on the construction sites on laws and regulations on environmental protection and health and sanitation;
- (3) The contractor of the Dike Construction should organize staff training on the risk emergency response plan as well as emergency response rehearsals on a yearly basis.

**Annex Table 1: Summary of Environmental Protection Measures**

Item		Environmental protection measures
ECOP in the stage of construction site preparation		(1) Effective measures for prevention and control of air, water, noise, solid waste pollution and soil erosion and improvement of environmental sanitation should be included in the construction organization design of the Project.
		(2) The environmental protection measures included in the construction organization design should be implemented in the construction process to assure that the quality of the ambient air, surface water and acoustic and ecological environment in the project area satisfies the requirements of the functional zone and is subject to supervision by the environment supervision unit and management unit.
		(3) Environmental protection and environmental sanitation management and inspection system must be set up on the construction sites and inspection records should be properly maintained.
		(4) The construction contractor should take effective measures for prevention and control of occupational diseases and provide the operators with necessary protective devices and organize physical examination and training for workers engaged in operations involving hazards of occupational diseases (at least once a year).
		(5) The construction contractors should take account of the seasonal characteristics and take effective actions to properly implement activities of food hygiene assurance, hot weather and cold weather protection and epidemic prevention.
		(6) Education and training and assessment for operators on construction sites should include contents of laws and regulations related to environmental protection and environmental health.
		(7) Construction contractors should develop public health emergency response plans for the construction sites in accordance with the respective laws and regulations.
ECOP for management of construction sites	Construction areas	(1) The construction area on the construction site should be clearly separated from the office area and the living area with corresponding separating measures and should be kept tidy and in good order.
		(2) Facilities of environmental protection or measures for mitigating environmental impacts should be provided in the construction area and the living area. For example, in the construction area, wastewater sedimentation tanks and measures for dust prevention and noise reduction should be provided; in the office and living areas, facilities for treatment of domestic sewage, canteen wastewater and domestic solid wastes should be available.
		(3) Company name or company logo should be displayed at the entrance and exit of the construction sites. A project introduction bulletin board should be set up at obvious positions at the main entrance and exit and the general layout map of the construction site as well as bulletin boards introducing the rules and regulations on production safety, fire and security protection, environmental protection and civilized construction should be erected inside the main gate.
		(4) A public announcement should be posted at least five days in advance at the construction site as well as the premises of affected households and enterprises to notify the public of the beginning

Item		Environmental protection measures	
		and ending time of any possible suspension of municipal services ( including water supply, power supply, telephone and bus service ) needed for the implementation of the construction works.	
		( 5 ) Existing buildings and infrastructures should be utilized as a priority on the construction sites. If new temporary buildings are needed, land use should be optimized to occupation of land resources. Use of clay bricks in construction of temporary facilities on construction sites is prohibited and the safety and fire protection requirements and relevant national regulations should be respected.	
		( 6 ) Staff dormitories must not be located in buildings under construction.	
		( 7 ) All temporary facilities should be demolished within one month as of the completion of the construction works.	
	Control of environmental impacts of construction access roads	Road dust	( 1 ) Pavement of new access roads and hardening of sites should be handled based on the design usage. For example, reusable load-bearing bricks ( components ) may be used for access roads allowing heavy-duty vehicles while reusable seepage bricks may be used for pavement of ordinary footpaths.
			( 2 ) The access roads should be maintained and cleaned every day and dust-prone sections should be sprayed with water for dust suppression.
		Noise pollution control measures	( 1 ) The construction contractor must select construction equipment and machinery and transportation vehicles conforming to the relevant national standards and select, if possible, low-noise construction plants.
			( 2 ) Maintenance and servicing of the various construction equipment should be strengthened to keep them in fine operation to fundamentally reduce the intensity of noise and vibration sources.
		Ecological impact control measures	( 1 ) Before the construction works is completed, construction access roads used as permanent roads should be repaired with greater efforts; newly constructed temporary access roads should be ecologically restored to at least the pre-construction state.
			( 2 ) Arable top soil stripped during the construction should be stockpiled temporarily on a relatively flat area on the construction site and fenced up with bagged earth cofferdam. Temporary gutters and sand sedimentation measures should be provided around the stockpiles. The stockpiled top soil should be covered with dust prevention nets and reused for ecological restoration upon completion of the construction activities.
			( 3 ) Occupied or damaged local roads should be relocated or subject to protective treatment such as pavement rehabilitation and landscaping. A certain compensation should be paid to the local government to safeguard the rightful interests of local government and residents.
		ECOP for construction camps	( 1 ) The construction area on the construction site should be clearly separated from the office area and the living area with corresponding separating measures and should be kept tidy and in good order.
			( 2 ) Facilities of environmental protection or measures for mitigating environmental impacts should be provided in the construction area and the living area. For example, in the construction area, wastewater sedimentation tanks and measures for dust prevention and noise reduction should be provided; in the office and living

Item		Environmental protection measures
		areas, facilities for treatment of domestic sewage, canteen wastewater and domestic solid wastes should be available. Oil traps and septic tanks and enclosed garbage stations should be provided and used and measures should be available for timely removal of solid wastes.
		(3) Company name or company logo should be displayed at the entrance and exit of the construction sites. A project introduction bulletin board should be set up at obvious positions at the main entrance and exit and the general layout map of the construction site as well as bulletin boards introducing the rules and regulations on production safety, fire and security protection, environmental protection and civilized construction should be erected inside the main gate.
		(4) A public announcement should be posted at least five days in advance at the construction site as well as the premises of affected households and enterprises to notify the public of the beginning and ending time of any possible suspension of municipal services (including water supply, power supply, telephone and bus service) needed for the implementation of the construction works.
		(5) Existing buildings and infrastructures should be utilized as a priority on the construction sites. If new temporary buildings are needed, land use should be optimized to occupation of land resources. Use of clay bricks in construction of temporary facilities on construction sites is prohibited and the safety and fire protection requirements and relevant national regulations should be respected.
		(6) A special storage space should be provided for oils and chemical solvents and other substances stored in the construction sites. Warning signs should be erected; floor should be subject to anti-seepage treatment and absorbing bags, sand and chips among other emergency response materials should be prepared.
		(7) Staff dormitories must not be located in buildings under construction.
		(8) All temporary facilities should be demolished within one month as of the completion of the construction works.
Environment Quality Management	Water environment quality management	(1) Construction and production areas, construction camps, access roads and Soil-spoiling and waste disposal sites should be located as far as possible away from surface waters.
		(2) It is recommended that water-related operations, such as dike construction, river dredging, dike rehabilitation, are implemented in low-water season and the construction time should be shortened where possible to reduce disturbance of the water systems.
		(3) Since the dike construction works involved in this Project are mainly located in the vicinity of the built urban area, it is suggested that the public toilets in the nearby villages are used for the construction camps. If the existing public toilets cannot be used, it is suggested that a centralized public toilet is constructed for the construction camps and septic tanks are provided for treatment of wastewater before reuse in farmland irrigation.
		(4) A sedimentation tank should be provided at the washing site of mixers, concrete pumps and transport vehicles and the wastewater must not be directly discharged into the river and should, instead, reused or used for dust suppression after secondary sedimentation.
		(5) Materials spilled on the construction sites should be cleaned in

Item		Environmental protection measures
		time and measures should be taken for protecting the materials stockpiled on site from storm water scours and drenching and avoid possible pollution of water systems.
		(6) Oily wastewater of the construction plants should be collected in time for treatment and should not be discharged into rivers and water systems. Construction must be suspended in rainy days and the earthwork fill must be covered to avoid possible rainwater scours and pollution of water systems.
	Acoustic environment quality management	(1) Low-noise equipment should be selected to the best possibility in terms of equipment selection and the power and mechanical equipment should be repaired and serviced on a periodical basis.
		(2) Scientific construction plans should be developed and reasonable construction time should be scheduled to best avoid simultaneous use of a large number of high noise equipment. In addition, the construction time of high-noise equipment ( e.g. excavators, mixers, etc. ) should be arranged in daytime and nighttime construction should be avoided (22:00 to 06:00) .
		(3) Handling and transportation of in-situ concrete and bulk materials should be reduced in night time. If continuous operation is needed on special occasions such as dike construction, measures of noise reduction should be taken and the local residents should be notified of the construction time and place and a report submitted to the EPB before the construction proceeds.
		(4) Mobile sound barriers should be provided by the construction contractors at noise sensitive sites to reduce the impacts of construction noises.
		(5) The mechanical equipment should be operated according to the respective stipulations and the codes of operation should be followed in the process of baffle and rack removal. Upon material loading and unloading, noise of collision should be reduced.
		(6) To avoid excessively high noise level at a certain spot, actions should be taken to avoid the arrangement of a large number of power and mechanical equipment at the same site.
		(7) The executive unit should coordinate with the local residents together with the construction contractor and disclose information on the construction timetable. A prior notice should be given to the affected organizations and residents before the operation starts and information on the construction progress as well as measures taken during construction for reducing noise should also be provided to them to obtain mutual understanding. In addition, complaint hotlines should be set up during the construction process to handle and respond positively to complaints about noise disturbances.
	Ambient air environment quality management	(1) Sediments, earthwork, debris and construction wastes must be transported in enclosed vehicles and vehicle washing facilities must be provided at entrances and exits of construction sites to make sure the vehicles are washed and cleaned to avoid possible take-away of mud and debris out of the site.
		(2) Effective measures of covering, hardening, landscaping and water spraying should be taken on the construction sites; dust generated on construction sites and roads should be prevented and controlled through water spraying and cleaning.
		(3) Cement and other fugitive fine-particle construction materials should be stored in an enclosed space and lime and sand on the construction sites should be stockpiled on a centralized site and

Item		Environmental protection measures
		properly covered.
		(4) Backfill and transfer of sediments and earth and other construction activities likely to cause dust pollution should not be conducted in days with a wind scale of Grade 4 or above.
		(5) Vegetation should be restored on temporarily occupied land parcels at the end of the temporary occupation to prevent soil erosion.
		(6) Construction plants and vehicles with low energy consumption and low pollutant emission should be selected where possible and tail gas purification devices should be installed for vehicles with non-compliant tail gas emission. Management and maintenance of machinery and vehicles should be strengthened to reduce air pollution caused by poor performance of machinery and vehicles.
	Solid waste management	(1) The waste soil contains a certain portion of mellow soil, which should be used in wasteland reclamation and forestation of the project area. The remaining soil may be used as subgrade fill of the dike construction works and bedding fill on both sides of channels in the vicinity.
		(2) Removal of construction wastes should be carried out with a closed container and random casting is prohibited. The construction wastes should be stored by type in accordance with the relevant classification management requirements of municipal wastes and should be cleared and digested in a timely manner.
		(3) Construction wastes (including excavation earth) should be transported to a designated waste disposal site for storage and disposal.
		(4) Domestic wastes should be collected in the garbage bins and bags provided on the construction sites and then transported to a designated waste disposal site for storage and disposal;
		(5) Burning of toxic and hazardous substances is not permitted on construction sites. Toxic and hazardous substances should be disposed according to the relevant requirements and stipulations.
		(6) Material transportation should avoid the peak traffic hours at the sensitive sites and appropriate protection measures should be taken to alleviate traffic pressure and reduce material spillage and leakage and possible secondary dust pollution resulting from material transportation.
	Soil erosion control	(1) Temporary stockpiling sites in the construction process should be located on the land occupation area on the river banks where possible to minimize occupation of land in other locations.
		(2) Such temporary stockpiling sites should be located on waste and poor land and far away from villages and sensitive objects and riverway to minimize impacts on water quality of the rivers.
		(3) Upon completion of the construction works, surfacing clearing should be carried out and soil and water conservation measures should be taken for the temporary stockpiling sites, which may be restored into greenbelts after soil improvement;
		(4) The existing riverside roads should be utilized where possible. If it is necessary to open new access roads, heavy excavation and fill should be avoided and efforts should be made in soil and water conservation to reduce soil erosion and ecological damages.
		(5) Trees and grasses should be planted upon the completion of the construction works;
		(6) Damages to surface vegetation should be minimized and the construction sites should be leveled properly;

Item		Environmental protection measures
		(7) Fences, drainage gutters and other measures effectively preventing and controlling soil erosion should be implemented for the temporary stockpiling sites of earthwork and aggregates;
		(8) Earth stockpiles should be covered with tarpaulins or plastic film, where possible, for prevention of stormwater scours and also control of dust pollution;
		(9) The soil and water conservation measures should be implemented simultaneously with the other measures to achieve the desired effect;
		(10) Upon completion of the construction works, top soil should be leveled in time and surface vegetation restored to reduce the excavated area.
	Quarries, borrowing sites	Attention should be paid to dust suppression through water spraying in the operation process of the borrowing site to reduce dust pollution caused by earthwork excavation. Necessary interception and drainage facilities should be constructed in advance before the operation of the borrowing site. Top soil generated from excavation should be preserved and used for land rehabilitation. Such top soil should be should be stockpiled temporarily on a relatively flat area on the construction site and fenced up with bagged earth cofferdam. Temporary gutters and sand sedimentation measures should be provided around the stockpiles. The stockpiled top soil should be covered with dust prevention nets and reused for borrowing site restoration upon completion of the construction activities.
	Waste (debris) disposal sites	Windproof and stormproof measures should be taken on temporary waste (debris) disposal sites, which, when necessary, should be fenced up and sprayed with water periodically for dust suppression and covered with tarpaulins in bad weathers. Waste soil (debris) eligible for comprehensive utilization should be utilized in time and the residual waste soil (debris) should be removed out of site in time. Waste soil (debris) during transportation should be covered with tarpaulins and transported along planned routes and at scheduled time to minimize environmental impacts on sensitive spots (areas).
Ecological protection management		(1) A reasonable construction organization plan should be developed for the construction works at each river section so that the construction activities are implemented and phased on a section-by-section basis and cumulative impacts arising from simultaneous construction on multiple construction sites can be avoided. Industrial and domestic wastewater generated from the construction process should be subject to necessary treatment for compliant discharge; cleaning and maintenance of construction plants should be strengthened to avoid pollution of water systems.
		(2) Construction materials outsourced for the construction works, such as stone, sand, cement, etc., should be transported on a demand-driven basis to minimize land occupation and vegetation damage. Upon completion of the construction works, the construction sites should be cleaned and landscaped in time to restore damaged vegetation to the maximum extent.
		(3) Occupation of river banks should be subject to strict control and construction camps and construction material stockpiling sites must not be located on river banks.
		(4) Upon the completion of the dike reinforcement and revetment works, landscaping of dike and revetment should be considered with priority and should be reasonably combined with cement concrete and masonry works. An ecological corridor should be developed through the integration of revetment landscaping and



Item		Environmental protection measures
		river bank landscaping.
		(5) Temporary interception ditches should be constructed on the construction site to provide a flood diversion canal for the surface runoff passage damaged by the Project so as to divert flood formed in rain season and avoid runoff scours.
		(6) The construction contractor should minimize the duration of temporary land occupation and control the earthwork construction time provided that the construction quality is assured and a stable excavation and fill slope should be maintained to reduce impacts on areas outside the construction area of the Project.
		(7) Restoration of the construction sites should be carried out prior to the final acceptance of the Project.
		(8) In order to reduce impacts of the construction operations on fish, specialists of the respective disciplines or local fishermen with practical experiences should be employed at the consent of local fishery administration authority to provide on-site guidance prior to the commencement of the construction works.
		(9) Fish breeding should be implemented according to the construction scale of the Project and the level of impacts on fish resources.
		(10) Stipulations on protection of aquatic organisms should be developed to assure that the construction workers respect the respective requirements of ecological protection. The construction workers should be strictly prohibited to fish or engage in other activities affecting ecological environment and fish protection in the river sections related to the construction works of the Project.
Social environment management		(1) The various LAR subsidies should be allocated to the concerned village groups and individuals based on the compensation standards of Guangxi and Hezhou City, the local circumstances and the agreements signed with the LAR affected households. The various compensations should be reasonably allocated and utilized through full promotion of democracy and respect of the basic citizen rights; the arable land and labor force should be reasonably adjusted through full enforcement of the relevant policies.
		(2) Local roads occupied or damaged in the construction stage should be relocated or subject to protective treatment such as pavement rehabilitation and landscaping. In addition, compensation of a certain amount should be paid to local governments to safeguard the righteous interests of local governments and residents. Gravel roads occupied by the sewage pipeline construction works should be restored upon completion of the respective works. Upon the completion of the sewage pipelines along the river, the occupied gravel roads should be restored.
		(3) Construction and transportation vehicles should avoid the peak hours of local roads to prevent traffic congestion and accidents.
		(4) Prior to the completion and operation of the Project, connections with the existing roads should be implemented and safety signs erected.
Risk control	Flood season construction disk control	(1) On the premise that organizational assurances are available, the importance of flood control should be highly recognized and strong efforts of advertisement and safety education should be made to a depth where typhoon and flood risks are controlled and to enable

Item		Environmental protection measures
		the construction workers to be seriously aware of and act as a group to truly enforce and implement the various flood prevention and control measures.
		(2) In the flood season, staffing arrangements should be made to assure 24-hour non-interrupted on-duty operation and specific personnel should be assigned to listen to weather forecasts so that flood control actions are immediately mobilized and effective measures are taken when any rainstorm, floods or disastrous weathers are forecasted to assure the safety of the construction works, the construction equipment and personal life and properties.
		(3) Records should be properly kept during rainstorms or floods and close attention should be paid to water level and possible impacts on the Project.
		(4) The construction activities should be immediately stopped 2 days ahead of the forecast date of flood arrival and the construction equipment on site should be evacuated to get fully prepared for the coming flood.
		(5) A telecommunication system mainly comprising of mobile and fixed telephones should be set up and all participating staff of the construction works must keep mobile phones accessible 24 hours.
		(6) Woven bags, excavators, power generators, water pumps, dump trucks, life jackets and waterproof flashlights and other respective flood control and rescue materials and devices should be provided.
	Flood control, waterlogging prevention	(1) Weather forecast, hydrological forecast and water level monitoring mechanisms should be established as a part of the construction and operation management system of the Project so that physical and human resources needed for flood control and rescue are prepared in time. The flood control and rescue activities in the rescue process should be well implemented according to the professional and technical requirements.
		(2) In the non-flood season, the overflow dam involves a big water depth and improvement of the river water environment will also increase the level of participation in the river. Therefore, safety guardrails and the warning signs should be set up to improve the capacity of drowning prevention. In extreme weathers, local residents should be evacuated within the forecast period.
		(3) A reasonable layout plan should be developed for the construction areas and diesel, engine oil, lubricants, paint and similar materials stored in the construction production areas should be kept far away from the river and appropriate isolation measures should be taken to prevent leakage in the flood season.
	Construction safety	(1) The construction contractors responsible for construction of flood control and diversion facilities in the flood season should develop and submit to the designated authority specified in the construction contract for approval the respective construction program based on design requirements and engineering needs, which shall be submitted by the EA to the competent department of flood control for approval.

Item		Environmental protection measures
		(2) Dike construction workers and operators should wear protective gloves and other necessary labor protection devices. Construction workers on site must wear safety helmets and those working on the revetment slope must wear safety ropes. Safety fences should be erected on the levee crest to prevent possible falls.
		(3) In the event of an overstandard flood, the emergency response plan should be triggered and emergency response actions taken in a timely manner.
		(4) Operators on the construction vessels should strictly abide by the national laws, regulations and standards on water operations.
		(5) Actions should be taken to assure stability of pit walls during earth excavation; and bottom digging should be banned during facade excavation.
		(6) Production safety advertisement boards and signs and marks should be erected on construction sites. Safety signs warning against “Deep Water, No Swimming, Drowning Danger” and other dangers and risk and construction road signs should be provided at obvious locations around water pits generated from dike foundation pits that are not backfilled in time.
Public participation	(1) Setting up a bulletin board at the entrance of the construction site to disclose information such as project name, key construction works, construction time as well as the contact person and contact information for complaints and advices;	
	(2) Making arrangements for site environment engineer to answer questions from the public on environmental protection;	
	(3) Fulfilling the relevant formalities for and disclose to the local residents information on any nighttime construction required for the sake of construction technology and workmanship. Information to be disclosed in such cases include beginning and ending time of as well as the permit granted by the environmental protection authority on nighttime construction.	
	(4) A public announcement should be posted at least five days in advance at the construction site as well as the premises of affected households and enterprises to notify the public of the beginning and ending time of any possible suspension of municipal services（including water supply, power supply, telephone and bus service）needed for the implementation of the construction works.	
	(5) All feedbacks, comments and questions from the public should be recorded and archived. Questions raised by the public should be answered and responded in a timely manner, with the results of answers and responses recorded and archived for future inspection by the supervision unit.	
Construction traffic management	(1) A reasonable construction schedule should be developed to shorten the time of temporary land occupation.	
	(2) Enclosed transportation vehicles must be used for transportation of earth, debris and construction wastes.	
	(3) Transportation of construction materials at night time should be prohibited on any construction access road with a centralized area of residence in a distance of less than 50m.	
	(4) Construction and transportation vehicles should avoid the peak	

Item	Environmental protection measures
	hours of local roads to prevent traffic congestion and accidents.
	(5) Construction vehicles should travel along designated routes and unauthorized change of routes is prohibited to avoid possible damages to farmland and forest land.
Construction safety and health	(1) Warning signs or instructions should be provided at operation positions, equipment and sites prone to occupational hazards on the construction sites.
	(2) Occupational health training and physical examination should be organized on a periodical basis for staff handling toxic and hazardous substances and guidance should be provided on correct use of occupational disease prevention devices and personal labor protection devices.
	(3) The construction contractor should provide the construction workers with safety helmets, safety belts and personal labor protection devices, such as safety boots, working clothing, etc. compatible to the operations they are engaged in.
	(4) Low-noise equipment should be selected and automated and enclosed construction technologies should be promoted on construction sites to reduce machinery noises. Operators should wear ear plugs during operation for hearing protection.
	(5) Forced ventilation facilities should be provided in operation areas where good natural ventilation is not guaranteed due to the presence of corrosion resistance or waterproofing operations. Operators working in sites involving toxic and hazardous gases should wear gas masks or protective masks.
	(6) Water spraying facilities should be provided in dusty operation sites reduce the dust concentration and operators should wear dust masks; operators in welding operations should wear protective masks, goggles and gloves and other personal protective equipment.
	(7) Summer cooling supplies should be provided on construction sites where high-temperature operations are involved and reasonable arrangements should be made for work and rest timetable.
Traffic safety	(1) Safety education and training should be organized on a periodical basis to particularly make the drivers aware of the importance of safe driving.
	(2) To avoid fatigue driving, actions should be taken to limit driving time and make sure drivers drive in turns. To minimize traffic accidents, driving on dangerous roads and time periods should be avoided.
	(3) Vehicles should be regularly maintained using manufacturer-approved spare parts, which should be purchased in a timely manner to prevent possible serious accidents due to equipment faults or premature failure of spare parts.
	(4) Separation of pedestrian and motor vehicles should be realized.
	(5) Traffic safety control measures should be taken and road signs and signal should be used to warn pedestrians and vehicles of any traffic dangers; road signs may be improved through cooperation with the local community and the competent authorities improve visibility of road signs and enhance traffic safety in an all-around way.
	(6) Traffic safety and pedestrian safety education should be conducted in the communities in the vicinity of the project area and schools.
	(7) To assure that appropriate first aid is provided in case of any accidents, communications should be kept with the emergency response workers.

Item	Environmental protection measures
	(8) Locally purchased materials should be used where possible to minimize transportation distance;
	(9) Driving techniques should be improved and it must be regarded as a mandatory requirement that drivers must hold licenses.
Environmental protection training and education	(1) Prior to the commencement of the Project, the Municipal PMO should assign an environmental specialist to provide environmental protection training for the contractors and construction supervision agencies of the Dike Construction;
	(2) Prior to the commencement of the Dike Construction, the contractor should organize training and examinations for the operators on the construction sites on laws and regulations on environmental protection and health and sanitation;
	(3) The contractor of the Dike Construction should organize staff training on the risk emergency response plan as well as emergency response rehearsals on a yearly basis.
	(4) The dike construction contractor should organize occupational health training and physical examination on a half-year basis for operators handling toxic and hazardous substances and provide guidance on correct use of occupational disease prevention devices and personal labor protection devices.

## Annex Table 2: Construction Site Checklist Prior to Mobilization

Name of subproject:

Contract No. and Subproject

Location:

Name of construction site:

Weather condition:

Checked by:

Date of construction site check:

S.N	Environmental issues	Yes	No	N/A	Note / Recommended actions
1	Is the Project located in a national / provincial/ county-level nature reserve? (If yes, the Project should be cancelled.)				
2	Is the Project located in an experimental zone of a national / provincial / county-level nature reserve? (If yes, the Project is eligible for construction, but permits from the concerned authorities are mandatory.)				
3	Will land acquisition for the Project cause significant deterioration or changes of the natural environment of a protection area, a recommended protection area or an area with unique ecological significance?				
4	Will the Project cause temporary or permanent relocation of or impacts of any other forms on the national / provincial or recommended national / provincial physical and cultural resources or physical and cultural resources identified through discussions with the APs?				
5	Does the Project involve any physical and cultural resources that are extremely sensitive for local residents (e.g. tombs)?				
6	Are there any known archaeological, historical or cultural relics (including ancient tombs, mausoleums) in the project area?				
7	Are there any endangered species (aquatic or terrestrial) in the project area?				
8	Are there any natural habitats in the project area?				
9	Are there any wetlands or saturated soil zones (permanent or temporary) in the project area?				
10	Will the construction of the Project cause any short-term impacts on the villagers' rights of use of the infrastructures, services and relevant resources?				
11	Are there a large number of objects of environmental				

	protection (hospitals, schools, residential areas, villages, etc.) in the project-affected area?				
12	Is transplanting needed for the sidewalk trees involved in the Project?				
13	Are there any existing power supply facilities (cables, poles, transformers), telecommunication facilities, water supply and drainage facilities and heating facilities in the construction site of the Project?				
14	Are there any conflicts with local traffic due to use of access roads (urban roads) for constructional purposes?				
15	Others (Please specify)				

## Annex Table 3: Checklist for Environment Protection Inspection on Construction Sites

Guangxi Hezhou Urban Water Infrastructure  
and Environment Improvement Project

Instructions:

This table is the checklist for environmental protection inspections in the construction stage of the Dike Construction of Guangxi Hezhou Urban Water Infrastructure and Environment Improvement Project and includes the environmental protection measures tailored to the specific subprojects and the local environmental conditions, which may be added or adjusted if necessary.

Name of subproject:

Name of construction site:

Current construction stage:

Date of environmental protection inspection:

Weather condition:

Checked by:

Inspection Item		Implementation Status			Note
		Yes	No	N/A	
ECOP for construction site preparation	(1) Whether effective measures for prevention and control of air, water, noise, solid waste pollution and soil erosion and improvement of environmental sanitation are included in the construction organization design of the Project?				
	(2) Whether the environmental protection measures included in the construction organization design are implemented in the construction process to assure that the quality of the ambient air, surface water and acoustic and ecological environment in the project area satisfies the requirements of the functional zone and is subject to supervision by the environment supervision unit and management unit?				
	(3) Whether an environmental protection and environmental sanitation management and inspection system is set up on the construction sites and inspection records properly maintained?				
	(4) Whether the construction contractor takes effective measures for prevention and control of occupational diseases and provides the operators with necessary				



Inspection Item		Implementation Status			Note
		Yes	No	N/A	
		protective devices and organize physical examination and training for workers engaged in operations involving hazards of occupational diseases (at least once a year)?			
		(5) Whether the construction contractors take account of the seasonal characteristics and take effective actions to properly implement activities of food hygiene assurance, hot weather and cold weather protection and epidemic prevention?			
		(6) Whether education and training and assessment for operators on construction sites include contents of laws and regulations related to environmental protection and environmental health?			
		(7) Whether the construction contractors develop public health emergency response plans for the construction sites?			
ECOP for management of construction sites	Construction area	(1) Whether the construction areas on the construction site are clearly separated from the office area and the living area corresponding separating measures and are kept tidy and in good order?			
		(2) Whether facilities of environmental protection or measures for mitigating environmental impacts are provided in the construction area and the living area? For example, in the construction area, wastewater sedimentation tanks and measures for dust prevention and noise reduction are provided; in the office and living areas, facilities for treatment of domestic sewage, canteen wastewater and domestic solid wastes are available.			
		(3) Whether company name or company logo are displayed at the entrance and exit of the construction sites? Whether a project introduction bulletin board is set up at obvious positions at the main entrance and exit and the general layout map of the construction site as well as bulletin boards introducing the rules and regulations on production safety, fire and security protection, environmental protection and civilized construction are erected inside the main gate?			
		(4) Whether a public announcement is posted at least five days in advance at the construction site as well as the premises of affected households and enterprises to notify the public of the beginning and ending time of any possible suspension of municipal services (including water			

Inspection Item		Implementation Status			Note
		Yes	No	N/A	
Environmental impact control for access roads		supply, power supply, telephone and bus service) needed for the implementation of the construction works?			
		(5) Whether existing buildings and infrastructures are utilized as a priority on the construction sites? whether land use is optimized to occupation of land resources if new temporary buildings are needed? whether use of clay bricks in construction of temporary facilities on construction sites is prohibited and the safety and fire protection requirements and relevant national regulations are respected?			
		(6) Whether any staff dormitories are located in buildings under construction?			
		(7) Whether all temporary facilities are demolished within one month as of the completion of the construction works?			
	Road dust	(1) Whether newly constructed access roads are hardened against their designed usages?			
		(2) Whether the access roads are maintained and cleaned every day and dust-prone sections sprayed with water for dust suppression?			
	Noise pollution control measures	(1) Whether the construction contractor selects construction equipment and machinery and transportation vehicles conforming to the relevant national standards and select, if possible, low-noise construction plants?			
		(2) Whether the various construction equipment is maintained and serviced properly?			
	Ecological impact control measures	(1) Whether newly constructed access roads are repaired before the construction works is completed and restored to at least the pre-construction state?			
		(2) Whether arable top soil stripped during the construction is stockpiled temporarily on a relatively flat area on the construction site and fenced up with bagged earth cofferdam? Whether temporary gutters and sand sedimentation measures are provided around the stockpiles and the stockpiled top soil is covered with dust prevention nets and reused for ecological restoration upon completion of the construction activities?			
		(3) Whether the occupied or damaged local roads are relocated or subject to protective treatment such as pavement rehabilitation and landscaping after the construction works is completed? Whether certain compensation is paid to local governments to safeguard the righteous interests of both			

Inspection Item				Implementation Status			Note
				Yes	No	N/A	
			local governments and residents?				
ECOP for construction camps	(1)	Whether the construction area on the construction site are separated from the office area and the living area with corresponding separating measures and are kept tidy and in good order?					
	(2)	Whether facilities of environmental protection or measures for mitigating environmental impacts are provided in the construction area and the living area?					
	(3)	Whether company name or company logo are displayed at the entrance and exit of the construction sites? Whether a project introduction bulletin board is set up at obvious positions at the main entrance and exit and the general layout map of the construction site as well as bulletin boards introducing the rules and regulations on production safety, fire and security protection, environmental protection and civilized construction are erected inside the main gate?					
	(4)	Whether a public announcement is posted at least five days in advance at the construction site as well as the premises of affected households and enterprises to notify the public of the beginning and ending time of any possible suspension of municipal services needed for the implementation of the construction works?					
	(5)	Whether use of clay bricks in construction of temporary facilities on construction sites is prohibited and the safety and fire protection requirements and relevant national regulations are respected?					
	(6)	Whether a special storage space is provided for oils and chemical solvents and other substances stored in the construction sites? Whether warning signs are erected, floor is subject to anti-seepage treatment and absorbing bags, sand and chips among other emergency response materials are prepared?					
	(7)	Whether staff dormitories are located in buildings under construction?					
	(8)	Are all temporary facilities are demolished within one month and restored to pre-construction state as of the completion of the construction works?					
			Others (Please specify)				

		Inspection Item	Implementation Status			Note
			Yes	No	N/A	
Environment quality management	Water environment quality management	(1) Whether construction and production areas, construction camps, access roads and Soil-spoiling and waste disposal sites are located as far as possible away from surface waters?				
		(2) Whether water-related operations, such as dike construction, river dredging, dike rehabilitation, are implemented in low-water season and the construction time is shortened where possible to reduce disturbance of the water systems?				
		(3) Whether the public toilets in the nearby villages are used for the construction camps? whether a centralized public toilet is constructed for the construction camps and septic tanks are provided for treatment of wastewater before reuse in farmland irrigation if the existing public toilets are not available?				
		(4) Whether a sedimentation tank is provided at the washing site of mixers, concrete pumps and transport vehicles; whether the wastewater is directly discharged into the river or reused or used for dust suppression after secondary sedimentation?				
		(5) Whether materials spilled on the construction sites are cleaned in time and measures are taken for protecting the materials stockpiled on site from storm water scours and drenching and avoid possible pollution of water systems?				
		(6) Whether oily wastewater of the construction plants is collected in time for treatment instead of discharged into rivers and water systems? Whether construction is suspended in rainy days and the earthwork fill is covered to avoid possible rainwater scours and pollution of water systems?				
	Acoustic environment quality management	(1) Whether low-noise equipment is selected to the best possibility in terms of equipment selection and the power and mechanical equipment is repaired and serviced on a periodical basis?				
		(2) Whether scientific construction plans are developed and reasonable construction time is scheduled to best avoid simultaneous use of a large number of high noise equipment. And whether the construction time of high-noise equipment (e.g. excavators, mixers, etc.) is arranged in daytime to avoid nighttime construction (22:00 to 06:00) ?				
		(3) Whether handling and transportation of in-				

Inspection Item		Implementation Status			Note
		Yes	No	N/A	
	situ concrete and bulk materials is reduced in night time? Whether measures of noise reduction are taken and the local residents are notified of the construction time and place and a report submitted to the EPB before the construction proceeds when continuous operation is needed on special occasions such as dike construction?				
	(4) Whether mobile sound barriers are provided by the construction contractors at noise sensitive sites to reduce the impacts of construction noises?				
	(5) Whether the mechanical equipment is operated according to the respective stipulations and the codes of operation are followed in the process of baffle and rack removal to reduce noise of collision upon material loading and unloading?				
	(6) Whether actions are taken to avoid the arrangement of a large number of power and mechanical equipment at the same site so as to avoid excessively high noise level at a certain spot?				
	(7) Whether the executive unit coordinates with the local residents together with the construction contractor and discloses information on the construction timetable? Whether prior notice is given to the affected organizations and residents before the operation starts and information on the construction progress as well as measures taken during construction for reducing noise is also provided to them to obtain mutual understanding? Whether complaint hotlines are set up during the construction process to handle and respond positively to complaints about noise disturbances?				
	Ambient air quality management	(1) Whether sediments, earthwork, debris and construction wastes are transported in enclosed vehicles and vehicle washing facilities are provided at entrances and exits of construction sites to make sure the vehicles are washed and cleaned to avoid possible take-away of mud and debris out of the site?			
		(2) Whether effective measures of covering, hardening, landscaping and water spraying are taken on the construction sites; dust generated on construction sites and roads is prevented and controlled through water spraying and cleaning?			
		(3) Whether cement and other fugitive fine-particle construction materials are stored in an enclosed space and lime and sand on			

Inspection Item		Implementation Status			Note
		Yes	No	N/A	
Solid waste management	(1) Whether the waste soil is used in wasteland reclamation and forestation of the project area and the remaining soil is used as subgrade fill of the dike construction works and bedding fill on both sides of channels in the vicinity?				
	(2) Whether removal of construction wastes is carried out with a closed container and random casting is prohibited? Whether the construction wastes are stored by type in accordance with the relevant classification management requirements of municipal wastes and are cleared and digested in a timely manner?				
	(3) Whether construction wastes (including excavated earth) are transported to a designated waste disposal site for storage and disposal?				
	(4) Whether domestic wastes are collected in the garbage bins and bags provided on the construction sites and then transported to a designated waste disposal site for storage and disposal?				
	(5) Whether burning of toxic and hazardous substances is banned on construction sites and toxic and hazardous substances are disposed according to the relevant requirements and stipulations?				
	(6) Whether material transportation is conducted in such a way to avoid the peak traffic hours at the sensitive sites and appropriate protection measures are taken to alleviate traffic pressure and reduce material spillage and leakage and possible secondary dust pollution resulting from material transportation?				

		Inspection Item	Implementation Status			Note
			Yes	No	N/A	
Soil erosion control	Temporary stockpiling sites	(1) Whether temporary stockpiling sites in the construction process are located on the land occupation area on the river banks where possible to minimize occupation of land in other locations?				
		(2) Whether the temporary stockpiling sites are located on waste and poor land and far away from villages and sensitive objects and riverway?				
		(3) Whether surfacing clearing is carried out and soil and water conservation measures are taken for the temporary stockpiling sites upon completion of the construction works and such sites are restored into greenbelts after soil improvement?				
		(4) Whether the existing riverside roads are utilized where possible? Whether heavy excavation and fill are avoided and efforts are made in soil and water conservation to reduce soil erosion and ecological damages when it is necessary to open new access roads?				
		(5) Whether trees and grasses are planted upon the completion of the construction works?				
		(6) Whether damages to surface vegetation are minimized and the construction sites are leveled properly				
		(7) Whether fences, drainage gutters and other measures effectively preventing and controlling soil erosion are implemented for the temporary stockpiling sites of earthwork and aggregates?				
		(8) Whether earth stockpiles are covered with tarpaulins or plastic film, where possible, for prevention of stormwater scours and also control of dust pollution?				
		(9) Whether the soil and water conservation measures are implemented simultaneously with the other measures to achieve the desired effect?				
		(10) Whether top soil is leveled in time and surface vegetation restored to reduce the excavated area upon completion of the construction works?				

Inspection Item		Implementation Status			Note
		Yes	No	N/A	
Quarries and borrowing sites	(1) Whether dust suppression is achieved through water spraying during operation of the borrowing sites and whether necessary interception and drainage facilities are constructed?				
Waste (debris) disposal sites	(1) Whether windproof and stormproof measures are taken on temporary waste (debris) disposal sites, which, when necessary, are fenced up and sprayed with water periodically for dust suppression and covered with tarpaulins in bad weathers?				
	(2) Whether waste soil (debris) eligible for comprehensive utilization are utilized in time and the residual waste soil (debris) removed out of site in time? Whether waste soil (debris) during transportation are covered with tarpaulins and transported along planned routes and at scheduled time to minimize environmental impacts on sensitive spots (areas)?				
Ecological protection management	(1) Whether a reasonable construction organization plan is developed for the construction works at each river section so that the construction activities are implemented and phased on a section-by-section basis and cumulative impacts arising from simultaneous construction on multiple construction sites can be avoided? Whether industrial and domestic wastewater generated from the construction process is subject to necessary treatment for compliant discharge; whether cleaning and maintenance of construction plants is strengthened to avoid pollution of water systems?				
	(2) Whether construction materials outsourced for the construction works, such as stone, sand, cement, etc., are transported on a demand-driven basis to minimize land occupation and vegetation damage; whether the construction sites are cleaned and landscaped in time upon completion of the construction works to restore damaged vegetation to the maximum extent?				
	(3) Whether occupation of river banks is subject to strict control and construction camps and construction material stockpiling sites are located on river banks?				
	(4) Whether landscaping of dike and revetment is considered with priority upon completion				



	Inspection Item	Implementation Status			Note
		Yes	No	N/A	
	of the dike reinforcement and revetment works; whether dike landscaping is reasonably combined with cement concrete and masonry works; whether an ecological corridor is developed through the integration of revetment landscaping and river bank landscaping?				
	(5) Whether temporary interception ditches are constructed on the construction site to provide a flood diversion canal for the surface runoff passage damaged by the Project so as to divert flood formed in rain season and avoid runoff scours				
	(6) Whether the construction contractor minimizes the duration of temporary land occupation and controls the earthwork construction time provided that the construction quality is assured and whether a stable excavation and fill slope is maintained to reduce impacts on areas outside the construction area of the Project?				
	(7) Whether restoration of the construction sites is carried out prior to the final acceptance of the Project?				
	(8) Whether specialists of the respective disciplines or local fishermen with practical experiences are employed at the consent of local fishery administration authority to provide on-site guidance?				
	(9) Whether fish breeding is implemented?				
	(10) Whether stipulations on protection of aquatic organisms are developed to assure that the construction workers respect the respective requirements of ecological protection? Whether the construction workers are strictly prohibited to fish or engage in other activities affecting ecological environment and fish protection in the river sections related to the construction works of the Project?				
Social Environment Management	(1) Whether the various LAR subsidies are allocated to the concerned village groups and individuals based on the compensation standards of Guangxi and Hezhou City? Whether the arable land and labor force are reasonably adjusted through full enforcement of the relevant policies?				
	(2) Whether local roads occupied or damaged in the construction stage are relocated or subject to protective treatment such as pavement rehabilitation and landscaping? whether compensation of a certain amount is paid to local governments to safeguard				

Inspection Item		Implementation Status			Note
		Yes	No	N/A	
	the righteous interests of local governments and residents?				
	(3) Whether construction and transportation vehicles avoid the peak hours of local roads to prevent traffic congestion and accidents?				
	(4) Whether connections with the existing roads are implemented and safety signs erected prior to the completion and operation of the Project?				
Risk Control Measures	Flood season construction risk control measures	(1) Whether strong efforts are made in advertisement and safety education on prevention and control of typhoon and flood risk?			
		(2) Whether staffing arrangements are made in the flood season to assure 24-hour non-interrupted on-duty operation and specific personnel is assigned to listen to weather forecasts so that flood control actions are immediately mobilized and effective measures are taken when any rainstorm, floods or disastrous weathers are forecasted?			
		(3) Whether records are properly kept during rainstorms or floods and close attention is paid to water level and possible impacts on the Project?			
		(4) Whether the construction activities are immediately stopped 2 days ahead of the forecast date of flood arrival and the construction equipment on site should be evacuated to get fully prepared for the coming flood?			
		(5) Whether a telecommunication system mainly comprising of mobile and fixed telephones is set up and all participating staff of the construction works are required to keep mobile phones accessible 24 hours?			
		(6) Whether corresponding flood control and rescue materials and devices are provided?			
	Flood control, waterlogging prevention	(1) Whether mechanisms of weather forecast, hydrological forecast and water level monitoring are established and whether the flood control and rescue activities in the rescue process are well implemented according to the professional and technical requirements?			
		(2) Whether safety guardrails and warning signs are set up to improve the capacity of drowning prevention? Whether local residents should be evacuated within the forecast period in extreme weathers?			
		(3) Whether a reasonable layout plan is developed for the construction areas and			

Inspection Item		Implementation Status			Note
		Yes	No	N/A	
	diesel, engine oil, lubricants, paint and similar materials stored in the construction production areas are kept far away from the river?				
Construction safety	(1) Whether the construction contractors responsible for construction of flood control and diversion facilities in the flood season develop and submit to the designated authority specified in the construction contract for approval the respective construction program based on design requirements and engineering needs? Whether such reports are submitted by the EA to the competent department of flood control for approval?				
	(2) Whether dike construction workers and operators should wear protective gloves and other necessary labor protection devices? Whether construction workers on site must wear safety helmets and those working on the revetment slope wear safety ropes? Whether safety fences are erected on the levee crest to prevent possible falls?				
	(3) Whether the emergency response plan is triggered and emergency response actions taken in a timely manner in the event of an overstandard flood?				
	(4) Whether operators on the construction vessels strictly abide by the national laws, regulations and standards on water operations?				
	(5) Whether actions are taken to assure stability of pit walls during earth excavation; and bottom digging is banned during facade excavation?				
	(6) Whether production safety advertisement boards and signs and marks are erected on construction sites? Whether safety signs warning against "Deep Water, No Swimming, Drowning Danger" and other dangers and risk and construction road signs are provided at obvious locations around water pits generated from dike foundation pits that are not backfilled in time?				
Public participation	(1) Whether a bulletin board is erected at the entrance of the construction site to disclose information on the Project and the contact information for complaints and advices?				

	Inspection Item	Implementation Status			Note
		Yes	No	N/A	
	(2) Whether arrangements are made to have technicians in the discipline of environmental protection answer public questions on environmental protection?				
	(3) Whether the relevant formalities are fulfilled for and information is disclose to the local residents on any nighttime construction?				
	(4) Whether a public announcement is posted at least five days in advance at the construction site as well as the premises of affected households and enterprises to notify the public of the beginning and ending time of any possible suspension of municipal services (including water supply, power supply, telephone and bus service) needed for the implementation of the construction works?				
	(5) Whether all feedbacks, comments and questions from the public and answers are recorded and archived and subject to inspection by the supervision unit?				
Construction traffic management	(1) Whether a reasonable construction schedule is developed to shorten the time of temporary land occupation?				
	(2) Whether enclosed transportation vehicles are used for transportation of earth, debris and construction wastes?				
	(3) Whether transportation of construction materials at night time is prohibited on any construction access road with a centralized area of residence in a distance of less than 50m?				
	(4) Whether actions are taken to assure that construction and transportation vehicles avoid the peak hours of local roads to prevent traffic congestion and accidents?				
	(5) Whether construction vehicles are required to travel along designated routes and unauthorized change of routes is prohibited to avoid possible damages to farmland and forest land?				
Constructional safety and health	(1) Whether warning signs or instructions are provided at operation positions, equipment and sites prone to occupational hazards on the construction sites?				
	(2) Whether occupational health training and physical examination are organized on a periodical basis for staff handling toxic and hazardous substances and guidance provided on correct use of occupational disease prevention devices and personal labor protection devices?				
	(3) Whether the construction contractor				

	Inspection Item	Implementation Status			Note
		Yes	No	N/A	
	provides the construction workers personal labor protection devices?				
	(4) Whether low-noise equipment is selected on construction sites and operators wear ear plugs for hearing protection?				
	(5) Whether forced ventilation facilities are provided in operation areas where good natural ventilation is not guaranteed and whether operators working in sites involving toxic and hazardous gases are properly protected?				
	(6) Whether operators wear dust masks in dusty operation sites and whether operators in welding operations wear protective masks, goggles and gloves and other personal protective equipment?				
	(7) Whether summer cooling supplies are provided on construction sites where high-temperature operations are involved and reasonable arrangements are made for work and rest timetable?				
Traffic safety	(1) Whether safety education and training is organized on a periodical basis to particularly make the drivers aware of the importance of safe driving?				
	(2) Whether actions are taken to limit driving time and make sure drivers drive in turns? Whether actions are taken to avoid driving on dangerous roads and time periods?				
	(3) Whether vehicles are regularly maintained; whether manufacturer-approved spare parts are used and purchased in a timely manner?				
	(4) Whether separation of pedestrian and motor vehicles is realized?				
	(5) Whether traffic safety control measures are taken and road signs and signal are used to warn pedestrians and vehicles of any traffic dangers; whether road signs are improved through cooperation with the local community and the competent authorities to improve visibility of road signs and enhance traffic safety in an all-around way?				
	(6) Whether traffic safety and pedestrian safety education is conducted in the communities in the vicinity of the project area and schools.?				
	(7) Whether communications are kept with the emergency response workers to assure that appropriate first aid is provided in case of any accidents?				
	(8) Whether locally purchased materials are used where possible to minimize transportation distance?				

Inspection Item		Implementation Status			Note
		Yes	No	N/A	
	(9) Whether it is regarded as a mandatory requirement that drivers must hold licenses?				
Educational protection training and education	(1) Whether the Municipal PMO assigns an environmental specialist prior to project commencement to provide environmental protection training for the contractors and construction supervision agencies of the Dike Construction?				
	(2) Whether the contractor organizes training and examinations for the operators on the construction sites on laws and regulations on environmental protection and health and sanitation prior to the commencement of the Dike Construction?				
	(3) Whether the contractor of the Dike Construction organizes staff training on the risk emergency response plan as well as emergency response rehearsals on a yearly basis?				
	(4) Whether the contractor of the Dike Construction organizes occupational health training and physical examination on a half-year basis for operators handling toxic and hazardous substances and provides guidance to such operators on correct use of occupational disease prevention devices and personal labor protection devices?				
<p>Checked by: (signature)_____ Time:_____</p> <p>Supervision Engineer: (signature)_____ Time:_____</p> <p>Notes:</p> <p>(1) Information to be noted may include problems observed on site, remarks on non-conforming situations and recommended corrective or preventive actions.</p> <p>(2) In the event of any unacceptable measures or situations requiring further improvement identified during site inspection, the Supervision Engineer may immediately issue an "Instruction on Environmental Protection Corrections" to the contractor and indicate the serial number of the Instruction herein. Details of corrective actions taken by the contractor need to be recorded separately.</p>					

Inspection Item	Implementation Status			Note
	Yes	No	N/A	
(3) This table is the checklist for environmental protection inspections in the construction stage of the Dike Construction of Guangxi Hezhou Urban Water Infrastructure and Environment Improvement Project and is applicable to the specific subprojects and specific environmental problems. This table may be adjusted and corresponding measures of environmental protection may be taken, where appropriate, based on local environmental conditions and construction components.				

## Annex Table 4: Instruction on Environmental Protection Corrections

Instruction on Environmental Protection Corrections	
S. N.: _____ Contract Number and Description: _____ Name of Subproject: _____ Name of Construction Site: _____ Current Construction Stage: _____	
Problems existing during site inspection:	
Checked by: _____ Date: _____	
Contractor's cause analysis and corrective actions:	
Contractor: _____ Date: _____	
Comments by Supervision Engineer:	
Supervision engineer: _____ Date: _____	
Opinions by Environmental Protection Authority (when necessary):	
Contact person: _____ Date: _____	
Deadline of correction:	
To be corrected by (Date): _____ Contractor: _____ Date: _____ Supervision Engineer: _____ Date: _____	
Conclusion of review:	
Reviewed by: _____ Date: _____	



## Annex Table 5: Checklist of Environmental Protection Inspection Prior to Project Completion and Hand-over

Guangxi Hezhou Urban Water Infrastructure and Environment Improvement Project      Serial No.:

Date:

Instructions:

This table is the checklist for environmental protection inspections in the construction stage of the Dike Construction of Guangxi Hezhou Urban Water Infrastructure and Environment Improvement Project and includes the environmental protection measures tailored to the specific subprojects and the local environmental conditions, which may be added or adjusted if necessary.

Name of subproject:

Contract No. and Subproject  
Location:

Name of construction site:

Current construction stage:

Date of environmental protection inspection:      Specific time:

Weather condition:

Checked by:

Item of inspection	Status of implementation		N/A	Note (e.g. problems or non-conformities observed, recommended corrective or preventive actions)
	Implemented	Not Implemented		
1. Are all the construction wastes on the construction sites removed and transported to the municipal solid waste landfill site?				
2. Are actions taken against the acoustic environment protection objects?				
3. Are ecological protection measures taken for the temporary waste (debris) disposal sites?				
4. Have the hardened concrete mixing sites been demolished?				
5. Are land rehabilitation, restoration or landscaping measures taken for land parcels temporarily occupied by the concrete mixing plants?				

Item of inspection	Status of implementation		N/A	Note (e.g. problems or non-conformities observed, recommended corrective or preventive actions)
	Implemented	Not Implemented		
6. Are the temporary sedimentation tanks and sand sedimentation tanks demolished?				
7. Are land rehabilitation, restoration or landscaping measures taken for land parcels temporarily occupied by the sedimentation tanks and sand sedimentation tanks?				
8. Are the top mellow soil stripped and preserved for restoration of waste (debris) disposal sites?				
9. Are the dike slopes landscaped?				
11. Have the owners of the subprojects carried out training and education activities?				
12. Are the local public satisfied with the road works constructed under the Project?				

\* Any local and existing item recorded as “not implemented” might indicate a condition that is non-conforming or needs further improvement. In such an event, the Supervision Engineer shall immediately issue to the Contractor an “Instruction on Environmental Protection Corrections” and note the serial number. Details of corrective actions taken by the contractor need to be recorded separately.

Site Inspector (signature):

Date:

Supervision Engineer (signature):

Date:

## **Annex II: ECOP for Small Waterworks Construction**

# **World Bank Financed Guangxi Hezhou Urban Water Infrastructure and Environment Improvement Project**

## **Small Waterworks Construction**

## **Environmental Codes of Practice**

Hezhou World Bank Loan Project Management Office  
Guangxi Zhengze Environmental Protection Technology Co., Ltd.

November 2017

# Contents

<b>1. General .....</b>	<b>1</b>
1.1 Project background .....	1
1.2 Relevant laws and regulations and World Bank safeguard policies .....	1
1.2.1 Relevant laws and regulations of China .....	1
1.2.2 World Bank safeguard policies and guidelines .....	2
1.3 Key project components .....	3
1.4 Objectives of Environmental Codes of Practice .....	4
1.5 Applicability .....	5
<b>2. ECOP management system .....</b>	<b>5</b>
2.1 Establishment of the ECOP management system .....	5
2.2 Responsibilities and staffing of agencies involved the environment management system .....	8
2.3 Environment management tasks in each stage of the Project .....	11
2.4 Work flowchart of agencies implementing ECOP in the construction stage .....	11
2.5 Management of ECOP files .....	12
<b>3. General requirements of the ECOP .....</b>	<b>15</b>
3.1 Implementation of environmental measures during construction drawing design and tendering document preparation .....	15
3.2 Preparations before construction .....	16
3.3 Environment management in the construction stage .....	16
3.3.1 Full-process construction supervision .....	17
3.3.2 Environmental protection agency supervision and public opinion .....	18
3.4 Corrective measures to non-conformities to the ECOP requirements .....	18
<b>4. Environmental codes of practice in the stage of construction site preparation .....</b>	<b>19</b>
<b>5. Management of construction sites and facilities .....</b>	<b>20</b>
<b>6. Construction material stockpiling sites .....</b>	<b>21</b>
6.1 Quarries and borrowing sites .....	21
6.2 Soil-spoiling and waste disposal sites .....	21
6.2 Precast yards .....	22
<b>7. Ambient air quality management .....</b>	<b>22</b>
<b>7.1 Construction dust and construction plant exhaust gas .....</b>	<b>22</b>
7.2 Odor of dredging sludge .....	23
<b>8. Acoustic environment quality management .....</b>	<b>24</b>

<b>9. Water environment quality management.....</b>	<b>25</b>
<b>10. Solid waste treatment management .....</b>	<b>26</b>
<b>11. Ecological protection management .....</b>	<b>27</b>
<b>12. Social environment management .....</b>	<b>27</b>
<b>13. Risk control measures .....</b>	<b>28</b>
13.1 Flood season construction risk control measures .....	28
13.2 Flood and waterlogging prevention and control .....	29
13.3 Construction safety .....	29
<b>14. Public participation .....</b>	<b>30</b>
<b>15. Construction traffic management .....</b>	<b>30</b>
<b>16. Supervision plan.....</b>	<b>31</b>
<b>16.1 Scope of construction supervision.....</b>	<b>31</b>
16.2 Contents of construction supervision.....	31
16.3 Terms of reference for construction supervision.....	32
<b>17. Construction safety and health .....</b>	<b>32</b>
<b>18. Traffic safety .....</b>	<b>33</b>
<b>19. Environmental protection training and education .....</b>	<b>34</b>
<b>Annex Table 1: Summary of Environmental Protection Measures.....</b>	<b>35</b>
<b>Annex Table 2: Construction Site Checklist Prior to Mobilization .....</b>	<b>45</b>
<b>Annex Table 3: Checklist for Environment Protection Inspection on Construction Sites.....</b>	<b>46</b>
<b>Annex Table 4: Instruction on Environmental Protection Corrections .....</b>	<b>58</b>
<b>Annex Table 5: Checklist of Environmental Protection Inspection Prior to Project Completion and Hand-over.....</b>	<b>59</b>

## **1. General**

### **1.1 Project background**

World Bank Financed Guangxi Hezhou Urban Water Infrastructure and Environment Improvement Project aims to implement integrated improvement of water environment and construction of urban infrastructure under the guidelines of development, livelihood and innovation and following the standards of “green water service, eco-friendly water service and storm and flood safety”. The Project will be helpful to safeguarding regional flood protection and waterlogging drainage, improving regional water environment and building high-standard and modernized urban infrastructure and public facilities; it will provide powerful support and assurance to the sustainable economic development of Hezhou City to promote the level of sustainable urban development and realize the integration of reform and innovation.

The Project is classified as a Category A through environmental screening of the category, location, sensitivity and scale of the Project as well as the characteristics and scale of potential environmental impacts based on the requirements of environmental screening and categorization specified in the World Bank safeguard policies on environmental assessment (OP4.01) and requires the development of Environmental Codes of Practice (ECOP). This report is the Environmental Codes of Practice for small waterworks construction, which is located in Pinggui District, Hezhou City of Guangxi. Mainly comprising of river rehabilitation and renovation, the small waterworks construction component includes the construction of the dispatching and control gate, the stormwater lift pump station, river cross section rehabilitation, ecological water replenishing and riverside sewage interceptors.

The key contents of the ECOP include project introduction, establishment of environment management system, implementation plan of environment protection measures, construction supervision plan and reporting mechanism and file management.

### **1.2 Relevant laws and regulations and World Bank safeguard policies**

#### **1.2.1 Relevant laws and regulations of China**

- (1) Environmental Protection Law of the People’s Republic of China (amended in Year 2014);
- (2) Law of the People’s Republic of China on Environmental Impact Assessment (amended in Year 2016);
- (3) Law of the People’s Republic of China on Prevention and Control of Air Pollution (amended in Year 2015)
- (4) Law of the People’s Republic of China on Prevention and Control of Water Pollution (amended in Year 2008)
- (5) Law of the People’s Republic of China on Prevention and Control of Noise Pollution (amended in Year 1997)

- (6) Law of the People's Republic of China on Prevention and Control of Environmental Pollution of Solid Wastes (amended in Year 2014);
- (7) Water and Soil Conservation Law of the People's Republic of China (amended in Year 2011)
- (8) Flood Control Law of the People's Republic of China (amended in Year 2015);
- (9) Law of the People's Republic of China on Protection of Cultural Relics (4<sup>th</sup> amendment on April 24, 2015)
- (10) Law of the People's Republic of China on Wildlife Protection (Nov. 8, 1988);
- (11) Regulations of the People's Republic of China on Protection of Wild Plants (2<sup>nd</sup> amendment on July 2, 2016);
- (12) Law of the People's Republic of China on Urban and Rural Planning (January 1, 2008);
- (13) Interim Methods for Public Participation in Environmental Impact Assessment (SEPA Huanfa Circular No. 2006[28], Feb. 14, 2006);
- (14) Methods for Public Participation in Environmental Protection (MoEP Decree No. (2015)35);
- (15) Notice on Strengthening Management of Environmental Impact Assessment on Construction Projects Utilizing Loans from International Financial Institutions (Huanjian Circular No. [1993]324);
- (16) Notice by the National Development and Reform Commission on Further Strengthening Management of Projects Utilizing Loans from International Financial Institutions (NDRC Foreign Investment Circular No. [2008]1269);
- (17) Management Catalogue of Environmental Impact Assessment Categories of Construction Projects (Sept. 1, 2017);
- (18) Notice by the State Council on Printing and Issuing the Action Plan on Prevention and Control of Water Pollution (State Council Circular No. [2015]17).
- (19) Law of the People's Republic of China on Protection of Minors (Oct. 26, 2012);
- (20) Stipulations on Prohibition of Use of Child Labour (Issued in 1991 by the State Council);
- (21) Law of the People's Republic of China on Protection of Women's Rights and Interests (Aug. 28, 3005);
- (22) Labor Law of the People's Republic of China (Aug. 27, 2009).

### **1.2.2 World Bank safeguard policies and guidelines**

This ECOP is developed in accordance with the Operational Policies on Environmental Assessment as a part of the World Bank safeguard policies (OP4.01) which requires environmental assessment of Category A projects and the development of an Environmental & Social Management Plan before and during the construction stage as well as the implementation of such Environmental & Social Management Plan and monitoring of the mitigation measures implemented during the construction stage.

### 1.3 Key project components

The key construction activities included in the small waterworks construction subproject of Guangxi Hezhou Urban Water Infrastructure and Environment Improvement Project are shown in Table 1.3-1. The geographical location of the Project is shown in Figure 1 as attached.

**Table 1.3-1 Key Construction Works of the Small Waterworks Construction**

S.N	Project activity	Project contents
1	Huang'ansi Drainage Pump Station	Huang'ansi Drainage Pump Station is located at the estuary where Huang'ansi Drainage River joins Hejiang River and involves a capacity of 6m <sup>3</sup> /s.
2	Shizigang Drainage Pump Station	Shizigang Drainage Pump Station is located at the estuary where Huang'ansi Drainage River joins Hejiang River and involves a capacity of 36m <sup>3</sup> /s.
3	Lining River Rehabilitation	The Lining River Rehabilitation Works involves the rehabilitation of a 4.38km long river section and the construction of new embankment with a length of 8.51km and 3 check gates, 2 embankment-crossing culverts and 21 river-crossing bridges and culverts. The existing riverway will be widened from 2.5m to 10m. The river rerouting will involve the excavation of an approximately 1.62km long section with a bottom width of 10m. Slope trimming will be needed (eco-vegetation slope); control gates will be provided both upstream and downstream.
4	Changlong River Rehabilitation	The Changlong River Rehabilitation Works involves the rehabilitation of a 4.49km long river section and the construction of new embankment with a length of 6.96km and 3 check gates, 1 embankment-crossing culvert and 15 river-crossing bridges and culverts. The existing riverway will be widened from 1.2-2m to 6-8m. The river rerouting will involve the excavation of an approximately 0.68km long section with a bottom width of 6-8m. Slope trimming will be needed (eco-vegetation slope); control gates will be provided both upstream and downstream.
5	Huangtian Branch Channel Rehabilitation	The Huangtian Branch Channel Rehabilitation Works involves the rehabilitation of a 6.16km long river section and construction of new embankment with a length of 6.16km and 1 check gate, 2 river-crossing bridges and culverts. The riverway is to be widened from 6-8m to 20m. The dredging works involves a 6.16km long section and a dredging volume of approximately 7440m <sup>3</sup> . Control gates are to be provided both upstream and downstream and riverside sewage interceptors are to be implemented on the river embankments.
6	Guposhan Drainage Channel Rehabilitation	The Guposhan Drainage Channel Rehabilitation Works involves the rehabilitation of a 3.96km long river section and construction of new embankment with a length of 3.96km and 1 check gate, aiming to rehabilitate the channel into a superficial flow eco-vegetation drainage channel. The dredging works involves a 3.96km long section and a dredging volume of approximately 3540m <sup>3</sup> . Control gates are to be provided both upstream and downstream and the general sewage interceptor is to be implemented at the general outfall of water flow.



7	Dongwu Branch Channel Rehabilitation	The Dongwu Branch Channel Rehabilitation Works involves the rehabilitation of a 8.39km long river and the construction of new embankment with a length of 16.74km and 5 embankment-crossing culverts and 18 river-crossing bridges and culverts. After the planning is adjusted, the riverway is rerouted and directly enters Hejiang River at the Zhanqian Avenue. the existing riverway is to be widened from 2-3m to 9-12m.
8	River governor system + web-based intelligent management and control system:	Development of an urban early warning management system, improvement of main watercourse hydrological monitoring stations; development of branch channel hydrological monitoring stations.

## 1.4 Objectives of ECOP

The ECOP is developed to present a set of detailed, technically feasible, and financially sustainable and operable environmental measures regarding to the inevitable and potential negative environmental impacts involved in the small waterworks component, identify the measures and arrangements of environmental pollution mitigation, environment management and institutional building to be implemented by the project construction contractors, supervision engineers, operators and environment management bodies in the construction and operation stages of the Project so as to eliminate or remedy and reduce the adverse environmental and social impacts to an acceptable level. The specific objectives of the ECOP include:

- (1) Identifying the obligations of environment management of the construction contractors and operators

The project management unit, the project owner, the design unit and the EIA consultant should carry out a detailed on-site review and verification of the environmental protection objectives involved in the project area and develop, in association with the local environmental characteristics and project features, and include practical and feasible environmental protection and pollution prevention and mitigation measures into the project design.

In the tendering stage of the Project, it should be explicitly specified that it is an obligation of the bid winner to implement the requirements included in the ECOP, which should be incorporated into the actual activities of engineering design and construction of the Project.

- (2) Serving as the operational guidelines of environment management

The construction supervision plan proposed in the ECOP for the pre-construction stage and the construction stage as well as the reporting mechanism and the file management procedure can assure the effective implementation of the environmental pollution mitigation measures. To be provided as environmental protection documents to the construction supervision unit, the environmental monitoring unit and other relevant organizations, these documents will specify the responsibilities and roles of the relevant functional departments and management bodies as well as the channels and means of communication between these departments and bodies to effectively assure the smooth implementation of the environmental pollution mitigation measures.

## 1.5 Applicability

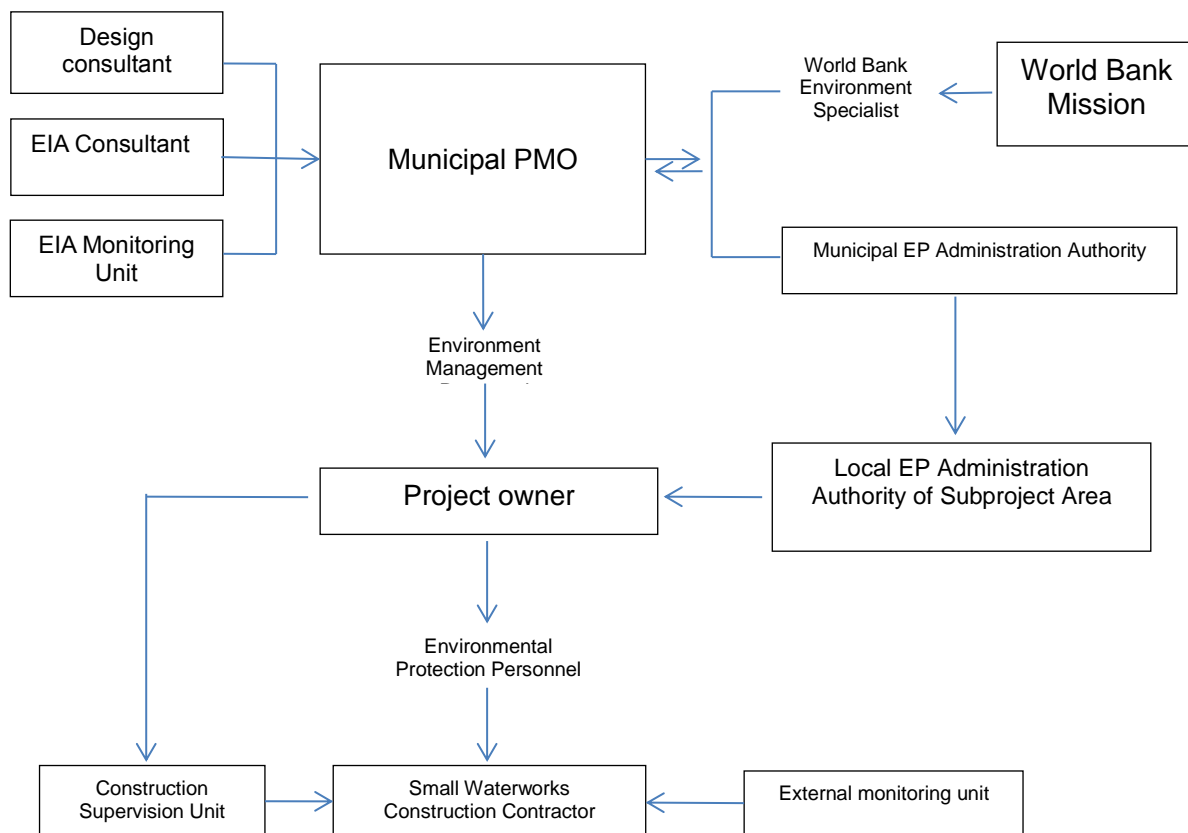
The Project is identified as a Category A Project through environmental screening of the category, location, sensitivity and scale of the Project as well as the characteristics and scale of potential environmental impacts based on the requirements of environmental screening and categorization specified in the World Bank safeguard policies on environmental assessment (OP4.01). This ECOP is mainly applicable to small waterworks. The Project will produce impacts of different degrees in the construction stage and the operation stage and requires corresponding environment management mechanisms, environmental protection and mitigation measures to reduce such impacts to the minimum.

This ECOP aims to provide the environment management agencies, construction supervision agencies and construction contractors with guidelines on the various measures for mitigation and monitoring of adverse environmental impacts in the process of project implementation and operation.

## 2. ECOP management system

### 2.1 Establishment of the ECOP management system

In order to respect the relevant stipulations and accommodate the actual needs of the Project and better realize the demonstrative effect of the Project, the Project Management Offices (PMOs) at each level will assign a special personnel to be



**Figure 2.1-1 Institutional Framework of the Project Environment Management System**

responsible for the environment management work and an environment management system will be established to cover the supervision unit, the implementation unit and the consultant service unit in addition to the regulatory functions performed by the environment protection authorities by law. See Figure 2.1-1 and Table 2.1-1 for detail.

**Table 2.1-1 Agencies Involved in the Environment Management System**

Nature of unit	Name of unit	Tasks assigned to the unit
Management unit	Municipal PMO	A special environment manager is assigned to be responsible for environmental protection work in the planning, design and implementation stages of the Project, assuring that the work procedures satisfy the domestic and WB requirements of EIA and environment management and that the environmental protection measures specified in the ECOP are smoothly implemented. See “2.2 Responsibilities and staffing of agencies involved the environment management system” for detail.
	Employer	A special environmental protection officer is assigned to be mainly responsible for assuring that the ECOP is effectively implemented in the project implementation and operation stages, the adverse environmental impacts of the Project are minimized or reduced to an acceptable degree and the environmental benefits of the Project are fully realized, the various fund needed for the environmental protection work of the Project are made available and also responsible for processing and archiving of the relevant documents. See “2.2 Responsibilities and staffing of agencies involved the environment management system” for detail.
Supervision unit	WB mission	An environmental technology specialist is assigned to monitor and inspect the implementation status of the ECOP. See “2.2 Responsibilities and staffing of agencies involved the environment management system” for detail.
	EP authorities at all levels	Performing the role of a government administrative supervision and management unit to supervise and inspect and make sure that the work procedures of the Project satisfy the requirements of environment management in China and the pollution control measures in the implementation process meet the needs of environmental protection in China. See “2.2 Responsibilities and staffing of agencies involved the environment management system” for detail.
Implementation unit	Contractor of road and pipeline network construction works	A site environment engineer is assigned to be responsible for implementing the environmental protection measures in the ECOP according to the requirements of environmental protection of the World Bank and the local EP administration bodies and preparing and submitting monthly environment reports in the construction stage. See “2.2 Responsibilities and staffing of agencies involved the environment management system” for detail.
Consultant service unit	EIA consultant	Preparing, with authorization, the ECOP of the small waterworks component. See “2.2 Responsibilities and staffing of agencies involved the environment management system” for detail.
	Design	Authorized and responsible for preparing FSR and

Nature of unit	Name of unit	Tasks assigned to the unit
	consultant	construction design proposal and assuring the incorporation of the measures and proposals in the ECOP into the outcomes. See “2.2 Responsibilities and staffing of agencies involved the environment management system” for detail.
	Construction supervision unit	Responsible for supervising and managing the routine production activities of the construction contractor. See “2.2 Responsibilities and staffing of agencies involved the environment management system” for detail.
	External monitoring unit	Responsible for inspecting the implementation status of environmental protection measures in each subproject and implementing environmental monitoring activities in the construction stage with the authorization by the owner. See “2.2 Responsibilities and staffing of agencies involved the environment management system” for detail.

## 2.2 Responsibilities and staffing of agencies involved the environment management system

The environment management system of Guangxi Hezhou Urban Water Infrastructure and Environment Improvement Project includes the project management unit, the supervision unit, the implementation unit and the consultant service unit. These agencies constitute an integral project environment management system, but each undertaking different assignments and different responsibilities. The Project will be implemented under the leadership of the Project Management Office of World Bank Financed Guangxi Hezhou Urban Water Infrastructure and Environment Improvement Project (hereinafter abbreviated as the “Municipal PMO”) and the administrative agencies of the Municipal Government to assure that the Project complies with the requirements of China and the World Bank in terms of work procedure and implementation of the pollution control measures. See Table 2.2-1 as below for responsibilities and staffing of agencies involved in the Project.

**Table 2.2-1 Responsibilities and staffing of agencies involved the environment management system**

Name of unit	Type of unit	Staffing	Responsibilities of unit
9. EP authorities at all levels	Supervision unit	1 person	2. Conducting full-process environment supervision and management of the Project, including approving EIA report of the Project (including EIA of subprojects) and environment supervision and management in the construction and operation stages of the Project.

10. Municipal PMO	Management unit	1 person	<ul style="list-style-type: none"> <li>7. Supervising the implementation of the ECOP;</li> <li>8. Assuring and coordinating the implementation of the domestic and World Bank requirements of environment management;</li> <li>9. Submitting to the World Bank half-year reports on the implementation progress of the ESMP and other relevant reports;</li> <li>10. Inspecting the environment management work of each subproject;</li> <li>11. Coordinating the other relevant authorities to address significant environmental issues;</li> <li>12. Authorizing external environment monitoring agencies to carry out inspections of the Project.</li> </ul>
11. Employer	Management unit	1 person	<ul style="list-style-type: none"> <li>11. Supervising the implementation of the environment management rules and regulations in the subprojects;</li> <li>12. Incorporating the environmental protection measures in the ESMP into the construction contracts;</li> <li>13. Recruiting, supervising and coordinating the work of the construction supervision unit (qualifications, responsibilities and management);</li> <li>14. Organizing the implementation of the environment management training plan;</li> <li>15. Organizing theme studies or relevant surveys;</li> <li>16. Keeping and processing records of complaints raised in the construction and operation processes of the Project, explaining the results of resolution to the public and addressing issues of public complaints;</li> <li>17. Reviewing the construction supervision and environment consulting reports;</li> <li>18. Submitting quarterly reports (or statements) to the Municipal PMO;</li> <li>19. Signing for acceptance of site check lists submitted by the construction contractor and the supervision unit, reviewing and verifying environmentally-sensitive issues and putting them into archives;</li> <li>20. Accepting inspections of environmental work (including inspections by the World Bank mission).</li> </ul>

12. World Bank	Supervision unit	1 person	<p>3. World Bank mission is assigned on a yearly basis to conduct special inspection of project implementation;</p> <p>4. Inspecting the status of execution of the loan agreement as well as implementation of ECOP in the Project.</p>
13. EIA consultant	EIA consultant	6 persons	<p>3. Carrying out site visit to and environment assessment of each subproject;</p> <p>4. Responsible for preparing the contents of ECOP.</p>
14. Construction supervision unit (responsible for environment supervision)	Consultant service unit	1-2 person	<p>6. The construction supervision engineer is assigned separately by the municipal PMO;</p> <p>7. Supervising and inspecting the domestic sewage treatment, industrial wastewater treatment, soil erosion prevention measures and exhaust gas, dust and noise control measures as well as domestic and industrial solid wastes and health management and epidemic prevention activities on the construction sites;</p> <p>8. Preparing on a periodical basis the various checklists of environment management in the annexes of the ECOP;</p> <p>9. Proposing and following up with corrective measures by the construction contractors to relevant environmental protection issues encountered in the construction activities, including issuing instructions and checklists of corrective measures and archiving inspection documents;</p> <p>10. Reporting project implementation status on a weekly basis to the municipal PMO.</p>
15. Environment monitoring	External monitoring unit	1-2 persons	<p>4. Assisting the municipal PMO in inspecting the environmental protection work of each subproject, preparing the execution progress report of the ESMP and relevant reports and submitting such reports to the municipal PMO on a half-year basis;</p> <p>5. Inspecting the implementation status of the environmental protection measures on the construction site and of the contractor, preparing and submitting reports to the municipal PMO and making recommendations and comments on implementation of environmental protection activities.</p>
16. Construction contractor	Implementation unit	A few	<p>7. Developing environmental protection measures in the construction stage;</p> <p>8. Accepting the supervision and inspection of</p>

			<p>environmental protection by the construction supervision engineer, the World Bank and the EP authorities at all levels;</p> <p>9. Setting up a feedback mechanism and carrying out the corrections within 3 working days as of the receipt of the instructions on corrective measures (or within 10 days where coordination from the administration agencies is required);</p> <p>10. Completing together with the construction supervision unit and submitting the construction site checklist to the municipal PMO before construction;</p> <p>11. The construction contractor reports on a weekly basis the project implementation status to the construction supervision engineer.</p>
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## 2.3 Environment management tasks in each stage of the Project

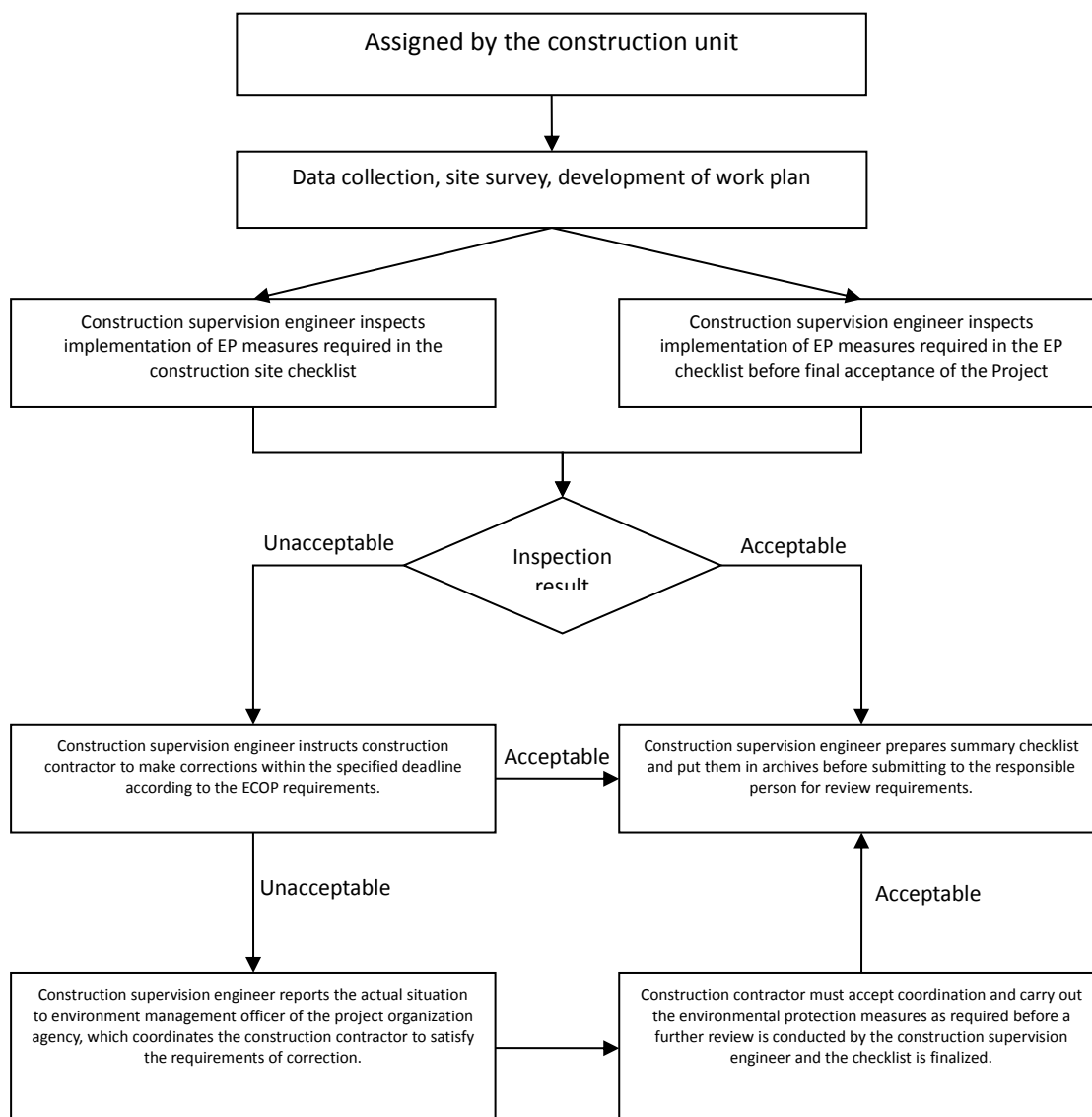
For different stages of project implementation, the ECOP contains different assignments.

The most important task of the ECOP is to assure that the various environmental protection measures as proposed are effectively implemented, including: (1) incorporating the ECOP environmental protection measures into the project design, tendering and construction contracts; (2) inspecting the effectiveness and implementation status of environmental protection measures through the supervision by the construction supervision engineer over the implementation of the environmental protection measures in the construction stage of the Project; (3) inspection, reporting and archiving mechanisms of the ECOP to reflect the time effectiveness of work through inspections of routine work activities.

## 2.4 Work flowchart of agencies implementing ECOP in the construction stage

In the construction process of the Project, the task of the construction supervision engineer is to check whether the environmental protection measures taken during construction meet the requirements included in the ECOP. The construction supervision engineer should conduct construction site inspections at least once a week and prepare and put into archives the environmental protection checklist for the construction stage, propose and follow up with the implementation of corrective measures to any environmental problems existing in the construction activities of the construction contractor and submit monthly environment management progress reports to the environment officer of the municipal PMO. The work flowchart of the construction supervision engineer in the construction period is shown in Figure 2.4-1 as follows.





**Figure 2.4-1 Work Flowchart of Construction Supervision Engineer in the Construction Stage**

## 2.5 Management of ECOP files

In the implementation process of the ECOP, the World Bank, the municipal PMO, the owner, the monitoring unit, the EIA consultant, the construction supervision unit and the construction contractor should all be engaged in management of the respective files and documents. Requirements of file management for each of these agencies are described in detail in Table 2.5-1.

**Table 2.5-1: Requirements of file management for each unit**

Name of unit	File management
(1) Construction contractor	<ol style="list-style-type: none"> <li>1. Recording, archiving and reporting to the construction supervision engineer on a weekly basis the implementation status of the construction activities;</li> <li>2. Completing together with the construction supervision engineer and archiving the construction site checklist prior to construction and submitting a report to the municipal PMO;</li> <li>3. Recording, archiving and reporting to the construction supervision engineer the implementation status in case of an emergency and unanticipated event;</li> <li>4. Carrying out the corrections within 3 working days as of the receipt of an instruction on corrective measures (or within 10 working days if coordination with the management unit is required) and putting the respective files and documents into archives.</li> </ol>
(2) Construction supervision unit	<ol style="list-style-type: none"> <li>1. Recording, archiving and reporting to the municipal PMO on a weekly basis information reported by the construction contractor;</li> <li>2. Completing together with the construction contractor and archiving the construction site checklist prior to construction and submitting a report to the municipal PMO;</li> <li>3. Recording, archiving and reporting to the municipal PMO the specific implementation plan of the construction contractor in case of an emergency and unanticipated event;</li> <li>4. Recommending and following up with the implementation of a corrective solution to any environmental protection issues encountered by the construction contractor in the construction activities, including issuing instructions on corrective measures and correction checklist and archiving the inspection files and documents.</li> </ol>
(3) EIA consultant	<ol style="list-style-type: none"> <li>1. Preparing the contents of the ECOP and putting the first draft, the draft for review and the final draft for approval into archives.</li> </ol>
(4) Monitoring unit	<ol style="list-style-type: none"> <li>1. Implementing the monitoring plan in the ESMP and submitting the monitoring report at the earliest possible date after the monitoring is completed to the contractor (or operator) and the construction supervision engineer;</li> <li>2. Including the monitoring report into the Project Progress Report, putting it into archives and submitting it in a timely manner to the PMO and respective management authorities (EPB) to enable these agencies to be aware of the execution status and effectiveness of the environmental protection measures in a timely manner.</li> </ol>
(5) Employer	<ol style="list-style-type: none"> <li>1. Preparing, implementing and putting into archives the rules and regulations on environment management for subprojects;</li> <li>2. Putting into archives the final draft and the approval document of the domestic EIA report of subprojects;</li> <li>3. Preparing, implementing and putting into archives the environment management training plan;</li> <li>4. Organizing theme studies or relevant studies and managing and archiving the work documents of such workshops and studies;</li> <li>5. Maintaining, processing and putting into archives records of complaints raised in the construction and operation processes of the Project;</li> <li>6. Summarizing and putting into archives on a monthly basis the environment management monthly report submitted by the construction supervision engineer and submitting a report (or statement) to the municipal PMO;</li> <li>7. Receiving construction site checklists submitted by the construction contractor and the supervision engineer, reviewing and verifying</li> </ol>

Name of unit	File management
	environmentally-sensitive issues and putting such documents into archives; 8. Managing and putting into archives the submitted instructions on corrective measures.
(6) Municipal PMO	1. Supervising the implementation of the ECOP and reviewing and archiving on a monthly basis the environment management monthly report submitted by each owner; 2. Summarizing reports from the municipal project leading group and the PMO and submitting to the World Bank and archiving relevant reports on a half-year basis; 3. Coordinating with the concerned authorities to address major environmental issues and recording and archiving the specific measures.
(7) World Bank	1. Reviewing and archiving on a half-year basis the ESMP execution progress report submitted by the municipal PMO;

## **6. General requirements of the ECOP**

In the construction process of the Project, the contractor of the small waterworks component will play a critical role in implementing the environment management, pollution control and prevention measures. In order to assure the execution of the ECOP, the contents included in this Section are general requirements and measures applicable to the major agencies involved in the construction process of the Project and the construction contractor should enforce the environment management measures proposed in the ECOPs under the coordination and supervisory management of the various management agencies

### **3.1 Implementation of environmental measures during construction drawing design and tendering document preparation**

As the Project enters the implementation stage, relevant procurement activities will be implemented according to the Procurement Guidelines of the World Bank.

The tendering document preparation unit and the construction design unit are required to include the mitigation measures proposed in the ECOP against any potential adverse environmental impacts into the technical specifications of the tendering documents and the construction design of different stages under the coordination, guidance and supervision of the municipal PMO. The tendering documents need to require the tenderer to make commitments on the following environment management requirement in the bid document and incorporate such contents into the construction contract.

- 10.1. The construction design unit should propose measures to mitigate potential adverse environmental impacts in the construction design of different stages. In the feasibility study stage, the environmental impacts should be analyzed and assessed and ECOP should be developed; in the preliminary design stage, the environmental protection measures proposed in the EIA and ECOP should be implemented; in the construction design stage, environmental protection engineering design should be produced based on the comments of ratification of the preliminary design.
- 10.2. The contractor of the small waterworks component is required to provide 1 to 2 site environment engineers on each construction site responsible for implementing the environmental protection measures throughout the construction stage to assure that the construction activities of the contractor and its subcontractors (if any) satisfy the various requirements of this ECOP and necessary environmental protection measures are taken in the construction process.
- 10.3. The contractor of the small waterworks component must include the "Site Environmental & Social Management Plan" in its construction program after the contract is signed and before the commencement of the construction works.

- 10.4. The contractor of the small waterworks component must respect the local construction safety and civilization requirements.
- 10.5. The contractor of the small waterworks component and the construction supervision unit must receive training on environmental protection and environment management before the commencement of the construction works.
- 10.6. The contractor of the small waterworks component should include a security deposit in terms of environment management at a percentage of around 3% in its yearly budget of the contract expenditures of the Project.

### **3.2 Preparations before construction**

After the contract award and before commencement of the small waterworks construction component, the ECOP document should be provided by the Municipal PMO to the small waterworks construction contractor and the construction supervision unit should be determined.

After the tendering process is ended and a contract is signed with the contractor, the contractor should conduct a visit to the construction site to identify environmental restriction factors in the project area. Prior to the commencement of the road and pipeline network construction works, a construction site checklist should be prepared and completed to inspect the sensitivity of the various environmental elements on site to provide an important basis for environmental protection of the small waterworks component in the future.

The purpose of the construction site checklist is to identify the relevant issues of environmental safety and identify and screen environmentally sensitive issues needing special protection measures.

Based on the results of construction site inspection, the contractor should prepare the “Site Environmental & Social Management Plan”, which should incorporate the requirements of the ECOP and get approval by the construction supervision unit.

### **3.3 Environment management in the construction stage**

During the construction of the small waterworks, the contractor should accept the supervision by the construction supervision unit commissioned by the owner.

The contractor of the small waterworks component should implement the various environmental protection measures based on the requirements of environment management in the construction contract and the “Site Environmental & Social Management Plan” approved by the construction supervision unit. The construction supervision unit should carry out direct full-process supervision over the implementation of the environmental protection measures taken by the contractors while the local environmental protection administrative authority and its environmental surveillance unit and the public stakeholders in the project area should conduct external environment management monitoring.

Throughout the construction stage, the contractor of the small waterworks component

should actively coordinate with the construction supervision unit and the environmental monitoring unit to perform their duties as detailed in “2.2 Responsibilities and Staffing of Agencies involved in the Environment Management System”.

The construction contractor should coordinate closely with the local government departments and other authorities to assure full compliance with the requirements of the laws and regulations of China. For details of the environmental protection measures, see Section 4 to 21.

### **3.3.1 Full-process construction supervision**

The key assignments of the construction supervision unit include:

- (1) Mainly responsible for supervising the construction activities of the contractor and other relevant activities, e.g. land occupation and compensation, etc. to assure that the aforesaid activities comply with the requirements, investment and objectives of environmental protection; responsible for coordinating the relationship between the land administration authority and the environmental monitoring authority on the construction site;
- (2) Responsible for supervising and guiding on a regular basis the contractor's environmental behaviors and assuring that the requirements of ECOP are satisfied;
- (3) Responsible for review and approval of the “Site Environmental & Social Management Plan” of the contractor;
- (4) Following up with and monitoring the implementation status of measures taken by the contractor in environmental protection and avoiding and mitigation of adverse environmental impacts;
- (5) Monitoring and checking whether the construction behaviors of the contractor comply with the requirements of this ECOP;
- (6) Making sure that an investigation should be immediately conducted and a report submitted to the municipal PMO or local environmental protection administration authority for a solution in case of any non-compliance with the environmental protection requirements or any adverse environmental impacts or any complaints from local residents on environmental protection in the project area; issuing simultaneously to the contractor an Instruction on Environmental Protection Corrections (Table 4 as attached) and making sure the corrective measures are taken by the contractor under supervision.
- (7) Stopping any activities or behaviors by the contractor violating the environmental protection requirements;
- (8) Providing on-the-job training to the contractor to avoid and abate possible adverse impacts on the local environment;
- (9) Conducting site environment inspections on a weekly basis and preparing, archiving and incorporating the Environmental Protection Checklist in the Construction Stage into the “Site Inspection Report” for monthly submission to the municipal PMO;
- (10) Conducting a further site environment inspection prior to the environmental protection acceptance upon the completion of the construction works and

preparing and putting into archives the Environmental Protection Acceptance Checklist (Table 5 as attached).

### **3.3.2 Environmental protection unit supervision and public opinion**

The construction contractors should coordinate closely with the local governments and other authorities throughout the construction stage to assure full compliance with this ECOP and provide adequate information to the affected public, in particular information on construction behaviors affecting public safety, matters infringing upon public interests and sensitive areas and temporary stockpiling sites, etc. The local EPB should carry out sample inspections over the environmental protection measures taken by the construction contractors, receive site inspection reports submitted by the owner and the municipal PMO and carry out its administrative duties based on the reported information and make arrangements for emergency responses to any abnormal environmental conditions arising in the construction process.

The contractors will assure that information to be disclosed to the public is posted at sites in the vicinity of local residential buildings in the project area, including name of contractor, name and telephone number of environment management coordinators, environmental impacts likely to arise in the construction process and preventive measures to be taken as well as the estimated duration of such impacts. In the meanwhile, the contractor needs to provide an open and transparent way of public participation and hotline telephone number and complaint handling office to receive public consultation and advices. Environmental issues reflected in the public feedback should be immediately investigated and addressed within the shortest possible time.

### **3.4 Corrective measures to non-conformities to the ECOP requirements**

The contractor and subcontractors (if any) of the small waterworks component must respect the requirements included in the ECOP and upon the occurrence of any pollution accidents (or events) due to failure in respecting the environmental protection measures specified in the ECOP:

- (1) The Contractor of the small waterworks component should take immediate measures and trigger the emergency response plan of environmental pollution accidents to eliminate the pollution sources and control the resulted environmental pollution.
- (2) The contractor of the small waterworks component should immediately notify the construction supervision unit and the project management unit while the construction supervision unit and the project management unit should provide assistance and guidance to the construction contractor to take remedial measures to reduce or eliminate environmental impacts. A report should be delivered within 24 hours to the local environmental protection administration authority (or local environment monitoring authority) for inspection and guidance to minimize the impact.

- (3) The contractor of the small waterworks component should keep record of the implementation status of the pollution control measures and propose and submit corrective measures to the construction supervision unit and the owner. Such records should be put into archives and registration by the construction supervision unit and the municipal PMO and the implementation status of such remedial measures will be reported by the owner to the municipal PMO.
- (4) The contractor of the small waterworks component should conduct an in-depth analysis of the causes of environmental pollution and develop preventive measures and improve the construction design proposal to prevent recurrence of similar accidents. The preventive measures developed by the contractor should be approved, archived and registered by the construction supervision unit and the municipal PMO.
- (5) The owner should take disciplinary and punishment actions to the contractor of the small waterworks component according to the stipulations in the contract based on the nature, scope and degree of impact of the pollution accident and the implementation status of the contractor's remedial measures and report the results of such actions to the local environmental protection administration authority.

#### **4. Environmental codes of practice in the stage of construction site preparation**

The purpose of developing the ECOPs for the construction stage is to protect the physical health and safety of the operators, improve their working environment and living conditions, protect the ecological environment, and prevent soil erosion in the construction process and prevent environmental pollution and various diseases occurred in the construction process.

This section presents the environmental protection measures that the civil works contractors should take in the construction of small waterworks component, mainly including environmental management of construction sites, control of dust pollution, control of hazardous gases, control of water pollution, control of noise pollution, control of construction wastes and soil erosion, etc..

The general requirements of the ECOP of the construction stage include:

- (1) Effective measures for prevention and control of air, water, noise, solid waste pollution and soil erosion and improvement of environmental sanitation should be included in the construction organization design of the Project.
- (2) The environmental protection measures included in the construction organization design should be implemented in the construction process to assure that the quality of the ambient air, surface water and acoustic and ecological environment in the project area satisfies the requirements of the functional zone and is subject to supervision by the environment supervision



unit and management unit.

- (3) Environmental protection and environmental sanitation management and inspection system must be set up on the construction sites and inspection records should be properly maintained.
- (4) The construction contractor should take effective measures for prevention and control of occupational diseases and provide the operators with necessary protective devices and organize physical examination and training for workers engaged in operations involving hazards of occupational diseases (at least once a year).
- (5) The construction contractors should take account of the seasonal characteristics and take effective actions to properly implement activities of food hygiene assurance, hot weather and cold weather protection and epidemic prevention.
- (6) Education and training and assessment for operators on construction sites should include contents of laws and regulations related to environmental protection and environmental health.
- (7) Construction contractors should develop public health emergency response plans for the construction sites in accordance with the respective laws and regulations.

## **5. Management of construction sites and facilities**

The scope of construction sites consists of construction area, office area and living area.

- (1) The construction area on the construction site should be clearly separated from the office area and the living area with corresponding separating measures and should be kept tidy and in good order.
- (2) Facilities of environmental protection or measures for mitigating environmental impacts should be provided in the construction area and the living area. For example, in the construction area, wastewater sedimentation tanks and measures for dust prevention and noise reduction should be provided; in the office and living areas, facilities for treatment of domestic sewage, canteen wastewater and domestic solid wastes should be available.
- (3) Company name or company logo should be displayed at the entrance and exit of the construction sites. A project introduction bulletin board should be set up at obvious positions at the main entrance and exit and the general layout map of the construction site as well as bulletin boards introducing the rules and regulations on production safety, fire and security protection, environmental protection and civilized construction should be erected inside the main gate.
- (4) A public announcement should be posted at least five days in advance at the construction site as well as the premises of affected households and enterprises to notify the public of the beginning and ending time of any possible suspension

of municipal services (including water supply, power supply, telephone and bus service) needed for the implementation of the construction works.

- (5) Existing buildings and infrastructures should be utilized as a priority on the construction sites. If new temporary buildings are needed, land use should be optimized to occupation of land resources. Use of clay bricks in construction of temporary facilities on construction sites is prohibited and the safety and fire protection requirements and relevant national regulations should be respected.
- (6) Staff dormitories must not be located in buildings under construction.
- (7) All temporary facilities should be demolished within one month as of the completion of the construction works.

## **6. Construction material stockpiling sites**

### **6.1 Quarries and borrowing sites**

Sand and gravels needed for the construction works are usually sourced from qualified quarries. In this Project, sand and gravels needed for the construction works are purchased from quarries with official business licenses in the region where this project is located, but strict actions should be taken to manage and control noises and dust generated in the course of loading and unloading and transportation of such materials as well as the stockpiling process in the construction sites.

Since this component mainly comprises of rehabilitation of existing water conservancy facilities, including channels, control gates and drainage pump stations, etc., based on the engineering characteristics of the project component and the environmental characteristics of the project area, a borrowing site with a land area of 16.85hm<sup>2</sup> located 1000m east of Hezhou Electronic Technology Ecological Industrial Park is to be utilized. The borrowing site belongs to the low-hill terrain and the landform types mainly include grassland and eucalyptus forest land.

### **6.2 Soil-spoiling and waste disposal sites**

Construction wastes (debris) generated in the construction process of the Project mainly comprises of construction wastes and waste soil (including some mellow soil) generated from rehabilitation of channels, control gates and drainage pump stations. The construction wastes will be utilized in a comprehensive way together with the simultaneously implemented revetment and road and pipeline construction works. 1 soil-spoiling and waste disposal site with a land area of 7.40hm<sup>2</sup> located 500m south of Guang-He Expressway south of Donglu Village is to be utilized for stockpiling of residual top soil, non-reusable earth and stone, soft soil and construction wastes. The remaining part of waste soil of the small waterworks component will be transported to the soil-spoiling and waste disposal site for disposal.

Windproof and stormproof measures should be taken for temporary waste (debris)

disposal sites and fences should be erected if necessary. Water spraying should be conducted on a periodical basis for the sake of dust suppression. In bad weathers, the waste (debris) disposal sites should be covered with tarpaulins; in addition, reusable waste soil (debris) should be used in time and the residual waste soil (debris) should be removed out of site in time. Covering measures should be taken during transportation and the routes and timing of transportation should be properly planned to minimize environmental impacts on sensitive sites (areas).

## **6.2 Precast yards**

The construction process of this component comprises of sand and gravel bedding + precast concrete blocks + channel lining + pointing. The precast yards may be located in the vicinity of the construction sites based on the environmental characteristics and orientation of the channels as planned and designed. Noise and curing wastewater generated in the processes of mechanical mixing, vibrating and concrete curing will produce impacts on the acoustic environment and surface water environment.

- (1) Precast yards should be located more than 300m away at the downwind side of environmentally sensitive sites and fences should be erected when necessary;
- (2) Silencers should be installed at noise sources such as the mixers and the vibrators and vibration reduction bases or vibration-reduction bearings may also be adopted;
- (3) The construction workers should be arranged in a reasonable way by the construction contractor to reduce the time of operation of the high-noise equipment operators and earmuffs may be provided to reduce the impacts on the construction workers.

## **7. Ambient air quality management**

Pollutants generating impacts on the ambient air quality in the construction stage of the Project mainly include construction dust and construction plant exhaust gas and dredging odor.

### **7.1 Construction dust and construction plant exhaust gas**

- (1) The construction access roads are simple gravel roads and water will be sprayed periodically to reduce dust.
- (2) Fine particle bulky materials stockpiled on construction sites should be enclosed or covered and water should be sprayed over the stockpiles, based on the nature of the material, to effectively suppress dust.
- (3) Road fences should be set up for environmentally sensitive sites (zones) along the road sections or pipeline sections under construction.

- (4) Removal of construction wastes should be carried out with a closed container and aerial casting is prohibited. The construction wastes should be stored by type in accordance with the relevant classification management requirements of municipal wastes and should be cleared and digested in a timely manner. Water should be sprayed to an appropriate extent ahead of the clearing operation.
- (5) Management of transportation vehicles should be strengthened and those transporting dust-prone materials should be covered with tarpaulins.
- (6) Water spraying should be carried out during demolition for the sake of dust suppression. The construction wastes should be cleared out of site within 3 days as of the completion of the demolition activity and the relevant requirements on demolition management should be respected.
- (7) Dust-prone areas on the construction sites should be enclosed with fences or sprayed with water for dust suppression.
- (8) Earthwork materials on construction sites should be stockpiled at a centralized place and properly covered; vehicles should not be overloaded to avoid spillage en route due to vibration.
- (9) Vehicle washing facilities should be provided at the entrance and exit of construction sites and surface mud and earth should be cleaned before vehicles leave the site.
- (10) The storage sites of materials and formworks on site should be flat and solid;
- (11) The construction sites should be cleaned and sprayed with water in a timely manner;
- (12) On account of the dominant wind direction and the objects of environmental protection in the vicinity, stockpiling sites of fine-particle bulky materials and other key dust sources should be located more than 300m away at the downwind side of objects of environmental protection.
- (13) Burning of wastes is prohibited.

## **7.2 Odor of dredging sludge**

- (1) The dredging operation should be conducted in low water season and deodorant should be sprayed on a periodical basis on the sludge dewatering site to reduce environmental impacts.
- (2) Protective devices, such as protective masks, should be provided for the construction workers.

## 8. Acoustic environment quality management

Noise sources at different stages of the construction stage will produce impacts of different degrees on the acoustic environment quality of the project area. Stronger efforts of management should be made and respective environment control measures should be taken to minimize such impacts.

- a) State-of-the-art and reliable low-noise equipment should be selected upon type selection;
- b) The construction period in a day lasts from 8:00am to 20:00pm and construction activities should be banned in the noon nap hours from 12:00am to 14:00pm. Nighttime construction is restricted, but if continuous nighttime construction is truly necessary, a certificate should be obtained from local construction administration authority, an approval granted by local EP authority and a public announcement made to local residents.
- c) The construction progress should be reasonably scheduled to avoid simultaneous operation of multiple high-noise mechanical plants on the same construction site and at the same time. During construction, efforts should be made to speed up the progress and shorten the duration of noise impacts so as to minimize the impacts of construction noises on the operators.
- d) Noises of transportation vehicles may produce certain impacts on the sensitive sites of acoustic environment along the route. Therefore, the construction contractor needs to strengthen the construction workers' awareness of environmental protection, learn local customs and habits and reasonably schedule the transportation time and take self-conscious measures to limit speed and prohibit honking for vehicles and other construction plants operating in high-density residential areas and other environmentally-sensitive areas so as to effectively prevent and reduce noise impacts.
- e) Mechanical equipment generating relatively high noise should be located on the far side of the residential area and noise-reducing fences should be erected around construction sites with a distance of less than 5m from residences, schools and similar buildings.
- f) Advices should be given to the construction contractor to reasonably arrange and allocate the construction workers to reduce the operation time of high-noise machinery operators. Earmuffs may be provided to reduce noise impacts on the construction workers.
- g) Low-noise pump units should be selected for the drainage pump station and vibration reduction devices should be installed on the pump bases. Sound insulation and absorption measures should be taken for the main pump house, which should be enclosed or provided with sound insulation windows.
- h) Stronger efforts should be made in maintenance and servicing of pump equipment to avoid increase of noise impacts due to abnormal operation.

## **9. Water environment quality management**

- (1) Temporary pit toilets are to be provided on the construction site. Feces should be periodically removed as farmland fertilizer based on the actual living conditions in the rural areas;
- (2) Stronger efforts should be made in construction management to strictly control oil leakages of the construction plants; drainage system and water and soil conservation measures should be properly implemented for the temporary stockpiling areas to prevent possible impacts on the water environment by soil erosion at the waste soil stockpiling sites.
- (3) The construction units must carry out the treatment measures for construction and production wastewater and domestic sewage to assure that such wastewater is properly treated and disposed.
- (4) Environmental protection education for construction workers should be strengthened to enhance their environmental awareness and prevent and stop any random dumping of wastes and wastewater by construction workers.
- (5) The low water season should be selected for dredging operations and the construction time should be minimized to reduce disturbances to the water systems.
- (6) Since dredging is the main source of pollution affecting the water environment in the construction period, the dredging process should be standardized and sludge submersible pumps should be used to reduce pollution of water environment in the construction period.
- (7) The construction plants involved in the dredging process must be inspected strictly to prevent oil leakage. Wastewater, solid wastes and oily wastewater must not be discharged into the water systems and should, instead, be collected and treated together with the other construction wastes.
- (8) The construction camps and building material stockpiles should be located as far as possible away from wetlands and other surface waters. If it becomes necessary for the sake of construction activities to have ordinary construction materials stockpiles in the vicinity of water systems, the stockpiles must be covered up and fences should be provided if necessary.
- (9) Domestic solid wastes generated by construction staff must not be disposed in a random way and must not be dumped into the water systems. Such domestic wastes must be collected for centralized treatment by the environment and sanitation authority on a periodical basis;
- (10) Waste oil and other solid wastes involved in the construction process must neither be dumped or cast into nor placed around the water systems and should, instead, be transported to designated sites or treated according to the relevant requirements in a timely manner.

- (11) The pipeline construction quality should be strictly controlled to avoid leakage or flooding of sewage due to failure of sewage pipelines that might lead to pollution of ground water environment and the branch channel water environment.

## **10. Solid waste treatment management**

According to the requirements of the relevant laws and regulations, solid wastes such as construction wastes, waste soil (debris) and domestic solid wastes and dredged sludge must be properly collected and reasonably treated.

- a) Arrangements should be made to achieve comprehensive use of construction wastes in the road and pipeline network component simultaneously implemented, with the remnants stockpiled at a designed stockpiling place on the construction site and transported in a timely manner based on the construction progress to the solid waste landfills of each project town for disposal.
- b) Removal of construction wastes should be carried out with a closed container and aerial casting is prohibited. The construction wastes should be stored by type in accordance with the relevant classification management requirements of municipal wastes and should be cleared and digested in a timely manner.
- c) Water should be sprayed to an appropriate extent ahead of the clearing operation.
- d) Domestic wastes should be collected in the garbage bins and bags provided on the construction sites and then transported to a designated place for centralized treatment and disposal;
- e) The waste soil contains a certain portion of mellow soil, which should be used in wasteland reclamation and forestation of the project area. The remaining soil may be used as subgrade fill of the road works and bedding fill on both sides of channels in the vicinity.
- f) Burning of toxic and hazardous substances is not permitted on construction sites. Toxic and hazardous substances should be disposed according to the relevant requirements and stipulations.
- g) Random stockpiling of dredged sludge should be prohibited to prevent possible soil erosion, impacts on water environment and soil and damages to landscape.
- h) Dredging should be conducted in low water season and the dredged sludge should be dewatered and then transported to the solid waste landfill for treatment.
- i) Temporary land occupation should be minimized through timely removal and transportation of dredged sludge.

- j) Screening residues generated in the operation stage of the drainage pump station should be stockpiled at a designated site in the station and collected and transported by the public sanitation department to the garbage site for disposal.

## **11. Ecological protection management**

- (1) The layout of the construction sites should be reasonably optimized to minimize the scope of construction activities and reduce the level of damages to vegetation from implementation of the construction works.
- (2) Construction materials outsourced for the construction works, such as stone, sand, cement, etc., should be transported on a demand-driven basis to minimize land occupation and vegetation damage. Upon completion of the construction works, the construction sites should be cleaned and landscaped in time to restore damaged vegetation to the maximum extent.
- (3) Temporary protective fences should be erected before the commencement of the construction works to protect trees left undisturbed on the construction sites based on the site visit results.
- (4) The excavation scope of the culvert gate should be subject to strict control and must not occupy land and waters outside the boundary; efforts should be made to shorten the construction period of the culvert gate to reduce the impact on aquatic organisms due to disturbance of waters and increase of suspended matters.
- (5) The construction contractor should minimize the duration of temporary land occupation and control the earthwork construction time provided that the construction quality is assured and a stable excavation and fill slope should be maintained to reduce impacts on areas outside the construction area of the Project.
- (6) Dredging works should be conducted in the low water season and the construction time should be reasonably arranged to reduce disturbances of waters;
- (7) Ecological restoration of the construction sites should be carried out prior to the final acceptance of the Project.

## **12. Social environment management**

In order to mitigate the impacts on the livelihood of local residents due to construction of the small waterworks component, the following environmental impact control measures should be taken:

- (1) The various LAR subsidies should be allocated to the concerned village groups and individuals based on the national and provincial compensation standards, the local circumstances and the agreements signed with the LAR affected households. The various compensations should be reasonably allocated and



utilized through full promotion of democracy and respect of the basic citizen rights; the arable land and labor force should be reasonably adjusted through full enforcement of the relevant policies.

- (2) Local roads occupied or damaged in the construction stage should be relocated or subject to protective treatment such as pavement rehabilitation and landscaping. In addition, compensation of a certain amount should be paid to local governments to safeguard the righteous interests of local governments and residents. Gravel roads occupied by the sewage pipeline construction works should be restored upon completion of the respective works.
- (3) Construction and transportation vehicles should avoid the peak hours of local roads to prevent traffic congestion and accidents.

### **13. Risk control measures**

The primary risk of small waterworks construction is construction safety of water-related construction activities. Therefore, the flood season risk control measures and technical codes of construction and operation safety for water-related construction works should be developed and implemented to put hazardous factors likely to arise in the water-related construction works under strict control and assure construction safety of the water related construction works.

#### **13.1 Flood season construction risk control measures**

- (1) On the premise that organizational assurances are available, the importance of flood control should be highly recognized and strong efforts of advertisement and safety education should be made to the depth of typhoon and flood risk control and to enable the construction workers to be seriously aware of and act as a group to truly enforce and implement the various flood prevention and control measures.
- (2) In the flood season, staffing arrangements should be made to assure 24-hour non-interrupted on-duty operation and specific personnel should be assigned to listen to weather forecasts so that flood control actions are immediately mobilized and effective measures are taken when any rainstorm, floods or disastrous weathers are forecasted to assure the safety of the construction works, the construction equipment and personal life and properties.
- (3) Records should be properly kept during rainstorms or floods and close attention should be paid to water level and possible impacts on the Project.
- (4) The construction activities should be immediately stopped 2 days ahead of the forecast date of flood arrival and the construction equipment on site should be evacuated to get fully prepared for the coming flood.
- (5) A telecommunication system mainly comprising of mobile and fixed telephones should be set up and all participating staff of the construction works must keep mobile phones accessible 24 hours.

- (6) Woven bags, excavators, power generators, water pumps, dump trucks, life jackets and waterproof flashlights and other respective flood control and rescue materials and devices should be provided.

### **13.2 Flood and waterlogging prevention and control**

- (1) Weather forecast, hydrological forecast and water level monitoring mechanisms should be established for management of the construction stage and operation stage of the Project so that physical and human resources needed for flood control and rescue are prepared in time. The flood control and rescue activities in the rescue process should be well implemented according to the professional and technical requirements.
- (2) In the flood season, the overflow dam involves a big water depth and improvement of the river water environment will also increase the level of participation in the river. Therefore, safety guardrails and the warning signs should be set up to improve the capacity of drowning prevention. In extreme weathers, local residents should be evacuated within the forecast period.
- (3) A reasonable layout plan should be developed for the construction areas and diesel, engine oil, lubricants, paint and similar materials stored in the construction production areas should be kept far away from the river and appropriate isolation measures should be taken to prevent leakage during the flood season.

### **13.3 Construction safety**

- (1) The construction contractors responsible for construction of flood control and diversion facilities in the flood season should develop and submit to the designated authority specified in the construction contract for approval the respective construction program based on design requirements and engineering needs, which shall be submitted by the EA to the competent department of flood control for approval.
- (2) Small waterworks construction workers and operators should wear protective gloves and other necessary labor protection devices. Construction workers on site must wear safety helmets and those working on the revetment slope must wear safety ropes. Safety fences should be erected on the levee crest to prevent possible falls.
- (3) In the event of an overstandard flood, the emergency response plan should be triggered and emergency response actions taken in a timely manner.
- (4) Actions should be taken to assure stability of pit walls during earth excavation; and bottom digging should be banned during facade excavation.
- (5) Production safety advertisement boards and signs and marks should be erected on construction sites. Safety signs warning against “Deep Water, No Swimming, Drowning Danger” and other dangers and risk and construction road signs

should be provided at obvious locations around water pits generated from embankment foundation pits that are not backfilled in time.

## **14. Public participation**

The construction contractors should provide adequate information to the public in the affected area, in particular, local residents likely to be directly affected by the construction activities in the project area. Key measures to be taken include:

- (1) Setting up a bulletin board at the entrance of the construction site to disclose information such as project name, key construction works, construction time as well as the contact person and contact information for complaints and advices;
- (2) Making arrangements for site environment engineer to answer questions from the public on environmental protection;
- (3) Fulfilling the relevant formalities for and disclose to the local residents information on any nighttime construction required for the sake of construction technology and workmanship. Information to be disclosed in such cases include beginning and ending time of as well as the permit granted by the environmental protection authority on nighttime construction.
- (4) A public announcement should be posted at least five days in advance at the construction site as well as the premises of affected households and enterprises to notify the public of the beginning and ending time of any possible suspension of municipal services (including water supply, power supply, telephone and bus service) needed for the implementation of the construction works.
- (5) All feedbacks, comments and questions from the public should be recorded and archived. Questions raised by the public should be answered and responded in a timely manner, with the results of answers and responses recorded and archived for future inspection by the supervision unit.

## **15. Construction traffic management**

- (1) Temporary increase of traffic caused by the construction activities will bring noise impacts and daily life inconvenience for local residents along the transportation routes. Therefore, the following construction traffic management measures are proposed in this ECOP.
- (2) A reasonable construction schedule should be developed to shorten the time of temporary land occupation.
- (3) Enclosed transportation vehicles must be used for transportation of earth, debris and construction wastes.

- (4) Transportation of construction materials at night time should be prohibited on any construction access road with a centralized area of residence in a distance of less than 50m.
- (5) Construction and transportation vehicles should avoid the peak hours of local roads to prevent traffic congestion and accidents.
- (6) Construction vehicles should travel along designated routes and unauthorized change of routes is prohibited to avoid possible damages to farmland and forest land;

## **16. Supervision plan**

Responsibilities of construction supervision should be incorporated into the environment supervision of the small waterworks component to implement total quality management of the Project following the requirements of both construction quality and environment quality.

### **16.1 Scope of construction supervision**

Areas of and along the Project, mainly construction sites, temporary stockpiling areas causing environmental pollution to the surrounding environment due to production and construction.

### **16.2 Contents of construction supervision**

- (1) Reviewing and verifying whether the environmental protection measures proposed in this ECOP are incorporated in the design proposal and the construction drawing design;
- (2) Assisting the executive unit in organizing environmental protection training for construction and management staff;
- (3) Reviewing clauses on environmental protection in the project contract;
- (4) Carrying out the supervision of water, sound and air environment quality in the construction process, the environmental impact mitigation measures and the environmental protection works and organizing staged acceptance based on the respective standards;
- (5) Keeping systematic records of the environmental impacts of the construction activities, effects of the environmental protection measures and the implementation status of the environmental protection activities;
- (6) Giving timely feedbacks to the construction supervision team on the relevant environmental protection measures and any unanticipated issues arising in the construction process and recommending solutions;

- (7) Responsible for preparing the construction supervision plans and summary reports.

### **16.3 Terms of reference for construction supervision**

- (1) A sound and robust safeguard system should be set up for construction supervision. It is required that a full-time environmental protection personnel should be assigned in the construction supervision team to conduct total quality management in accordance with the construction quality and environmental quality requirements. The environmental protection and construction supervision work of the Project will be supervised by the Municipal PMO, environmental specialist and the environmental protection bureau.
- (2) Environmental protection management methods as well as their detailed rules of implementation should be developed. Environmental protection regulations, such as environmental protection management methods and the detailed rules of implementation of the environmental protection work should be developed based on the specific characteristics of the Project.
- (3) A sound work procedure for construction supervision should be established.
  - a) Work record system, i.e. the “Supervision Diary”, which describes the results of inspection, environmental problems and cause analysis and responsible units as well as the preliminary solution, etc.
  - b) Reporting system: As the key channel for vertical and horizontal and internal and external communication and transmission of information, the reporting system includes the Engineer’s “monthly reports”, “quarter reports” and “half-year progress evaluation reports” and the contractors’ “monthly environment reports”.
  - c) Document notification system: Matters that require actions by both the Engineer and the contractors are communicated and confirmed in letters and documents. Verbal notice is allowed for emergency cases, but must be validated with a written document afterwards.
  - d) Regular environment meeting system: Environmental protection meetings are held once a month to review the work of environmental protection, raise existing problems and correction requirements and develop an implementation plan.

## **17. Construction safety and health**

The construction contractor is obliged to respect all national and local safety requirements and take other measures to avoid accidents and assure the safety and health of the construction workers.

- (1) The construction contractor should ensure that qualified first aid is available. Appropriate first aid devices should be provided at the construction sites and documented emergency handling procedure should be developed for remote sites so that the patient can be transferred to a suitable medical institution;
- (2) Occupational health and safety training should be provided all newly recruited construction workers to introduce to them basic work rules on the construction site, rules of personal protection and how to prevent the other staff members from being injured;
- (3) Warning signs should be attached on all powered electric devices and wires; all electricity wires, cables and electric tools on hand should be checked for any damaged or exposed wires and the maximum permissible operating voltage of tools on hand should be determined in accordance with the manufacturer's recommendations. All electrical equipment operating in humid (or possibly humid) environment should be double-insulation / grounded;
- (4) Appropriate eye protection devices (such as welding goggles and / or masks) should be provided for all operators participating or assisting in the welding operations.
- (5) Guardrails (with middle and peripheral baffles) should be installed at the edge of all vulnerable and dangerous areas. In addition, the construction workers should be provided with fall prevention devices (including safety belts and distance limiting ropes).
- (6) The construction contractor should determine and provide the construction workers with appropriate personal protective devices that can adequately protect the workers themselves, other workers and occasional visitors and should not bring unnecessary inconvenience to the user.
- (7) Health education should be provided to construction workers, e.g. implementing information communication strategies, enhancing face-to-face counseling, addressing systemic problems that affect individual behavior and encouraging individuals to take protective measures and use condoms to avoid spreading diseases to others; in addition, the construction workers should be encouraged to use insect repellent, clothing, mosquito nets and other blocking methods to avoid disease spreading via mosquito bites.

## **18. Traffic safety**

The project staff must maintain traffic safety while traveling and leaving the workplace and operating the project equipment on free roads or public roads. The security measures to prevent and control the injury and death of traffic accidents should be designed to protect project workers and road users and victims of road traffic accidents. Based on the size and nature of the project activities, the following safety actions should be taken:

- (1) Safety education and training should be organized on a periodical basis to particularly make the drivers aware of the importance of safe driving.
- (2) To avoid fatigue driving, actions should be taken to limit driving time and make sure drivers drive in turns. To minimize traffic accidents, driving on dangerous roads and time periods should be avoided.
- (3) Vehicles should be regularly maintained using manufacturer-approved spare parts, which should be purchased in a timely manner to prevent possible serious accidents due to equipment faults or premature failure of spare parts.
- (4) Separation of pedestrian and motor vehicles should be realized.
- (5) Traffic safety control measures should be taken and road signs and signal should be used to warn pedestrians and vehicles of any traffic dangers; road signs may be improved through cooperation with the local community and the competent authorities improve visibility of road signs and enhance traffic safety in an all-around way.
- (6) Traffic safety and pedestrian safety education should be conducted in the communities in the vicinity of the project area and schools.
- (7) To assure that appropriate first aid is provided in case of any accidents, communications should be kept with the emergency response workers.
- (8) Locally purchased materials should be used where possible to minimize transportation distance;
- (9) Driving techniques should be improved and it must be regarded as a mandatory requirement that drivers must hold licenses.

## **19. Environmental protection training and education**

- (1) Prior to the commencement of the Project, the owner should assign an environmental specialist to provide environmental protection training for the contractors and construction supervision agencies of the small waterworks component;
- (2) Prior to the commencement of the small waterworks component, the contractor of the road and pipeline network component should organize training and examinations for the operators on the construction sites on laws and regulations on environmental protection and health and sanitation;
- (3) The contractor of the small waterworks component should organize staff training on the risk emergency response plan as well as emergency response rehearsals on a yearly basis.

**Annex Table 1: Summary of Environmental Protection Measures**

Item		Environmental Protection Measures	
Environmental codes of practice in the stage of construction site preparation	( 7 )	Effective measures for prevention and control of air, water, noise, solid waste pollution and soil erosion and improvement of environmental sanitation should be included in the construction organization design of the Project.	
	( 8 )	The environmental protection measures included in the construction organization design should be implemented in the construction process to assure that the quality of the ambient air, surface water and acoustic and ecological environment in the project area satisfies the requirements of the functional zone and is subject to supervision by the environment supervision unit and management unit.	
	( 9 )	Environmental protection and environmental sanitation management and inspection system must be set up on the construction sites and inspection records should be properly maintained.	
	( 10 )	The construction contractor should take effective measures for prevention and control of occupational diseases and provide the operators with necessary protective devices and organize physical examination and training for workers engaged in operations involving hazards of occupational diseases (at least once a year).	
	( 11 )	The construction contractors should take account of the seasonal characteristics and take effective actions to properly implement activities of food hygiene assurance, hot weather and cold weather protection and epidemic prevention.	
	( 12 )	Education and training and assessment for operators on construction sites should include contents of laws and regulations related to environmental protection and environmental health.	
	( 13 )	Construction contractors should develop public health emergency response plans for the construction sites in accordance with the respective laws and regulations.	
ECOP of Construction Sites	Construction areas	( 1 )	The construction area on the construction site should be clearly separated from the office area and the living area with corresponding separating measures and should be kept tidy and in good order.
		( 2 )	Facilities of environmental protection or measures for mitigating environmental impacts should be provided in the construction area and the living area. For example, in the construction area, wastewater sedimentation tanks and measures for dust prevention and noise reduction should be provided; in the office and living areas, facilities for treatment of domestic sewage, canteen wastewater and domestic solid wastes should be available.
		( 3 )	Company name or company logo should be displayed at the entrance and exit of the construction sites. A project introduction bulletin board should be set up at obvious positions at the main entrance and exit and the general layout map of the construction site as well as bulletin boards introducing the rules and regulations on production safety, fire and security protection, environmental protection and civilized construction should be erected inside the main gate.
		( 4 )	A public announcement should be posted at least five days in advance at the construction site as well as the premises of affected households and enterprises to notify the public of the beginning and ending time of any



Item		Environmental Protection Measures	
Control of environmental impacts of construction access roads			possible suspension of municipal services (including water supply, power supply, telephone and bus service) needed for the implementation of the construction works.
		( 5 )	Existing buildings and infrastructures should be utilized as a priority on the construction sites. If new temporary buildings are needed, land use should be optimized to occupation of land resources. Use of clay bricks in construction of temporary facilities on construction sites is prohibited and the safety and fire protection requirements and relevant national regulations should be respected.
		( 6 )	Staff dormitories must not be located in buildings under construction.
		( 7 )	All temporary facilities should be demolished within one month as of the completion of the construction works
	Road dust	( 1 )	Pavement of new access roads and hardening of sites should be handled based on the design usage. For example, reusable load-bearing bricks (components) may be used for access roads allowing heavy-duty vehicles while reusable seepage bricks may be used for pavement of ordinary footpaths.
		( 2 )	The access roads should be maintained and cleaned every day and dust-prone sections should be sprayed with water for dust suppression.
	Noise control	( 3 )	The construction contractor must select construction equipment and machinery and transportation vehicles conforming to the relevant national standards and select, if possible, low-noise construction plants.
		( 4 )	Maintenance and servicing of the various construction equipment should be strengthened to keep them in fine operation to fundamentally reduce the intensity of noise and vibration sources.
	Ecological impact control	( 1 )	Newly constructed access roads should be ecologically restored to at least the pre-construction state after the construction works is completed.
		( 2 )	Arable top soil stripped during the construction should be stockpiled temporarily on a relatively flat area on the construction site and fenced up with bagged earth cofferdam. Temporary gutters and sand sedimentation measures should be provided around the stockpiles. The stockpiled top soil should be covered with dust prevention nets and reused for ecological restoration upon completion of the construction activities.
		( 3 )	Local roads occupied or damaged in the construction stage should be relocated or subject to protective treatment such as pavement rehabilitation and landscaping. In addition, compensation of a certain amount should be paid to local governments to safeguard the righteous interests of local governments and residents.
ECOP of Construction Camps		( 1 )	The construction area on the construction site should be clearly separated from the office area and the living area with corresponding separating measures and should be kept tidy and in good order.
		( 2 )	Facilities of environmental protection or measures for mitigating environmental impacts should be provided in the construction area and the living area. For example, in the construction area, wastewater sedimentation tanks and measures for dust prevention and noise reduction should be provided; in the office and living areas, facilities for treatment of domestic sewage, canteen wastewater and domestic solid wastes should be available. Oil traps, septic tanks and enclosed garbage stations should be provided and garbage should be removed in a timely manner;
		( 3 )	Company name or company logo should be displayed at the entrance and exit of the construction sites. A project introduction bulletin board should be set up at obvious positions at the main entrance and exit and the general

Item		Environmental Protection Measures	
		layout map of the construction site as well as bulletin boards introducing the rules and regulations on production safety, fire and security protection, environmental protection and civilized construction should be erected inside the main gate.	
	( 4 )	A public announcement should be posted at least five days in advance at the construction site as well as the premises of affected households and enterprises to notify the public of the beginning and ending time of any possible suspension of municipal services (including water supply, power supply, telephone and bus service) needed for the implementation of the construction works.	
	( 5 )	Offices, dormitories, canteens, toilets, shower rooms, hot water supply, conference room and enclosed garbage stations (or containers) and washing facilities among other temporary facilities should be provided on the construction sites. Existing buildings and infrastructures should be utilized as a priority on the construction sites. If new temporary buildings are needed, land use should be optimized to occupation of land resources. Use of clay bricks in construction of temporary facilities on construction sites is prohibited and the safety and fire protection requirements and relevant national regulations should be respected.	
	( 6 )	A special storage space should be provided for oils stored in the construction sites. Warning signs should be erected; floor should be subject to anti-seepage treatment and absorbing bags, sand and chips among other emergency response materials should be prepared.	
	( 7 )	Staff dormitories must not be located in buildings under construction.	
	( 8 )	All temporary facilities should be demolished within one month as of the completion of the construction works.	
Environment Quality Management	Water environment quality management	( 1 )	Construction and production areas, construction camps, access roads and soil-spoiling and waste disposal sites should be located as far as possible away from surface waters.
		( 2 )	It is recommended that water-related operations, such as embankment construction, river dredging, embankment rehabilitation, are implemented in low-water season and the construction time should be shortened where possible to reduce disturbance of the water systems.
		( 3 )	Since the embankment construction works involved in this Project are mainly located in the vicinity of the built urban area, it is suggested that the public toilets in the nearby villages are used for the construction camps. If the existing public toilets cannot be used, it is suggested that a centralized public toilet is constructed for the construction camps and septic tanks are provided for treatment of wastewater before reuse in farmland irrigation.
		( 4 )	A sedimentation tank should be provided at the washing site of mixers, concrete pumps and transport vehicles and the wastewater must not be directly discharged into the river and should, instead, reused or used for dust suppression after secondary sedimentation.
		( 5 )	Materials spilled on the construction sites should be cleaned in time and measures should be taken for protecting the materials stockpiled on site from storm water scours and drenching and avoid possible pollution of water systems.
		( 6 )	Oily wastewater of the construction plants should be collected in time for treatment and should not be discharged into rivers and water systems. Construction must be suspended in rainy days and the earthwork fill must be covered to avoid possible rainwater scours and pollution of water systems.

Item		Environmental Protection Measures
	Acoustic environment quality management	(8) Low-noise equipment should be selected to the best possibility in terms of equipment selection and the power and mechanical equipment should be repaired and serviced on a periodical basis.
		(9) Scientific construction plans should be developed and reasonable construction time should be scheduled to best avoid simultaneous use of a large number of high noise equipment. In addition, the construction time of high-noise equipment (e.g. excavators, mixers, etc.) should be arranged in daytime and nighttime construction should be avoided (22:00 to 06:00).
		(10) Handling and transportation of in-situ concrete and bulk materials should be reduced in night time. If continuous operation is needed on special occasions such as embankment construction, measures of noise reduction should be taken and the local residents should be notified of the construction time and place and a report submitted to the EPB before the construction proceeds.
		(11) Mobile sound barriers should be provided by the construction contractors at noise sensitive sites to reduce the impacts of construction noises.
		(12) The mechanical equipment should be operated according to the respective stipulations and the codes of operation should be followed in the process of baffle and rack removal. Upon material loading and unloading, noise of collision should be reduced.
		(13) To avoid excessively high noise level at a certain spot, actions should be taken to avoid the arrangement of a large number of power and mechanical equipment at the same site.
		(14) The executive unit should coordinate with the local residents together with the construction contractor and disclose information on the construction timetable. A prior notice should be given to the affected organizations and residents before the operation starts and information on the construction progress as well as measures taken during construction for reducing noise should also be provided to them to obtain mutual understanding. In addition, complaint hotlines should be set up during the construction process to handle and respond positively to complaints about noise disturbances.
	Ambient air environment quality management	(1) Sediments, earthwork, debris and construction wastes must be transported in enclosed vehicles and vehicle washing facilities must be provided at entrances and exits of construction sites to make sure the vehicles are washed and cleaned to avoid possible take-away of mud and debris out of the site.
		(2) Effective measures of covering, hardening, landscaping and water spraying should be taken on the construction sites; dust generated on construction sites and roads should be prevented and controlled through water spraying and cleaning.
		(3) Cement and other fugitive fine-particle construction materials should be stored in an enclosed space and lime and sand on the construction sites should be stockpiled on a centralized site and properly covered.
		(4) Backfill and transfer of sediments and earth and other construction activities likely to cause dust pollution should not be conducted in days with a wind scale of Grade 4 or above.
		(5) Vegetation should be restored on temporarily occupied land parcels at the end of the temporary occupation to prevent soil erosion.
		(6) Construction plants and vehicles with low energy consumption and low pollutant emission should be selected where possible and tail gas purification devices should be installed for vehicles with non-compliant tail gas emission. Management and maintenance of machinery and vehicles should be strengthened to reduce air pollution caused by poor performance of machinery and vehicles.

Item		Environmental Protection Measures
	Solid waste management	(1) The waste soil contains a certain portion of mellow soil, which should be used in wasteland reclamation and forestation of the project area. The remaining soil may be used as subgrade fill of the embankment construction works and bedding fill on both sides of channels in the vicinity.
		(2) Removal of construction wastes should be carried out with a closed container and random casting is prohibited. The construction wastes should be stored by type in accordance with the relevant classification management requirements of municipal wastes and should be cleared and digested in a timely manner.
		(3) Construction wastes (including excavation earth) should be transported to a designated soil-spoiling and waste disposal site for storage and disposal.
		(4) Domestic wastes should be collected in the garbage bins and bags provided on the construction sites and then transported to a designated soil-spoiling and waste disposal site for storage and disposal;
		(5) Burning of toxic and hazardous substances is not permitted on construction sites. Toxic and hazardous substances should be disposed according to the relevant requirements and stipulations.
		(6) Material transportation should avoid the peak traffic hours at the sensitive sites and appropriate protection measures should be taken to alleviate traffic pressure and reduce material spillage and leakage and possible secondary dust pollution resulting from material transportation.
Soil Erosion Control	Temporary stockpiling sites	(1) Temporary stockpiling sites in the construction process should be located on the land occupation area on the river banks where possible to minimize occupation of land in other locations.
		(2) Such temporary stockpiling sites should be located on waste and poor land and far away from villages and sensitive objects and riverway to minimize impacts on water quality of the rivers.
		(3) Upon completion of the construction works, surfacing clearing should be carried out and soil and water conservation measures should be taken for the temporary stockpiling sites, which may be restored into greenbelts after soil improvement;
		(4) The existing riverside roads should be utilized where possible. If it is necessary to open new access roads, heavy excavation and fill should be avoided and efforts should be made in soil and water conservation to reduce soil erosion and ecological damages.
		(5) Trees and grasses should be planted upon the completion of the construction works;
		(6) Damages to surface vegetation should be minimized and the construction sites should be leveled properly;
		(7) Fences, drainage gutters and other measures effectively preventing and controlling soil erosion should be implemented for the temporary stockpiling sites of earthwork and aggregates;
		(8) Earth stockpiles should be covered with tarpaulins or plastic film, where possible, for prevention of stormwater scours and also control of dust pollution;
		(9) The soil and water conservation measures should be implemented simultaneously with the other measures to achieve the desired effect;
		(10) Upon completion of the construction works, top soil should be leveled in time and surface vegetation restored to reduce the excavated area.

Item		Environmental Protection Measures
	Quarries, borrowing sites	Attention should be paid to dust suppression through water spraying in the operation process of the borrowing site to reduce dust pollution caused by earthwork excavation. Necessary interception and drainage facilities should be constructed in advance before the operation of the borrowing site. Top soil generated from excavation should be preserved and used for land rehabilitation. Such top soil should be should be stockpiled temporarily on a relatively flat area on the construction site and fenced up with bagged earth cofferdam. Temporary gutters and sand sedimentation measures should be provided around the stockpiles. The stockpiled top soil should be covered with dust prevention nets and reused for borrowing site restoration upon completion of the construction activities.
	Waste (debris) disposal sites	Windproof and stormproof measures should be taken on temporary waste (debris) disposal sites, which, when necessary, should be fenced up and sprayed with water periodically for dust suppression and covered with tarpaulins in bad weathers. Waste soil (debris) eligible for comprehensive utilization should be utilized in time and the residual waste soil (debris) should be removed out of site in time. Waste soil (debris) during transportation should be covered with tarpaulins and transported along planned routes and at scheduled time to minimize environmental impacts on sensitive spots (areas).
Ecological protection management		(1) A reasonable construction organization plan should be developed for the construction works at each river section so that the construction activities are implemented and phased on a section-by-section basis and cumulative impacts arising from simultaneous construction on multiple construction sites can be avoided. Industrial and domestic wastewater generated from the construction process should be subject to necessary treatment for compliant discharge; cleaning and maintenance of construction plants should be strengthened to avoid pollution of water systems.
		(2) Construction materials outsourced for the construction works, such as stone, sand, cement, etc., should be transported on a demand-driven basis to minimize land occupation and vegetation damage. Upon completion of the construction works, the construction sites should be cleaned and landscaped in time to restore damaged vegetation to the maximum extent.
		(3) Occupation of river banks should be subject to strict control and construction camps and construction material stockpiling sites must not be located on river banks.
		(4) Upon the completion of the embankment reinforcement and revetment works, landscaping of embankment and revetment should be considered with priority and should be reasonably combined with cement concrete and masonry works. An ecological corridor should be developed through the integration of revetment landscaping and river bank landscaping.
		(5) Temporary interception ditches should be constructed on the construction site to provide a flood diversion canal for the surface runoff passage damaged by the Project so as to divert flood formed in rain season and avoid runoff scours.
		(6) The construction contractor should minimize the duration of temporary land occupation and control the earthwork construction time provided that the construction quality is assured and a stable excavation and fill slope should be maintained to reduce impacts on areas outside the construction area of the Project.
		(7) Restoration of the construction sites should be carried out prior to the final acceptance of the Project.
		(8) In order to reduce impacts of the construction operations on fish, specialists of the respective disciplines or local fishermen with practical experiences should be employed at the consent of local fishery administration authority to provide on-site guidance prior to the commencement of the construction works.

Item		Environmental Protection Measures
		(9) Fish breeding should be implemented according to the construction scale of the Project and the level of impacts on fish resources.
		(10) Stipulations on protection of aquatic organisms should be developed to assure that the construction workers respect the respective requirements of ecological protection. The construction workers should be strictly prohibited to fish or engage in other activities affecting ecological environment and fish protection in the river sections related to the construction works of the Project.
Social environment management		(1) The various LAR subsidies should be allocated to the concerned village groups and individuals based on the compensation standards of Guangxi and Hezhou City, the local circumstances and the agreements signed with the LAR affected households. The various compensations should be reasonably allocated and utilized through full promotion of democracy and respect of the basic citizen rights; the arable land and labor force should be reasonably adjusted through full enforcement of the relevant policies.
		(2) Local roads occupied or damaged in the construction stage should be relocated or subject to protective treatment such as pavement rehabilitation and landscaping. In addition, compensation of a certain amount should be paid to local governments to safeguard the righteous interests of local governments and residents. Gravel roads occupied by the sewage pipeline construction works should be restored upon completion of the respective works. Upon the completion of the sewage pipelines along the river, the occupied gravel roads should be restored.
		(3) Construction and transportation vehicles should avoid the peak hours of local roads to prevent traffic congestion and accidents.
		(4) Prior to the completion and operation of the Project, connections with the existing roads should be implemented and safety signs erected.
Risk control measures	Flood season construction risk control measures	(1) On the premise that organizational assurances are available, the importance of flood control should be highly recognized and strong efforts of advertisement and safety education should be made to a depth where typhoon and flood risks are controlled and to enable the construction workers to be seriously aware of and act as a group to truly enforce and implement the various flood prevention and control measures.
		(2) In the flood season, staffing arrangements should be made to assure 24-hour non-interrupted on-duty operation and specific personnel should be assigned to listen to weather forecasts so that flood control actions are immediately mobilized and effective measures are taken when any rainstorm, floods or disastrous weathers are forecasted to assure the safety of the construction works, the construction equipment and personal life and properties.
		(3) Records should be properly kept during rainstorms or floods and close attention should be paid to water level and possible impacts on the Project.
		(4) The construction activities should be immediately stopped 2 days ahead of the forecast date of flood arrival and the construction equipment on site should be evacuated to get fully prepared for the coming flood.
		(5) A telecommunication system mainly comprising of mobile and fixed telephones should be set up and all participating staff of the construction works must keep mobile phones accessible 24 hours.
		(6) Woven bags, excavators, power generators, water pumps, dump trucks, life jackets and waterproof flashlights and other respective flood control and rescue materials and devices should be provided.
	—	Weather forecast, hydrological forecast and water level monitoring mechanisms

Item		Environmental Protection Measures
		should be established as a part of the construction and operation management system of the Project so that physical and human resources needed for flood control and rescue are prepared in time. The flood control and rescue activities in the rescue process should be well implemented according to the professional and technical requirements.
		In the non-flood season, the overflow dam involves a big water depth and improvement of the river water environment will also increase the level of participation in the river. Therefore, safety guardrails and the warning signs should be set up to improve the capacity of drowning prevention. In extreme weathers, local residents should be evacuated within the forecast period.
	Construction safety	(1) The construction contractors responsible for construction of flood control and diversion facilities in the flood season should develop and submit to the designated authority specified in the construction contract for approval the respective construction program based on design requirements and engineering needs, which shall be submitted by the EA to the competent department of flood control for approval.
		(2) Construction workers and operators should wear protective gloves and other necessary labor protection devices. Construction workers on site must wear safety helmets and those working on the revetment slope must wear safety ropes. Safety fences should be erected on the levee crest to prevent possible falls.
		(3) In the event of an overstandard flood, the emergency response plan should be triggered and emergency response actions taken in a timely manner.
		(4) Operators on the construction vessels should strictly abide by the national laws, regulations and standards on water operations.
		(5) Actions should be taken to assure stability of pit walls during earth excavation; and bottom digging should be banned during facade excavation.
		(6) Production safety advertisement boards and signs and marks should be erected on construction sites. Safety signs warning against "Deep Water, No Swimming, Drowning Danger" and other dangers and risk and construction road signs should be provided at obvious locations around water pits generated from embankment foundation pits that are not backfilled in time.
	Public participation	(1) Setting up a bulletin board at the entrance of the construction site to disclose information such as project name, key construction works, construction time as well as the contact person and contact information for complaints and advices;
		(2) Making arrangements for site environment engineer to answer questions from the public on environmental protection;
		(3) Fulfilling the relevant formalities for and disclose to the local residents information on any nighttime construction required for the sake of construction technology and workmanship. Information to be disclosed in such cases include beginning and ending time of as well as the permit granted by the environmental protection authority on nighttime construction.
		(4) A public announcement should be posted at least five days in advance at the construction site as well as the premises of affected households and enterprises to notify the public of the beginning and ending time of any possible suspension of municipal services (including water supply, power supply, telephone and bus service) needed for the implementation of the construction works.
		(5) All feedbacks, comments and questions from the public should be recorded and archived. Questions raised by the public should be answered and

Item	Environmental Protection Measures
	responded in a timely manner, with the results of answers and responses recorded and archived for future inspection by the supervision unit.
Construction traffic management	(6) A reasonable construction schedule should be developed to shorten the time of temporary land occupation.
	(7) Enclosed transportation vehicles must be used for transportation of earth, debris and construction wastes.
	(8) Transportation of construction materials at night time should be prohibited on any construction access road with a centralized area of residence in a distance of less than 50m.
	(9) Construction and transportation vehicles should avoid the peak hours of local roads to prevent traffic congestion and accidents.
	(10) Construction vehicles should travel along designated routes and unauthorized change of routes is prohibited to avoid possible damages to farmland and forest land.
Construction safety and health	(1) Warning signs or instructions should be provided at operation positions, equipment and sites prone to occupational hazards on the construction sites.
	(2) Occupational health training and physical examination should be organized on a periodical basis for staff handling toxic and hazardous substances and guidance should be provided on correct use of occupational disease prevention devices and personal labor protection devices.
	(3) The construction contractor should provide the construction workers with safety helmets, safety belts and personal labor protection devices, such as safety boots, working clothing, etc. compatible to the operations they are engaged in.
	(4) Low-noise equipment should be selected and automated and enclosed construction technologies should be promoted on construction sites to reduce machinery noises. Operators should wear ear plugs during operation for hearing protection.
	(5) Forced ventilation facilities should be provided in operation areas where good natural ventilation is not guaranteed due to the presence of corrosion resistance or waterproofing operations. Operators working in sites involving toxic and hazardous gases should wear gas masks or protective masks.
	(6) Water spraying facilities should be provided in dusty operation sites reduce the dust concentration and operators should wear dust masks; operators in welding operations should wear protective masks, goggles and gloves and other personal protective equipment.
	(7) Summer cooling supplies should be provided on construction sites where high-temperature operations are involved and reasonable arrangements should be made for work and rest timetable.
Traffic safety	(1) Safety education and training should be organized on a periodical basis to particularly make the drivers aware of the importance of safe driving.
	(2) To avoid fatigue driving, actions should be taken to limit driving time and make sure drivers drive in turns. To minimize traffic accidents, driving on dangerous roads and time periods should be avoided.
	(3) Vehicles should be regularly maintained using manufacturer-approved spare parts, which should be purchased in a timely manner to prevent possible serious accidents due to equipment faults or premature failure of spare parts.
	(4) Separation of pedestrian and motor vehicles should be realized.
	(5) Traffic safety control measures should be taken and road signs and signal should be used to warn pedestrians and vehicles of any traffic dangers; road signs may be improved through cooperation with the local community and the competent authorities improve visibility of road signs and enhance traffic



Item		Environmental Protection Measures
		safety in an all-around way.
		(6) Traffic safety and pedestrian safety education should be conducted in the communities in the vicinity of the project area and schools.
		(7) To assure that appropriate first aid is provided in case of any accidents, communications should be kept with the emergency response workers.
		(8) Locally purchased materials should be used where possible to minimize transportation distance;
		(9) Driving techniques should be improved and it must be regarded as a mandatory requirement that drivers must hold licenses.
Physical cultural resources	Cultural relics protection	(1) If any cultural relics are discovered during construction, the construction works should be immediately suspended to protect the scene and a report should be immediately delivered to the local cultural relics administration department.
		(2) No further action taken should be taken without authorization. Upon receipt of the opinion of the cultural relics administration department on further action, the construction contractor should develop its construction program for the concerned section based on the opinion of the cultural relics administration department and should not resume the construction until a consent is obtained from the cultural relics administration department.
		(3) No unit and individuals should continue the construction or carry out any production activities in the archaeological excavation area until such excavation is completed. No unit or individual should plunder, privately divide or conceal any cultural relics discovered during construction.
	Environmental protection training and education	(1) Prior to the commencement of the Project, the Municipal PMO should assign an environmental specialist to provide environmental protection training for the contractors and construction supervision agencies of the small waterworks construction component;
		(2) Prior to the commencement of the small waterworks construction component, the contractor should organize training and examinations for the operators on the construction sites on laws and regulations on environmental protection and health and sanitation;
		(3) The contractor of the small waterworks construction component should organize staff training on the risk emergency response plan as well as emergency response rehearsals on a yearly basis.
		(4) The small waterworks construction contractor should organize occupational health training and physical examination on a half-year basis for operators handling toxic and hazardous substances and provide guidance on correct use of occupational disease prevention devices and personal labor protection devices.

## Annex Table 2: Construction Site Checklist Prior to Mobilization

Name of subproject:

Contract No. and Subproject

Location:

Name of construction site:

Weather condition:

Checked by:

Date of construction site inspection:

S.N	Environmental issues	Yes	No	N/A	Note / Recommended actions
1	Is the Project located in a national / provincial/ county-level nature reserve? (If yes, the Project should be cancelled.)				
2	Is the Project located in an experimental zone of a national / provincial / county-level nature reserve? (If yes, the Project is eligible for construction, but permits from the concerned authorities are mandatory.)				
3	Will land acquisition for the Project cause significant deterioration or changes of the natural environment of a protection area, a recommended protection area or an area with unique ecological significance?				
4	Will the Project cause temporary or permanent relocation of or impacts of any other forms on the national / provincial or recommended national / provincial physical and cultural resources or physical and cultural resources identified through discussions with the APs?				
5	Does the Project involve any physical and cultural resources that are extremely sensitive for local residents (e.g. tombs)?				
6	Are there any known archaeological, historical or cultural relics (including ancient tombs, mausoleums) in the project area?				
7	Are there any endangered species (aquatic or terrestrial) in the project area?				
8	Are there any natural habitats in the project area?				
9	Are there any wetlands or saturated soil zones (permanent or temporary) in the project area?				
10	Will the construction of the Project cause any short-term impacts on the villagers' rights of use of the infrastructures, services and relevant resources?				
11	Are there a large number of objects of environmental protection (hospitals, schools, residential areas, villages, etc.) in the project-affected area?				
12	Is transplanting needed for the sidewalk trees involved in the Project?				
13	Are there any existing power supply facilities (cables, poles, transformers), telecommunication facilities, water supply and drainage facilities and heating facilities in the construction site of the Project?				
14	Are there any conflicts with local traffic due to use of access roads (urban roads) for constructional purposes?				
15	Others (Please specify)				

## Annex Table 3: Checklist for Environment Protection Inspection on Construction Sites

Serial No.:

Guangxi Hezhou Urban Water Infrastructure  
and Environment Improvement Project

Date:

Instructions:

This table is the checklist for environmental protection inspections in the construction stage of the small waterworks construction component of Guangxi Hezhou Urban Water Infrastructure and Environment Improvement Project and includes the environmental protection measures tailored to the specific subprojects and the local environmental conditions, which may be added or adjusted if necessary.

Name of subproject:

Contract No. and Subproject  
Location:

Name of construction site:

Weather condition:

Current construction stage:

Date of environmental protection inspection:      Specific time:

Weather condition:

Checked by:

Inspection Item		Implementation Status			Note
		Yes	No	N/A	
Item	Environmental Protection Measures				
ECOP for construction site preparation	(8) Whether effective measures for prevention and control of air, water, noise, solid waste pollution and soil erosion and improvement of environmental sanitation are included in the construction organization design of the Project?				
	(9) Whether the environmental protection measures included in the construction organization design are implemented in the construction process to assure that the quality of the ambient air, surface water and acoustic and ecological environment in the project area satisfies the requirements of the functional zone and is subject to supervision by the environment supervision unit and management unit?				
	(10) Whether an environmental protection and environmental sanitation management and inspection system is set up on the construction sites and inspection records properly maintained?				
	(11) Whether the construction contractor takes				

Inspection Item		Implementation Status			Note
		Yes	No	N/A	
Item	Environmental Protection Measures				
	effective measures for prevention and control of occupational diseases and provides the operators with necessary protective devices and organize physical examination and training for workers engaged in operations involving hazards of occupational diseases (at least once a year)?				
	(12) Whether the construction contractors take account of the seasonal characteristics and take effective actions to properly implement activities of food hygiene assurance, hot weather and cold weather protection and epidemic prevention?				
	(13) Whether education and training and assessment for operators on construction sites include contents of laws and regulations related to environmental protection and environmental health?				
	(14) Whether the construction contractors develop public health emergency response plans for the construction sites?				
Construction site and facility management	(9) Whether the construction area on the construction site are separated from the office area and the living area with corresponding separating measures and are kept tidy and in good order?				
	(10) Whether facilities of environmental protection or measures for mitigating environmental impacts are provided in the construction area and the living area?				
	(11) Whether company name or company logo are displayed at the entrance and exit of the construction sites?				
	(12) Whether a public announcement is posted in advance to notify the public of the beginning and ending time of any possible suspension of municipal services needed for the implementation of the construction works?				
	(13) Whether existing buildings and infrastructures on the construction sites are utilized with priority?				
	(14) Whether a special storage space is provided for oils and chemical solvents and other substances stored in the construction sites with warning signs erected?				
	(15) Whether staff dormitories are located in buildings under construction?				
	(16) Are all temporary facilities are demolished within one month and restored to pre-construction state as of the completion of the construction works?				

Inspection Item			Implementation Status			Note
			Yes	No	N/A	
Item		Environmental Protection Measures				
ECOP for management of construction sites	Construction material stockpiling sites	(1) Whether windproof and stormproof measures are taken on temporary waste (debris) disposal sites, which, when necessary, are fenced up and sprayed with water periodically for dust suppression and covered with tarpaulins in bad weathers?				
		(2) Whether waste soil (debris) eligible for comprehensive utilization are utilized in time and the residual waste soil (debris) removed out of site in time?				
		(3) Whether waste soil (debris) during transportation are covered with tarpaulins and transported along planned routes and at scheduled time to minimize environmental impacts on sensitive spots (areas)?				
	Precast yards	(1) Whether the site is located more than 300m away at the downwind side of environmentally-sensitive spots and is fenced up when necessary?				
		(2) Whether silencing devices or vibration-reduction bearings are installed at the noise sources?				
		(3) Whether the maintenance wastewater is treated in the temporary sedimentation tanks before comprehensive utilization?				
		(4) Whether reasonable arrangements are made for the construction workers to reduce the operation time of high-noise machinery operators and earmuffs are provided to reduce noise impacts on the construction workers?				
	Ambient Air Environment Quality Management	Construction dust and exhaust gas from construction plants	(1) Whether the construction access roads are designed into simple gravel roads and water is sprayed periodically to reduce dust?			
(2) Whether materials on sites are enclosed or covered and water is sprayed over the stockpiles, based on the nature of the material, to effectively suppress dust?						
(3) Whether road fences are set up when environmentally sensitive sites (zones) are involved?						
(4) Whether the construction wastes are stored by type in accordance with the relevant						

Inspection Item			Implementation Status			Note
			Yes	No	N/A	
Item		Environmental Protection Measures				
		classification management requirements of municipal wastes and cleared and digested in a timely manner? Whether water is sprayed to an appropriate extent ahead of the clearing operation?				
		(5) Whether management of transportation vehicles is strengthened and those transporting dust-prone materials are covered with tarpaulins?				
		(6) Whether water spraying is carried out during demolition for the sake of dust suppression?				
		(7) Whether dust-prone areas on the construction sites are enclosed with fences or sprayed with water for dust suppression?				
		(8) Whether earthwork materials on construction sites are stockpiled at a centralized place and properly covered?				
		(9) Whether vehicle washing facilities are provided at the entrance and exit of construction sites and surface mud and earth are cleaned before vehicles leave the site?				
		(10) Whether the storage sites of materials and formworks on site are flat and solid?				
		(11) Whether the construction sites are cleaned and sprayed with water in a timely manner?				
		(12) Whether stockpiling sites of fine-particle bulky materials and other key dust sources are located more than 300m away at the downwind side of objects of environmental protection on account of the dominant wind direction and the objects of environmental protection in the vicinity?				
		(13) Whether burning of wastes is prohibited?				
	Dredging odor	(1) Whether the dredging is conducted in low-water season and deodorants are sprayed on the dewatering site to reduce environmental impacts?				
		(2) Are protective devices, such as protective respirators or masks, are provided for construction workers?				
	Acoustic environment management quality	(1) Whether state-of-the-art and reliable low-noise equipment is selected to the best possibility in terms of equipment selection?				
(2) Whether the construction time is scheduled						

Inspection Item		Implementation Status			Note
		Yes	No	N/A	
Item	Environmental Protection Measures				
	from 8:00 am to 20:00 pm and construction is banned for the period from 12:00 am to 14:00pm? Whether nighttime construction is restricted?				
	(3) Whether the construction progress is reasonably scheduled to avoid simultaneous operation of multiple high-noise mechanical plants?				
	(4) Whether measures are taken to limit the speed or prohibit honking of vehicles and other construction plants?				
	(5) Whether mechanical equipment generating relatively high noise are located on the far side of the residential area and noise-reducing fences should be erected around construction sites with a distance of less than 5m from residences, schools and similar buildings?				
	(6) Whether advices are given to the construction contractor to reasonably arrange and allocate the construction workers to reduce the operation time of high-noise machinery operators and earmuffs are provided to reduce noise impacts on the construction workers?				
	(7) Whether low-noise pump units are selected for the drainage pump station and vibration reduction devices are installed on the pump bases? Whether sound insulation and absorption measures are taken for the main pump house and whether the pump houses are enclosed or provided with sound insulation windows?				
	(8) Whether pump equipment are effectively maintained and serviced with stronger efforts to avoid abnormal operation and increased noise impacts?				
Water environment quality management	(1) Whether temporary pit toilets are provided on the construction site?				
	(2) Whether stronger efforts are made in construction management to strictly control oil leakages of the construction plants?				
	(3) Whether treatment measures for construction and production wastewater and domestic sewage are implemented to assure that such wastewater is properly treated and disposed?				
	(4) Whether environmental protection education for construction workers is strengthened to enhance their environmental awareness?				
	(5) Whether the low water season is selected for dredging operations and the construction time				

Inspection Item		Implementation Status			Note
		Yes	No	N/A	
Item	Environmental Protection Measures				
	is minimized to reduce disturbances to the water systems?				
	(6) Whether sludge submersible pumps are used to reduce pollution of water environment in the construction period?				
	(7) Whether the construction plants involved in the dredging process are inspected strictly to prevent oil leakage?				
	(8) Whether the construction camps and building material stockpiles are located as far as possible away from wetlands and other surface waters and the stockpiles are covered and fenced up if it becomes necessary for the sake of construction activities to have ordinary construction materials stockpiles in the vicinity of water systems?				
	(9) Whether domestic solid wastes generated by construction staff are collected for centralized treatment by the environment and sanitation authority on a periodical basis?				
	(10) Whether waste oil involved in the construction process is transported to designated sites or treated according to the relevant requirements in a timely manner?				
	(11) Whether the pipeline construction quality is strictly controlled to avoid leakage or flooding of sewage due to failure of sewage pipelines that might lead to pollution of ground water environment and the branch channel water environment?				
Solid waste management	(7) Whether the construction wastes are utilized in a comprehensive manner in the construction works of the Project?				
	(8) Whether aerial cast of construction wastes is prohibited? Whether the construction wastes are stored by type in accordance with the relevant classification management requirements of municipal wastes and are cleared and digested in a timely manner?				
	(9) Whether water is sprayed in advance before construction wastes are transported out of the construction sites?				
	(10) Whether domestic wastes are collected and then transported to a designated soil-spoiling and waste disposal site for centralized				



Inspection Item		Implementation Status			Note
		Yes	No	N/A	
Item	Environmental Protection Measures				
	disposal?				
	(11) Whether the waste soil is used in wasteland reclamation and forestation of the project area and the remaining soil is used as subgrade fill of the embankment construction works and bedding fill on both sides of channels in the vicinity?				
	(12) Whether burning of toxic and hazardous substances is banned on construction sites and toxic and hazardous substances are disposed according to the relevant requirements and stipulations?				
	(13) Whether soil erosion is caused by random stockpiling of dredging sludge?				
	(14) Whether the dredging is conducted in low-water season and the dredged sludge is dewatered and transported to solid waste landfill for treatment?				
	(15) Whether actions are taken to minimize temporary land occupation and achieve timely removal of solid wastes?				
	(16) Whether screening residues generated in the operation stage of the drainage pump station are stockpiled at a designated site in the station and collected and transported by the public sanitation department to the garbage site for disposal?				
Ecological protection management	(11) Whether a reasonable and optimized construction site layout plan is developed to reduce the scope of construction activities and the degree of damages to vegetation caused by the implementation of the Project?				
	(12) Whether construction materials outsourced for the construction works, such as stone, sand, cement, etc., are transported on a demand-driven basis to minimize land occupation and vegetation damage; whether the construction sites are cleaned and landscaped in time upon completion of the construction works to restore damaged vegetation to the maximum extent?				
	(13) Whether fences are erected around trees in the construction sites that are not felled or transplanted for the sake of temporary protection?				
	(14) Whether the excavation scope of the culvert gate is subject to strict control to avoid occupation of land and waters outside the boundary? whether efforts are made to shorten the construction period of the culvert gate to reduce the impact on aquatic organisms due to disturbance of waters and increase of suspended matters?				

Inspection Item		Implementation Status			Note
		Yes	No	N/A	
Item	Environmental Protection Measures				
	(15) Whether action is taken to minimize the duration of temporary land occupation and controls the earthwork construction time and whether a stable excavation and fill slope is maintained to reduce impacts on areas outside the construction area of the Project?				
	(16) Whether dredging is conducted in low-water season and construction time is reasonably arranged to reduce disturbance of water systems?				
	(17) Whether the construction sites are restored prior to the completion and final acceptance of the construction works?				
Social Environment Management	(5) Whether the relevant policies are enforced based on the national and provincial compensation standards?				
	(6) Whether local roads occupied or damaged in the construction stage are compensated and restored to safeguard the righteous interests of local governments and residents?				
	(7) Whether construction and transportation vehicles avoid the peak hours of local roads to prevent traffic congestion and accidents?				
Risk Control Measures	Flood season construction risk control measures	(7) Whether strong efforts are made in advertisement and safety education on prevention and control of typhoon and flood risk?			
		(8) Whether staffing arrangements are made in the flood season to assure 24-hour non-interrupted on-duty operation and specific personnel is assigned to listen to weather forecasts so that flood control actions are immediately mobilized and effective measures are taken when any rainstorm, floods or disastrous weathers are forecasted?			
		(9) Whether records are properly kept during rainstorms or floods and close attention is paid to water level and possible impacts on the Project?			
		(10) Whether the construction activities are immediately stopped 2 days ahead of the forecast date of flood arrival and the construction equipment on site should be evacuated to get fully prepared for the coming flood?			
		(11) Whether a telecommunication system mainly comprising of mobile and fixed telephones is set up and all participating staff of the construction works are required to keep mobile phones accessible 24 hours?			
		(12) Whether corresponding flood control and rescue materials and devices are provided?			
	(4) Whether mechanisms of weather forecast,				

Inspection Item			Implementation Status			Note
			Yes	No	N/A	
Item	Environmental Protection Measures					
		hydrological forecast and water level monitoring are established and whether the flood control and rescue activities in the rescue process are well implemented according to the professional and technical requirements?				
		(5) Whether safety guardrails and warning signs are set up to improve the capacity of drowning prevention? Whether local residents should be evacuated within the forecast period in extreme weathers?				
		(6) Whether a reasonable layout plan is developed for the construction areas and diesel, engine oil, lubricants, paint and similar materials stored in the construction production areas are kept far away from the river?				
	Construction safety	(7) Whether the construction contractors responsible for construction of flood control and diversion facilities in the flood season develop and submit to the designated authority specified in the construction contract for approval the respective construction program based on design requirements and engineering needs? Whether such reports are submitted by the EA to the competent department of flood control for approval?				
		(8) Whether construction workers and operators wear protective gloves and other necessary labor protection devices? Whether construction workers on site must wear safety helmets and those working on the revetment slope wear safety ropes? Whether safety fences are erected on the levee crest to prevent possible falls?				
		(9) Whether the emergency response plan is triggered and emergency response actions taken in a timely manner in the event of an overstandard flood?				
		(10) Whether actions are taken to assure stability of pit walls during earth excavation; and bottom digging is banned during facade excavation?				
		(11) Whether production safety advertisement boards and signs and marks are erected on construction sites? Whether safety signs warning against "Deep Water, No Swimming, Drowning Danger" and other dangers and risk and construction road signs are provided at obvious locations around water pits generated from embankment foundation pits that are not backfilled in time?				
	Public participation	(6) Whether a bulletin board is erected at the entrance of the construction site for information disclosure?				
		(7) Whether arrangements are made to have				

Inspection Item		Implementation Status			Note
		Yes	No	N/A	
Item	Environmental Protection Measures				
	technicians in the discipline of environmental protection answer public questions on environmental protection?				
	(8) Whether the relevant formalities are fulfilled for and information is disclose to the local residents on any nighttime construction?				
	(9) Whether a public announcement is posted to notify the public of the beginning and ending time of any possible suspension of municipal services needed for the implementation of the construction works?				
	(10) Whether all feedbacks, comments and questions from the public and answers are recorded and archived and subject to inspection by the supervision unit?				
Construction traffic management	(6) Whether a reasonable construction schedule is developed to shorten the time of temporary land occupation?				
	(7) Whether enclosed transportation vehicles are used for transportation of earth, debris and construction wastes?				
	(8) Whether transportation of construction materials at night time is prohibited on any construction access road with a centralized area of residence in a distance of less than 50m?				
	(9) Whether actions are taken to assure that construction and transportation vehicles avoid the peak hours of local roads to prevent traffic congestion and accidents?				
	(10) Whether construction vehicles are required to travel along designated routes and unauthorized change of routes is prohibited to avoid possible damages to farmland and forest land?				
Constructional safety and health	(8) Whether acceptable first aid is provided?				
	(9) Whether occupational health and safety training is provided for all newly employed construction workers?				
	(10) Whether warning signs are placed on all powered devices and electric wires?				
	(11) Whether suitable eye protection devices are provided (e.g. welding goggles and / or masks)?				
	(12) Whether guardrails are installed on the boundary of vulnerable and hazardous areas?				
	(13) Whether suitable personal protective devices are provided to construction workers?				
	(14) Whether health education is provided to construction workers?				
Tr aff sa fet y	(10) Whether safety education and training is organized on a periodical basis to particularly				

Inspection Item		Implementation Status			Note
		Yes	No	N/A	
Item	Environmental Protection Measures				
	make the drivers aware of the importance of safe driving?				
	(11) Whether actions are taken to limit driving time and make sure drivers drive in turns? Whether actions are taken to avoid driving on dangerous roads and time periods?				
	(12) Whether vehicles are regularly maintained; whether manufacturer-approved spare parts are used and purchased in a timely manner?				
	(13) Whether separation of pedestrian and motor vehicles is realized?				
	(14) Whether traffic safety control measures are taken and road signs and signal are used to warn pedestrians and vehicles of any traffic dangers; whether road signs are improved through cooperation with the local community and the competent authorities to improve visibility of road signs and enhance traffic safety in an all-around way?				
	(15) Whether traffic safety and pedestrian safety education is conducted in the communities in the vicinity of the project area and schools?				
	(16) Whether communications are kept with the emergency response workers to assure that appropriate first aid is provided in case of any accidents?				
	(17) Whether locally purchased materials are used where possible to minimize transportation distance?				
	(18) Whether it is regarded as a mandatory requirement that drivers must hold licenses?				
Educational protection training and education	(5) Whether an environmental specialist is assigned to provide environmental protection training for the contractors and construction supervision agencies of the small waterworks construction component?				
	(6) Whether training and examinations for the operators on the construction sites are organized?				
	(7) Whether staff training is organized on the risk emergency response plan and emergency response rehearsals is conducted?				
<p>Checked by: (signature)_____ Time:_____</p> <p>Supervision Engineer: (signature)_____ Time:_____</p> <p>Notes:</p> <p>(4) Information to be noted may include problems observed on site, remarks on non-</p>					

Inspection Item		Implementation Status			Note
		Yes	No	N/A	
Item	Environmental Protection Measures				
<p>conforming situations and recommended corrective or preventive actions.</p> <p>(5) In the event of any unacceptable measures or situations requiring further improvement identified during site inspection, the Supervision Engineer may immediately issue an “Instruction on Environmental Protection Corrections” to the contractor and indicate the serial number of the Instruction herein. Details of corrective actions taken by the contractor need to be recorded separately.</p> <p>(6) This table is the checklist for environmental protection inspections in the construction stage of the small waterworks construction component of Guangxi Hezhou Urban Water Infrastructure and Environment Improvement Project and is applicable to the specific subprojects and specific environmental problems. This table may be adjusted and corresponding measures of environmental protection may be taken, where appropriate, based on local environmental conditions and construction components.</p>					

## Annex Table 4: Instruction on Environmental Protection Corrections

Instruction on Environmental Protection Corrections	
S. N.: _____ Contract Number and Description: _____ Name of Subproject: _____ Name of Construction Site: _____ Current Construction Stage: _____	
Problems existing during site inspection:          <div style="text-align: right;">Checked by: _____ Date: _____</div>	
Contractor's cause analysis and corrective actions:          <div style="text-align: right;">Contractor: _____ Date: _____</div>	
Comments by Supervision Engineer:          <div style="text-align: right;">Supervision engineer: _____ Date: _____</div>	
Opinions by Environmental Protection Authority (when necessary):          <div style="text-align: right;">Contact person: _____ Date: _____</div>	
Deadline of correction:          <div style="text-align: right;"> To be corrected by (Date): _____  Contractor: _____ Date: _____  Supervision Engineer: _____ Date: _____ </div>	
Conclusion of review:          <div style="text-align: right;">Reviewed by: _____ Date: _____</div>	

## Annex Table 5: Checklist of Environmental Protection Inspection Prior to Project Completion and Hand-over

Guangxi Hezhou Urban Water Infrastructure and Environment Improvement Project    Serial No.:

Date:

**Instructions:**

This table is the checklist for environmental protection inspections in the construction stage of the small waterworks construction component of Guangxi Hezhou Urban Water Infrastructure and Environment Improvement Project and includes the environmental protection measures tailored to the specific subprojects and the local environmental conditions, which may be added or adjusted if necessary.

Name of subproject: \_\_\_\_\_ Contract No. \_\_\_\_\_ and Subproject Location: \_\_\_\_\_

Name of construction site: \_\_\_\_\_

Current construction stage: \_\_\_\_\_

Date of environmental protection inspection: \_\_\_\_\_ Specific time: \_\_\_\_\_

Weather condition: \_\_\_\_\_

Checked by: \_\_\_\_\_

Item of inspection	Status of implementation		N/A	Note (e.g. problems or non-conformities observed, recommended corrective or preventive actions)
	Implemented	Not Implemented		
1. Are all the construction wastes on the construction sites removed and transported to the municipal solid waste landfill site?				
2. Are actions taken against the acoustic environment protection objects?				
3. Are restoration measures taken for the temporary waste (debris) disposal sites?				
4. Have the existing rural roads used as construction access roads deteriorated? Are they still in good traffic condition?				
5. Have the hardened concrete mixing sites been demolished?				
6. Are land rehabilitation, restoration or landscaping				



Item of inspection	Status of implementation		N/A	Note (e.g. problems or non-conformities observed, recommended corrective or preventive actions)
	Implemented	Not Implemented		
measures taken for land parcels temporarily occupied by the concrete mixing plants?				
7. Are the temporary sedimentation tanks and sand sedimentation tanks demolished?				
8. Are land rehabilitation, restoration or landscaping measures taken for land parcels temporarily occupied by the sedimentation tanks and sand sedimentation tanks?				
9. Are temporary facilities demolished and measures taken for site restoration?				
10. Are the top mellow soil stripped and preserved for restoration of waste (debris) disposal sites?				
11. Are the embankment slopes landscaped?				
12. Have the owners of the subprojects carried out training and education activities?				
13. Are the local public satisfied with the road works constructed under the Project?				

\* Any local and existing item recorded as "not implemented" might indicate any condition that is non-conforming or needs further improvement. In such an event, the Supervision Engineer shall immediately issue to the Contractor an "Instruction on Environmental Protection Corrections" and note the serial number. Details of corrective actions taken by the contractor need to be recorded separately.

Site Inspector (signature):

Date:

Supervision Engineer (signature):

Date:

## **Annex III: ECOP for Road & Pipeline Construction**

# **World Bank Financed Guangxi Hezhou Urban Water Infrastructure and Environment Improvement Project**

## **Road and Pipeline Construction**

## **Environmental Codes of Practice**

Hezhou World Bank Loan Project Management Office  
Guangxi Zhengze Environmental Protection Technology Co.,  
Ltd.

November 2017

# Contents

1. General .....	1
1.1 Project background .....	1
1.2 Relevant laws and regulations and World Bank safeguard policies .....	1
1.2.1 <i>Relevant laws and regulations of China</i> .....	1
1.2.2 <i>World Bank safeguard policies and the Environment, Health and Safety Guidelines of international financial institutions</i> .....	3
1.3 Key Project Components .....	3
1.4 Objectives of Environmental Codes of Practice .....	3
1.5 Applicability .....	4
<b>2. ECOP Management System</b> .....	<b>4</b>
2.1 Establishment of the ECOP Management System .....	4
2.2 Responsibilities and staffing of agencies involved the environment management system .....	6
2.3 Environment management tasks in each stage of the Project .....	9
2.4 Work Flowchart of Agencies Implementing ECOP in the Construction Stage .....	9
2.5 Management of ECOP Files .....	10
<b>3. General requirements of the ECOP</b> .....	<b>13</b>
3.1 Implementation of environmental measures during construction drawing design and tendering document preparation .....	13
3.2 Preparations before construction .....	15
3.3 Environment management in the construction stage .....	16
3.3.1 <i>Full-process construction supervision</i> .....	16
3.3.2 <i>Environmental Protection Agency Supervision and Public Opinion</i> .....	17
3.4 Corrective measures to non-conformities to the ECOP requirements .....	18
<b>4. Environmental codes of practice in the stage of construction site preparation</b> .....	<b>19</b>
4.1 Road and pipeline network construction .....	19
<b>5. Management of construction sites and facilities</b> .....	<b>23</b>
5.1 Management of construction sites .....	23
5.1.1 <i>Construction areas of main works</i> .....	23
5.1.2 <i>Construction and production areas</i> .....	27
5.1.3 <i>Construction access roads</i> .....	29
5.2 Construction equipment management .....	30
5.2.1 <i>Pollution source analysis for construction equipment</i> .....	30
5.2.2 <i>Pollution control for construction equipment</i> .....	30
<b>6. Environmental Codes of Practices for construction camps</b> .....	<b>32</b>
6.1 Pollution source analysis of construction camps .....	32
6.2 Pollution control for construction camps .....	32
<b>7. Environmental Codes of Practices for construction material stockpiling sites</b> .....	<b>34</b>
7.1 Sand and stone quarries .....	34

7.2 Borrowing sites .....	34
7.2.1 Analysis of environmental impact factors for the borrowing sites .....	34
7.3 Soil-spoiling and waste disposal sites.....	35
7.3.1 Analysis of environmental impact factors for the soil-spoiling and waste disposal sites	35
7.3.2 Control of environmental impacts from soil-spoiling and waste disposal sites .....	36
<b>8. Management of water and soil conservation</b>	<b>37</b>
8.1 Distribution of water and soil conservation facilities and construction arrangement..	37
8.2 Prevention and control zone of the main works .....	37
8.3 Prevention and control zone for the construction and production areas .....	38
8.4 Prevention and control zone for the construction access roads .....	39
8.5 Prevention and control zone of the construction camps.....	40
8.6 Prevention and control zone of the borrowing sites.....	40
8.7 Prevention and control zone for the soil-spoiling and waste disposal sites .....	40
<b>9. Ambient air quality management</b>	<b>41</b>
9.1 Construction dust .....	41
9.2 Automobile tail gas .....	42
<b>10. Vibration and acoustic environment quality management</b>	<b>42</b>
10.1 Vibration environment quality management measures .....	42
10.2 Acoustic environment quality management measures .....	42
<b>11. Water environment quality management</b>	<b>43</b>
<b>12. Ecological protection management</b>	<b>44</b>
<b>13. Social environment management</b>	<b>45</b>
<b>14. Solid waste treatment management</b>	<b>46</b>
<b>15. Hazardous wastes and flammables and explosives</b>	<b>46</b>
15.1 Management measures for hazardous wastes, flammables and explosives .....	46
15.2 Risk control measures and emergency response plan.....	47
15.2.1 Risk control measures .....	48
15.2.2 Risk emergency response plan .....	48
<b>16. Public participation</b>	<b>49</b>
<b>17. Landscape impact control</b>	<b>49</b>
<b>18. Construction traffic management</b>	<b>50</b>
<b>19. Supervision plan</b>	<b>51</b>
19.1 Scope of construction supervision .....	51
19.2 Contents of construction supervision .....	51
19.3 Terms of reference for construction supervision.....	52
<b>20. Construction safety and health</b>	<b>52</b>
20.1 Occupational health.....	52
20.2 Health and epidemic prevention .....	54
<b>21. Traffic safety</b>	<b>54</b>

<b>22. Physical and cultural resources</b>	<b>55</b>
22.1 Cultural relics protection.....	55
<b>23. Environmental protection training and education</b>	<b>58</b>
<b>Annex Table 1: Summary of Environmental Protection Measures</b>	<b>59</b>
<b>Annex Table 2: Construction Site Checklist Prior to Mobilization</b>	<b>76</b>
<b>Annex Table 3: Checklist for Environment Protection Inspection on Construction Sites</b>	<b>78</b>
<b>Annex Table 4: Instruction on Environmental Protection Corrections</b>	<b>102</b>
<b>Annex Table 5: Checklist of Environmental Protection Inspection Prior to Project Completion and Hand-over</b>	<b>104</b>

# **1. General**

## **1.1 Project background**

World Bank Financed Guangxi Hezhou Urban Water Infrastructure and Environment Improvement Project aims to implement integrated improvement of water environment and construction of urban infrastructure under the guidelines of development, livelihood and innovation and following the standards of “green water service, eco-friendly water service and storm and flood safety”. The Project will be helpful to safeguarding regional flood protection and waterlogging drainage, improving regional water environment and building high-standard and modernized urban infrastructure and public facilities; it will provide powerful support and assurance to the sustainable economic development of Hezhou City to promote the level of sustainable urban development and realize the integration of reform and innovation.

The Project is classified as Category A through environmental screening of the category, location, sensitivity and scale of the Project as well as the characteristics and scale of potential environmental impacts based on the requirements of environmental screening and categorization specified in the World Bank safeguard policies on environmental assessment (OP4.01) and requires the development of Environmental Codes of Practice (ECOP). This report is the Environmental Codes of Practice for the Road and Pipeline Construction and is applicable to the road and pipelines to be constructed at Binjiang South Road in the urban area of Hezhou City. As a new road to be constructed, the road construction works consists of road engineering, stormwater engineering, sewage engineering, electrical engineering, telecommunication engineering, lighting engineering, landscaping engineering and traffic engineering. The key contents of the ECOP include project introduction, establishment of environment management body, implementation plan of environment protection measures, construction supervision plan and reporting mechanism and file management.

## **1.2 Relevant laws and regulations and World Bank safeguard policies**

### **1.2.1 Relevant laws and regulations of China**

- (1) Environmental Protection Law of the People's Republic of China (amended in Year 2014);
- (2) Law of the People's Republic of China on Environmental Impact Assessment (amended in Year 2016);
- (3) Law of the People's Republic of China on Prevention and Control of Air Pollution (amended in Year 2015)
- (4) Law of the People's Republic of China on Prevention and Control of Water Pollution (amended in Year 2008)

- (5) Law of the People's Republic of China on Prevention and Control of Noise Pollution (amended in Year 1997)
- (6) Law of the People's Republic of China on Prevention and Control of Environmental Pollution of Solid Wastes (amended in Year 2014);
- (7) Water and Soil Conservation Law of the People's Republic of China (amended in Year 2011)
- (8) Flood Control Law of the People's Republic of China (amended in Year 2015);
- (9) Law of the People's Republic of China on Protection of Cultural Relics (4<sup>th</sup> amendment on April 24, 2015)
- (10) Law of the People's Republic of China on Wildlife Protection (Nov. 8, 1988);
- (11) Regulations of the People's Republic of China on Protection of Wild Plants (2<sup>nd</sup> amendment on July 2, 2016);
- (12) Law of the People's Republic of China on Urban and Rural Planning (January 1, 2008);
- (13) Interim Methods for Public Participation in Environmental Impact Assessment (SEPA Huanfa Circular No. 2006[28], Feb. 14, 2006);
- (14) Methods for Public Participation in Environmental Protection (MoEP Decree No. (2015)35);
- (15) Notice on Strengthening Management of Environmental Impact Assessment on Construction Projects Utilizing Loans from International Financial Institutions (Huanjian Circular No. [1993]324);
- (16) Notice by the National Development and Reform Commission on Further Strengthening Management of Projects Utilizing Loans from International Financial Institutions (NDRC Foreign Investment Circular No. [2008]1269);
- (17) Management Catalogue of Environmental Impact Assessment Categories of Construction Projects (Sept. 1, 2017);
- (18) Notice by the State Council on Printing and Issuing the Action Plan on Prevention and Control of Water Pollution (State Council Circular No. [2015]17).
- (19) Law of the People's Republic of China on Protection of Minors (Oct. 26, 2012);
- (20) Stipulations on Prohibition of Use of Child Labour (Issued in 1991 by the State Council);
- (21) Law of the People's Republic of China on Protection of Women's Rights and Interests (Aug. 28, 3005);
- (22) Labor Law of the People's Republic of China (Aug. 27, 2009).

### **1.2.2 World Bank safeguard policies and the Environment, Health and Safety Guidelines of international financial institutions**

This ECOP is developed in accordance with the Operational Policies on Environmental Assessment as a part of the World Bank safeguard policies (OP4.01) which requires environmental assessment of Category A projects, and the Environment, Health and Safety Guidelines of international financial institutions, which requires the development of an Environmental & Social Management Plan before and during the construction stage as well as the implementation of such Environmental & Social Management Plan and monitoring of the mitigation measures implemented during the construction stage.

### **1.3 Key Project Components**

Starting at Chuangye Road and ending at Jiangnan WWTP, Binjiang South Road is a secondary urban trunk road with a total length of 5.56km, a design speed of 40km/h and a pavement width of 30m. This road construction component consists of road engineering, stormwater engineering, sewage engineering, electrical engineering, telecommunication engineering, lighting engineering, greenbelt and landscaping engineering and traffic engineering.

Supporting pipeline network: Sewage interception works of Binjiang South Road include sewage interception facilities covering an area of approximately 8.28ha to be constructed along the river bank with Binjiang South Road on its north, planned Wenyuan Road on its south, South Ring Road on its west and Xinxing South Road on its east aiming at intercepting sewage generated from Jiangnan District. This pipeline network will comprise of sewage pipelines with a total length of 18.07km, including 16.57km long gravity sewers and 1.5km long sewage pressure pipes with a diameter range of DN400-DN1350, and stormwater pipelines with a total length of 6.43km with a diameter range of DN600 to DN1600.

### **1.4 Objectives of ECOP**

The ECOP is developed to present a set of detailed, technically feasible, and financially sustainable and operable environmental measures regarding to the inevitable and potential negative environmental impacts involved in the road and pipeline network construction works, identify the measures and arrangements of environmental pollution mitigation, environment management and institutional building to be implemented by the project construction contractors, supervision engineers, operators and environment management bodies in the construction and operation stages of the Project so as to eliminate or remedy and reduce the adverse environmental and social impacts to an acceptable level. The specific objectives of the ECOP include:

- (1) Identifying the obligations of environment management of the construction contractors and operators



The project management unit, the project owner, the design unit and the EIA agency should carry out a detailed on-site review and verification of the environmental protection objectives involved in the project area and develop, in association with the local environmental characteristics and project features, and include practical and feasible environmental protection and pollution prevention and mitigation measures into the project design. In the tendering stage of the Project, it should be explicitly specified that it is an obligation of the bid winner to implement the requirements included in the ECOP, which should be incorporated into the actual activities of engineering design and construction of the Project.

(2) Serving as the operational guidelines of environment management

The construction supervision plan proposed in the ECOP for the pre-construction stage and the construction stage as well as the reporting mechanism and the file management procedure can assure the effective implementation of the environmental pollution mitigation measures. To be provided as environmental protection documents to the construction supervision unit, the environmental monitoring unit and other relevant agencies, these documents will specify the responsibilities and roles of the relevant functional departments and management bodies as well as the channels and means of communication between these departments and bodies to effectively assure the smooth implementation of the environmental pollution mitigation measures.

## **1.5 Applicability**

This ECOP is applicable to Binjiang South Road and its sewage interception works and aims to provide the environment management agencies, construction supervision agencies and construction contractors with guidelines on the various measures for mitigation and monitoring of adverse environmental impacts in the process of project implementation and operation.

## **2. ECOP Management System**

### **2.1 Establishment of the ECOP Management System**

In order to respect the relevant stipulations and accommodate the actual needs of the Project and better realize the demonstrative effect of the Project, the Project Management Offices (PMOs) at each level will assign a special personnel to be responsible for the environment management work and an environment management system will be established to cover the supervision unit, the implementation unit and the consultant service unit in addition to the regulatory functions performed by the environment protection authorities by law. See Figure 2.1-1 and Table 2.1-1 for detail.

**Table 2.1-1 Agencies Involved in the Environment Management System**

Nature of unit	Name of unit	Tasks assigned to the unit
Management unit	Municipal PMO	A special environment manager is assigned to be responsible for environmental protection work in the planning, design and implementation stages of the Project, assuring that the work procedures satisfy the domestic and WB requirements of EIA and environment management and that the environmental protection measures specified in the ECOP are smoothly implemented. See “2.2 Responsibilities and staffing of agencies involved the environment management system” for detail.
	Project owner	A special environmental protection officer is assigned to be mainly responsible for assuring that the ECOP is effectively implemented in the project implementation and operation stages, the adverse environmental impacts of the Project are minimized or reduced to an acceptable degree and the environmental benefits of the Project are fully realized, the various fund needed for the environmental protection work of the Project are made available and also responsible for processing and archiving of the relevant documents. See “ 2.2 Responsibilities and staffing of agencies involved the environment management system” for detail.
Supervision unit	WB mission	An environmental technology specialist is assigned to monitor and inspect the implementation status of the ECOP. See “2.2 Responsibilities and staffing of agencies involved the environment management system” for detail.
	EP administration at all levels	Performing the role of a government administrative supervision and management unit to supervise and inspect and make sure that the work procedures of the Project satisfy the requirements of environment management in China and the pollution control measures in the implementation process meet the needs of environmental protection in China. See “ 2.2 Responsibilities and staffing of agencies involved the environment management system” for detail.
Implementation unit	Contractor of road and pipeline network construction works	A site environment engineer is assigned to be responsible for implementing the environmental protection measures in the ECOP according to the requirements of environmental protection of the World Bank and the local EP administration bodies and preparing and submitting monthly environment reports in the construction stage.

		See “ 2.2 Responsibilities and staffing of agencies involved the environment management system” for detail.
Consultant service unit	EIA consultant	Preparing, with authorization, the ECOP of the road and pipeline network construction works. See “ 2.2 Responsibilities and staffing of agencies involved the environment management system” for detail.
	Design consultant	Authorized and responsible for preparing FSR and construction design proposal and assuring the incorporation of the measures and proposals in the ECOP into the outcomes. See “2.2 Responsibilities and staffing of agencies involved the environment management system” for detail.
	Construction supervision unit	Responsible for supervising and managing the routine production activities of the construction contractor. See “2.2 Responsibilities and staffing of agencies involved the environment management system” for detail.
	External monitoring unit	Responsible for inspecting the implementation status of environmental protection measures in each subproject and implementing environmental monitoring activities in the construction stage with the authorization by the project owner. See “2.2 Responsibilities and staffing of agencies involved the environment management system” for detail.

## 2.2 Responsibilities and staffing of agencies involved the environment management system

The environment management system of Guangxi Hezhou Urban Water Infrastructure and Environment Improvement Project includes the project management unit, the supervision unit, the implementation unit and the consultant service unit. These agencies constitute an integral project environment management system, but each undertaking different assignments and different responsibilities. The Project will be implemented under the leadership of the Project Management Office of World Bank Financed Guangxi Hezhou Urban Water Infrastructure and Environment Improvement Project (hereinafter abbreviated as the “Municipal PMO”) and the administrative agencies of the Municipal Government to assure that the Project complies with the requirements of China and the World Bank in terms of work procedure and implementation of the pollution control measures. See Table 2.2-1 as below for responsibilities and staffing of agencies involved in the Project.

**Table 2.2-1 Responsibilities and staffing of agencies involved the environment management system**

Name of unit	Type of unit	Staffing	Responsibilities of unit
17. EP authorities at all levels	Supervision unit	1 person	3. Conducting full-process environment supervision and management of the Project, including approving EIA report of the Project

			(including EIA of subprojects) and environment supervision and management in the construction and operation stages of the Project.
18. Municipal PMO	Management unit	1 person	<p>13. Supervising the implementation of the ECOP;</p> <p>14. Assuring and coordinating the implementation of the domestic and World Bank requirements of environment management;</p> <p>15. Submitting to the World Bank half-year reports on the implementation progress of the ESMP and other relevant reports;</p> <p>16. Inspecting the environment management work of each subproject;</p> <p>17. Coordinating the other relevant authorities to address significant environmental issues;</p> <p>18. Authorizing external environment monitoring agencies to carry out inspections of the Project.</p>
19. Project owner	Management unit	1 person	<p>21. Supervising the implementation of the environment management rules and regulations in the subprojects;</p> <p>22. Incorporating the environmental protection measures in the ESMP into the construction contracts;</p> <p>23. Recruiting, supervising and coordinating the work of the construction supervision unit (qualifications, responsibilities and management);</p> <p>24. Organizing the implementation of the environment management training plan;</p> <p>25. Organizing theme studies or relevant surveys;</p> <p>26. Keeping and processing records of complaints raised in the construction and operation processes of the Project, explaining the results of resolution to the public and addressing issues of public complaints;</p> <p>27. Reviewing the construction supervision and environment consulting reports;</p> <p>28. Submitting quarterly reports (or statements) to the Municipal PMO;</p> <p>29. Signing for acceptance of site check lists submitted by the construction contractor and the supervision unit, reviewing and verifying environmentally-sensitive issues and putting them into archives;</p> <p>30. Accepting inspections of environmental work (including inspections by the World Bank mission).</p>
20. World Bank	Supervision unit	1 person	<p>5. World Bank mission is assigned on a yearly basis to conduct special inspection of project implementation;</p> <p>6. Inspecting the status of execution of the loan agreement as well as implementation of ECOP in the Project.</p>

21. EIA consultant	EIA consultant	6 persons	<p>5. Carrying out site visit to and environment assessment of each subproject;</p> <p>6. Responsible for preparing the contents of ECOP.</p>
22. Construction supervision unit (responsible for environment supervision)	Consultant service unit	1-2 persons	<p>11. The construction supervision engineer is assigned separately by the municipal PMO;</p> <p>12. Supervising and inspecting the domestic sewage treatment, industrial wastewater treatment, soil erosion prevention measures and exhaust gas, dust and noise control measures as well as domestic and industrial solid wastes and health management and epidemic prevention activities on the construction sites;</p> <p>13. Preparing on a periodical basis the various checklists of environment management in the annexes of the ECOP;</p> <p>14. Proposing and following up with corrective measures by the construction contractors to relevant environmental protection issues encountered in the construction activities, including issuing instructions and checklists of corrective measures and archiving inspection documents;</p> <p>15. Reporting project implementation status on a weekly basis to the municipal PMO.</p>
23. Environment monitoring	External monitoring unit	1-2 persons	<p>7. Assisting the municipal PMO in inspecting the environmental protection work of each subproject, preparing the execution progress report of the ESMP and relevant reports and submitting such reports to the municipal PMO on a half-year basis;</p> <p>8. Inspecting the implementation status of the environmental protection measures on the construction site and of the contractor, preparing and submitting reports to the municipal PMO and making recommendations and comments on implementation of environmental protection activities.</p>
24. Construction contractor	Implementation unit	A few	<p>12. Developing environmental protection measures in the construction stage;</p> <p>13. Accepting the supervision and inspection of environmental protection by the construction supervision engineer, the World Bank and the EP authorities at all levels;</p> <p>14. Setting up a feedback mechanism and carrying out the corrections within 3 working days as of the receipt of the instructions on corrective measures (or within 10 days where coordination from the administration agencies is required);</p> <p>15. Completing together with the construction supervision unit and submitting the construction site checklist to the municipal PMO before construction;</p> <p>16. The construction contractor reports on a weekly basis the project implementation status</p>

			to the construction supervision engineer.
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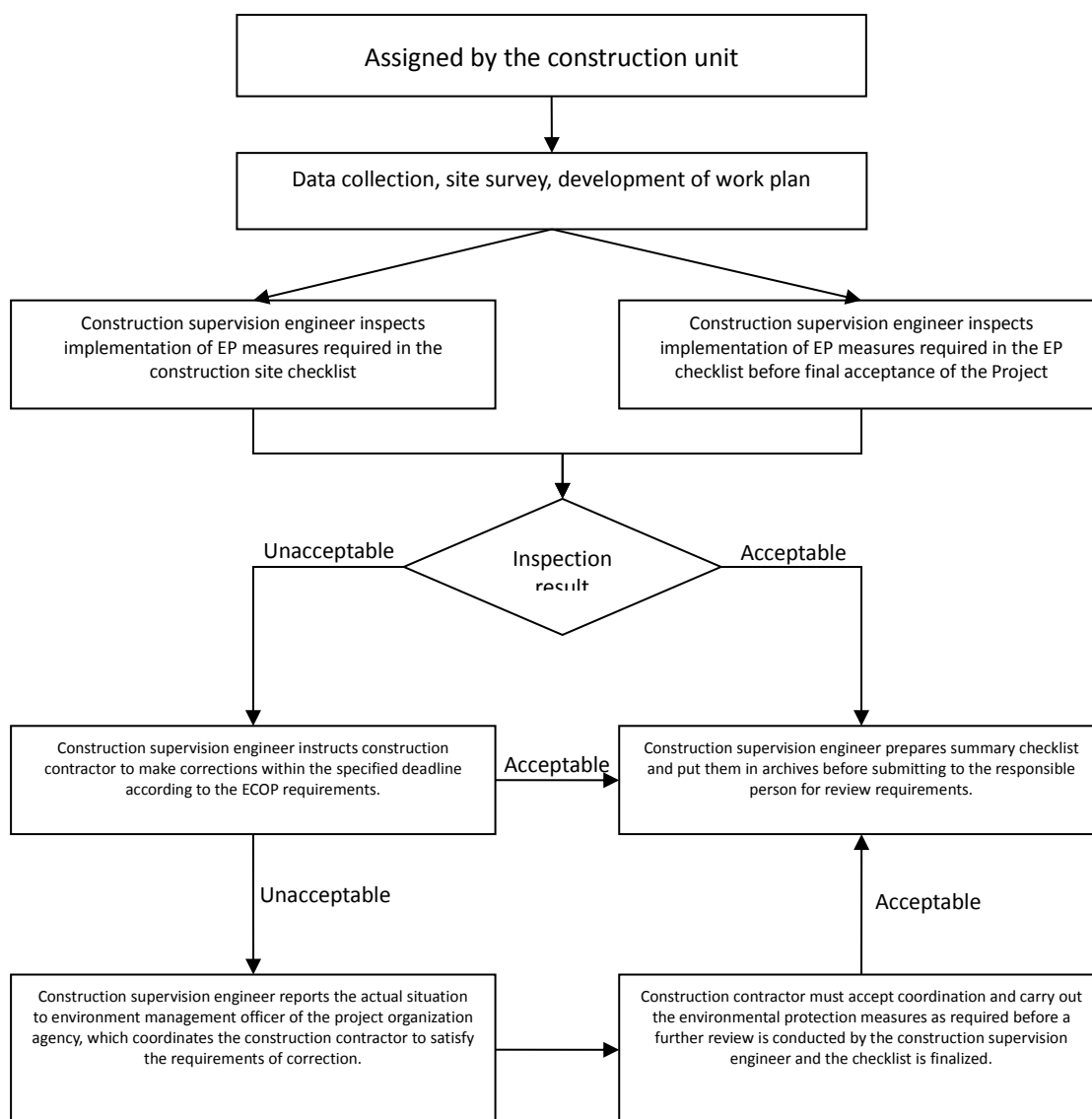
## 2.3 Environment management tasks in each stage of the Project

For different stages of project implementation, the ECOP contains different assignments.

The most important task of the ECOP is to assure that the various environmental protection measures as proposed are effectively implemented, including: (1) incorporating the ECOP environmental protection measures into the project design, tendering and construction contracts; (2) inspecting the effectiveness and implementation status of environmental protection measures through the supervision by the construction supervision engineer over the implementation of the environmental protection measures in the construction stage of the Project; (3) inspection, reporting and archiving mechanisms of the ECOP to reflect the time effectiveness of work through inspections of routine work activities.

## 2.4 Work Flowchart of Agencies Implementing ECOP in the Construction Stage

In the construction process of the Project, the task of the construction supervision engineer is to check whether the environmental protection measures taken during construction meet the requirements included in the ECOP. The construction supervision engineer should conduct construction site inspections at least once a week and prepare and put into archives the environmental protection checklist for the construction stage, propose and follow up with the implementation of corrective measures to any environmental problems existing in the construction activities of the construction contractor and submit monthly environment management progress reports to the environment officer of the municipal PMO. The work flowchart of the construction supervision engineer in the construction period is shown in Figure 2.4-1 as follows.



**Figure 2.4-1** Work Flowchart of Construction Supervision Engineer in the Construction Stage

## 2.5 Management of ECOP Files

In the implementation process of the ECOP, the World Bank, the municipal PMO, the project owner, the monitoring unit, the EIA consultant, the construction supervision unit and the construction contractor should all be engaged in management of the respective files and documents. Requirements of file management for each of these agencies are described in detail in Table 2.5-1.

**Table 2.5-1 Requirements of file management for each unit**

Name of unit	File management
(1) Contractor	<ol style="list-style-type: none"> <li>1. Recording, archiving and reporting to the construction supervision engineer on a weekly basis the implementation status of the construction activities;</li> <li>2. Completing together with the construction supervision engineer and archiving the construction site checklist prior to construction and submitting a report to the municipal PMO;</li> <li>3. Recording, archiving and reporting to the construction supervision engineer the implementation status in case of an emergency and unanticipated event;</li> <li>4. Carrying out the corrections within 3 working days as of the receipt of an instruction on corrective measures (or within 10 working days if coordination with the management unit is required) and putting the respective files and documents into archives.</li> </ol>
(2) Construction supervision unit	<ol style="list-style-type: none"> <li>1. Recording, archiving and reporting to the municipal PMO on a weekly basis information reported by the construction contractor;</li> <li>2. Completing together with the construction contractor and archiving the construction site checklist prior to construction and submitting a report to the municipal PMO;</li> <li>3. Recording, archiving and reporting to the municipal PMO the specific implementation plan of the construction contractor in case of an emergency and unanticipated event;</li> <li>4. Recommending and following up with the implementation of a corrective solution to any environmental protection issues encountered by the construction contractor in the construction activities, including issuing instructions on corrective measures and correction checklist and archiving the inspection files and documents.</li> </ol>
(3) EIA consultant	<ol style="list-style-type: none"> <li>1. Preparing the contents of the ECOP and putting the first draft, the draft for review and the final draft for approval into archives.</li> </ol>
(4) Monitoring unit	<ol style="list-style-type: none"> <li>1. Implementing the monitoring plan in the ESMP and submitting the monitoring report at the earliest possible date after the monitoring is completed to the contractor (or operator) and the construction supervision engineer;</li> <li>2. Including the monitoring report into the Project Progress Report, putting it into archives and submitting it in a timely</li> </ol>



	<p>manner to the PMO and respective management authorities (EPB) to enable these agencies to be aware of the execution status and effectiveness of the environmental protection measures in a timely manner.</p>
(5) Project owner	<ol style="list-style-type: none"> <li>1. Preparing, implementing and putting into archives the rules and regulations on environment management for subprojects;</li> <li>2. Putting into archives the final draft and the approval document of the domestic EIA report of subprojects;</li> <li>3. Preparing, implementing and putting into archives the environment management training plan;</li> <li>4. Organizing theme studies or relevant studies and managing and archiving the work documents of such workshops and studies;</li> <li>5. Maintaining, processing and putting into archives records of complaints raised in the construction and operation processes of the Project;</li> <li>6. Summarizing and putting into archives on a monthly basis the environment management monthly report submitted by the construction supervision engineer and submitting a report (or statement) to the municipal PMO;</li> <li>7. Receiving construction site checklists submitted by the construction contractor and the supervision engineer, reviewing and verifying environmentally-sensitive issues and putting such documents into archives;</li> <li>8. Managing and putting into archives the submitted instructions on corrective measures.</li> </ol>
(6) Municipal PMO	<ol style="list-style-type: none"> <li>1. Supervising the implementation of the ECOP and reviewing and archiving on a monthly basis the environment management monthly report submitted by each project owner;</li> <li>2. Summarizing reports from the municipal project leading group and the PMO and submitting to the World Bank and archiving relevant reports on a half-year basis;</li> <li>3. Coordinating with the concerned authorities to address major environmental issues and recording and archiving the specific measures.</li> </ol>
(7) World Bank	<ol style="list-style-type: none"> <li>1. Reviewing and archiving on a half-year basis the ESMP execution progress report submitted by the municipal PMO;</li> </ol>

### **3. General requirements of the ECOP**

In the construction process of the Project, the contractor of the road and pipeline construction works will play a critical role in implementing the environment management, pollution control and prevention measures. In order to assure the execution of the ECOP, the contents included in this Section are general requirements and measures applicable to the major agencies involved in the construction process of the Project and the construction contractor should enforce the environment management measures proposed in the ECOP under the coordination and supervisory management of the various management agencies.

#### **3.1 Implementation of environmental measures during construction drawing design and tendering document preparation**

As the Project enters the implementation stage, relevant procurement activities will be implemented according to the Procurement Guidelines of the World Bank.

The tendering document preparation unit and the construction design unit are required to include the mitigation measures proposed in the ECOP against any potential adverse environmental impacts into the technical specifications of the tendering documents and the construction design of different stages under the coordination, guidance and supervision of the municipal PMO. The tendering documents need to require the tenderer to make commitments on the following environment management requirement in the bid document and incorporate such contents into the construction contract.

- (1) The construction design unit should propose measures to mitigate potential adverse environmental impacts in the construction design of different stages. In the feasibility study stage, the environmental impacts should be analyzed and assessed and ECOP should be developed; in the preliminary design stage, the environmental protection measures proposed in the EIA and ECOP should be implemented; in the construction design stage, environmental protection engineering design should be produced based on the comments of ratification of the preliminary design.
- (2) The contractor of the road and pipeline construction works is required to provide 1 to 2 site environment engineers on each construction site responsible for implementing the environmental protection measures throughout the construction stage to assure that the construction activities of the contractor and its subcontractors (if any) satisfy the various requirements of this ECOP and necessary environmental protection measures are taken in the construction process.
- (3) The contractor of the road and pipeline construction works must include the “Site Environmental & Social Management Plan” in its construction program after the contract is signed and before the commencement of the construction works.

- (4) The contractor of the road and pipeline construction works must respect the local construction safety and civilization requirements.
- (5) The contractor of the road and pipeline construction works and the construction supervision unit must receive training on environmental protection and environment management before the commencement of the construction works.
- (6) The contractor of the road and pipeline construction works should include a security deposit in terms of environment management at a percentage of around 3% in its yearly budget of the contract expenditures of the Project.

The following design elements should be taken into account as a priority in the various stages of design based on the general requirements of the ECOP and in association with the characteristics of the road and pipeline infrastructure works:

#### Road design requirements:

- (1) During the route and site selection stage of the construction drawing design of the temporary land occupation of the Project (construction sites, construction camps and access roads), full consideration should be given to avoidance of sensitive sites to mitigate impacts on residential areas in the neighborhood by temporary land occupation, minimize occupation of arable land and reduce damages to existing landscape and vegetation.
- (2) In the design of earthworks and stonework, earthworks and stonework balance should be optimized and deep excavation should be avoided to achieve best possible balance between excavation and fill.
- (3) Subgrade design should consider characteristics of local climate and rain season and construction of channels crossing roads should be planned and arranged ahead of time. Subgrade stormwater interception and drainage measures should be reinforced and side ditches and gutters and other roadside water diversion measures should be provided to increase the function of soil and water conservation.
- (4) The slope protection design should cater for the specific features of the Project and the reality of the local natural environment and also take protection of embankment slope as the top goal and extend concurrent consideration to the needs of production activities.
- (5) In the process of development of the construction program, the characteristics of local climate should be considered to develop a reasonable construction schedule and assure proper implementation of the flood prevention and stormwater drainage activities in the rain season. In addition, preventive measures should be taken to prevent and control erosion of exposed subgrade after excavation and fill caused by stormwater scouring.
- (6) In terms of land acquisition and resettlement, a detailed plan of land acquisition and resident resettlement should be developed as soon as possible after the

design proposal is finalized and negotiations with local people should be implemented ahead of time according to the resettlement plan to assure that resident resettlement is carried out in a harmonious way and compensations made through friendly negotiation.

- (7) The construction organization plan of the road construction works should give prior consideration to the protection of local residents and other sensitive objects and practical and feasible pollution prevention measures should be proposed in the design process to minimize disturbances to sensitive objects.
- (8) The landscaping design should be developed in association with the noise control and dust control measures. Appropriate tree species should be selected to minimize repetitive investment in water and soil conservation, greenbelt beautification and dust prevention and noise insulation.

Pipeline design requirements:

- (1) The pipeline layout should be developed in such a way that the shortest route is selected and smallest undulation is achieved.
- (2) The trunk pipelines to be constructed should be located along urban roads with high density of residents, where possible, to minimize the number of branch drainage pipes.
- (3) The orientation and location design should be developed in association with the master urban planning and the pipelines should be laid along existing or planned roads where possible for easy construction and maintenance.
- (4) The drainage pipeline network should be designed according to the long-term planning and the pipeline diameter should be determined by means of hydraulic calculation based on daily maximum hourly flow.

### **3.2 Preparations before construction**

After the contract award and before commencement of the road and pipeline network construction works, the ECOP document should be provided by the Municipal PMO to the road and pipeline network construction contractor and the construction supervision unit should be determined.

After the tendering process is ended and a contract is signed with the civil works contractor, the contractor should conduct a visit to the construction site to identify environmental restriction factors in the project area. Prior to the commencement of the road and pipeline network construction works, a construction site checklist should be prepared and completed to inspect the sensitivity of the various environmental elements on site to provide an important basis for environmental protection of the road and pipeline network works in the future.

The purpose of the construction site checklist is to identify the relevant issues of environmental safety and identify and screen environmentally sensitive issues needing

special protection measures.

Based on the results of construction site inspection, the civil works contractor should prepare the “Site Environmental & Social Management Plan”, which should incorporate the requirements of the ECOP and get approval by the construction supervision unit.

### **3.3 Environment management in the construction stage**

During the construction of the road and pipeline network construction works, the civil works contractor should accept the supervision by the construction supervision unit commissioned by the project owner.

The contractor of the road and pipeline construction works should implement the various environmental protection measures based on the requirements of environment management in the construction contract and the “Site Environmental & Social Management Plan” approved by the construction supervision unit. The construction supervision unit should carry out direct full-process supervision over the implementation of the environmental protection measures taken by the contractors while the local environmental protection administrative authority and its environmental surveillance unit and the public stakeholders in the project area should conduct external environment management monitoring.

Throughout the construction stage, the contractor of the road and pipeline construction works should actively coordinate with the construction supervision unit and the environmental monitoring unit to perform their duties as detailed in “2.2 Responsibilities and Staffing of Agencies involved in the Environment Management System”.

The construction contractor should coordinate closely with the local government departments and other authorities to assure full compliance with the requirements of the laws and regulations of China.

#### **3.3.1 Full-process construction supervision**

The key assignments of the construction supervision unit include:

- (1) Mainly responsible for supervising the construction activities of the contractor and other relevant activities, e.g. land occupation and compensation, etc. to assure that the aforesaid activities comply with the requirements, investment and objectives of environmental protection; responsible for coordinating the relationship between the land administration authority and the environmental monitoring authority on the construction site;
- (2) Responsible for supervising and guiding on a regular basis the contractor’s environmental behaviors and assuring that the requirements of ECOP are satisfied;
- (3) Responsible for review and approval of the “Site Environmental & Social Management Plan” of the contractor;

- (4) Following up with and monitoring the implementation status of measures taken by the contractor in environmental protection and avoiding and mitigation of adverse environmental impacts;
- (5) Monitoring and checking whether the construction behaviors of the contractor comply with the requirements of this ECOP;
- (6) Making sure that an investigation should be immediately conducted and a report submitted to the municipal PMO or local environmental protection administration authority for a solution in case of any non-compliance with the environmental protection requirements or any adverse environmental impacts or any complaints from local residents on environmental protection in the project area; issuing simultaneously to the contractor an Instruction on Environmental Protection Corrections (Table 4 as attached) and making sure the corrective measures are taken by the contractor under supervision.
- (7) Stopping any activities or behaviors by the contractor violating the environmental protection requirements;
- (8) Providing on-the-job training to the contractor to avoid and abate possible adverse impacts on the local environment;
- (9) Conducting site environment inspections on a weekly basis and preparing, archiving and incorporating the Environmental Protection Checklist in the Construction Stage (Table 3 as attached) into the "Site Inspection Report" for monthly submission to the municipal PMO;
- (10) Conducting a further site environment inspection prior to the environmental protection acceptance upon the completion of the construction works and preparing and putting into archives the Environmental Protection Acceptance Checklist (Table 5 as attached).

### **3.3.2 Environmental Protection Unit Supervision and Public Opinion**

The construction contractors should coordinate closely with the local governments and other authorities throughout the construction stage to assure full compliance with this ECOP and provide adequate information to the affected public, in particular information on construction behaviors affecting public safety, matters infringing upon public interests and sensitive areas and temporary stockpiling sites, etc. The local EPB should carry out sample inspections over the environmental protection measures taken by the construction contractors, receive site inspection reports submitted by the project owner and the municipal PMO and carry out its administrative duties based on the reported information and make arrangements for emergency responses to any abnormal environmental conditions arising in the construction process.

The contractors will assure that information to be disclosed to the public is posted at sites in the vicinity of local residential buildings in the project area, including name of contractor, name and telephone number of environment management coordinators, environmental impacts likely to arise in the construction process and preventive

measures to be taken as well as the estimated duration of such impacts. In the meanwhile, the contractor needs to provide an open and transparent way of public participation and hotline telephone number and complaint handling office to receive public consultation and advices. Environmental issues reflected in the public feedback should be immediately investigated and addressed within the shortest possible time.

### **3.4 Corrective measures to non-conformities to the ECOP requirements**

The contractor and subcontractors (if any) of the road and pipeline network construction works must respect the requirements included in the ECOP and upon the occurrence of any pollution accidents (or events) due to failure in respecting the environmental protection measures specified in the ECOP:

- (1) The Contractor of the road and pipeline network construction works should take immediate measures and trigger the emergency response plan of environmental pollution accidents to eliminate the pollution sources and control the resulted environmental pollution.
- (2) The contractor of the road and pipeline construction works should immediately notify the construction supervision unit and the project management unit while the construction supervision unit and the project management unit should provide assistance and guidance to the construction contractor to take remedial measures to reduce or eliminate environmental impacts. A report should be delivered within 24 hours to the local environmental protection administration authority (or local environment monitoring authority) for inspection and guidance to minimize the impact.
- (3) The contractor of the road and pipeline construction works should keep record of the implementation status of the pollution control measures and propose and submit corrective measures to the construction supervision unit and the project owner. Such records should be put into archives and registration by the construction supervision unit and the municipal PMO and the implementation status of such remedial measures will be reported by the project owner to the municipal PMO.
- (4) The contractor of the road and pipeline construction works should conduct an in-depth analysis of the causes of environmental pollution and develop preventive measures and improve the construction design proposal to prevent recurrence of similar accidents. The preventive measures developed by the contractor should be approved, archived and registered by the construction supervision unit and the municipal PMO.
- (5) The project owner should take disciplinary and punishment actions to the contractor of the road and pipeline construction works according to the stipulations in the contract based on the nature, scope and degree of impact of the pollution accident and the implementation status of the contractor's remedial measures and report the results of such actions to the local environmental

protection administration authority.

## **4. ECOP in the stage of construction site preparation**

### **4.1 Road and pipeline network construction**

The construction sites of the road and pipeline network construction works mainly include the main works construction areas, the construction and production areas, the construction camps and the access roads as well as the stockpiling sites of related construction materials.

- (1) Main works construction areas include land within the boundary of the right-of-way of roads and pipelines.
- (2) Construction and production areas generally include the asphalt and concrete mixing plants, lime soil mixing plants, precast yards and construction material stockpiling sites.
- (3) Construction camps are temporary places of centralized residence for construction workers participating in a construction project.
- (4) Access roads are temporary roads constructed for the convenience of the construction activities.
- (5) Construction material stockpiling sites generally include the sand and stone quarries, borrowing sites and soil-spoiling and waste disposal sites.

Construction site preparation mainly includes the formalities of land acquisition and resettlement to be fulfilled in advance. The construction areas of the main works are areas of permanent land occupation while the construction and production areas, construction camps, access roads and construction material stockpiling sites are generally areas of temporary land occupation.

Both permanent and temporary land occupation involve the following environmental and social impacts:

- (1) Change of land use;
- (2) Damages to surface vegetation;
- (3) Aggravation of soil erosion among a series of environmental problems;
- (4) Negative impacts caused by land acquisition and resettlement on the daily life of local residents.

Therefore, in order to save land resources and avoid unnecessary environmental impacts from land occupation, the scope of permanent and temporary land occupation (construction and production areas, construction camps and construction access roads) for the road and pipeline network works should be determined and the relevant formalities of land use for the Project should be fulfilled in the construction preparation stage prior to construction mobilization and commencement.



The following principles should be followed in terms of temporary land occupation:

- (1) Where resettlement is involved in the process of land acquisition for the construction area of the main works of road and pipeline network under the Project, the relocation program included in the resettlement plan of the Project should be strictly implemented so that any problems of production and livelihood of the affected residents in the future are solved effectively and reasonable compensation are provided.
- (2) The construction and production areas mainly include the asphalt and concrete mixing plants, lime soil mixing plants and precast yards and should be located in a centralized way. Prior investigations should be carried out to identify any reliable and available municipal asphalt mixing plants or concrete mixing plants. Where possible, commodity asphalt mixtures and commodity concrete should be selected as a priority and in-situ asphalt mixing on the construction sites (the construction areas of main works) should be banned; in case of any operation difficulties, the construction and production areas should be selected in accordance with the requirements in Table 4.1-1.

**Table 4.1-1 Requirements on selection of construction and production areas**

Non-selectable	Selectable
<ul style="list-style-type: none"> <li>• Land parcels located upwind of sensitive sites such as residential buildings, schools, etc.</li> <li>• Land parcels located within a distance of 200m downwind of sensitive sites such as residential buildings, schools, etc.</li> <li>• Basic farmland</li> <li>• Homestead</li> <li>• Forest land</li> <li>• Land parcels within a distance of 200m from the land territory of a river way</li> <li>• Land parcels located within a distance of 1000m at the upper reaches and 500m at the lower reaches of the drinking water sources and inside the protection area of drinking water sources</li> <li>• Low-lying land or paddy fields</li> <li>• Land with excellent vegetation cover</li> <li>• Land of special usages</li> </ul>	<ul style="list-style-type: none"> <li>• Land parcel within the scope of permanent land use</li> <li>• Wasteland</li> <li>• Abandoned farmland</li> <li>• Land parcels with relatively high terrain</li> <li>• Other low-quality land parcels</li> </ul>

- (3) Existing buildings and infrastructures should be utilized as a priority as construction camps to reduce soil and water conservation and environmental impacts caused by construction of construction camps; in case of any operation difficulties, the construction camps should be selected in accordance with the requirements in Table 4.1-2.

**Table 4.1-2 Requirements on siting of construction camps**

Non-selectable	Selectable
<ul style="list-style-type: none"> <li>• Land parcels near residential buildings</li> <li>• Basic farmland</li> <li>• Homestead</li> <li>• Forest land</li> <li>• Land parcels within a distance of 200m from the land territory of a river way</li> <li>• Land parcels located within a distance of 1000m at the upper reaches and 500m at the lower reaches of the drinking water sources and inside the protection area of drinking water sources</li> <li>• Low-lying land or paddy fields</li> <li>• Land with excellent vegetation cover</li> <li>• Areas with hazards of collapses and landslides</li> <li>• Areas prone to mud slides</li> <li>• Land of special usages</li> </ul>	<ul style="list-style-type: none"> <li>• Wasteland</li> <li>• Abandoned farmland</li> <li>• Land parcels with relatively high terrain</li> <li>• Other low-quality land parcels</li> </ul>

- (4) Existing roads should be utilized to the best possibility as access roads for construction of road and pipeline networks and such access roads should be located far away from sensitive sites such as residential buildings, schools and hospitals.

New access road should be paved based on their usages. Site pavement should be handled based on the usage of the respective sites. For example, roads allowing the passage of heavy-duty vehicles should be paved with recyclable load-bearing bricks (structures) while ordinary sidewalks should be paved with recyclable seepage bricks. Dust along road sections prone to dust generation should be suppressed by water spraying.

- (5) Construction material stockpiling sites generally include sand and aggregate stockpiling sites, borrowing sites and soil-spoiling and waste disposal sites.

Quarries: Aggregates needed for construction of the Project should unexceptionally be purchased locally.

Borrowing sites: Construction projects usually need heavy volume of earthwork. In the construction site preparation stage, surveys should be implemented to an adequate extent about the available soil resources in the neighborhood and commodity soil should be selected or urban construction projects should be utilized for waste disposal to avoid the construction of new borrowing sites. In case of any operational difficulty, the principles of siting included in Table 4.1-3 should be followed.

**Table 4.1-3 Requirements on siting of borrowing sites**

Non-selectable	Selectable
<ul style="list-style-type: none"> <li>• Basic farmland or other farm land, paddy field and cash crop fields</li> <li>• Homestead</li> <li>• Forest land</li> <li>• Land parcels within a distance of 200m from the land territory of a river way</li> <li>• Low-lying land or paddy fields</li> <li>• Land with excellent vegetation cover</li> <li>• Areas with hazards of collapses and landslides</li> <li>• Areas prone to mud slides</li> <li>• Land of special usages</li> </ul>	<ul style="list-style-type: none"> <li>• Wasteland</li> <li>• Abandoned farmland</li> <li>• Other low-quality land parcels</li> </ul>

Soil-spoiling and waste disposal sites: In the process of construction, a certain volume of construction wastes and debris will likely be generated, mainly including waste soil from excavation, waste materials of road construction and waste rocks and mud from clearing and grubbing. In the construction site preparation stage, the destination of such wastes should be selected in a reasonable way based on the results of calculation of earthwork and stonework balance in the design stage and local recycling or borrowing site vegetation restoration should be selected as a top priority. In case of any operational difficulty, the siting of soil-spoiling and waste disposal sites should satisfy the requirements in Table 4.1-4.

**Table 4.1-4 Requirements on siting of soil-spoiling and waste disposal sites**

Non-selectable	Selectable
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<ul style="list-style-type: none"> <li>• Basic farmland or other farm land, paddy field and cash crop fields</li> <li>• Homestead</li> <li>• Forest land</li> <li>• Land parcels within a distance of 200m from the land territory of a river way</li> <li>• Low-lying land or paddy fields</li> <li>• Land with excellent vegetation cover</li> <li>• Areas with hazards of collapses and landslides</li> <li>• Areas prone to mud slides</li> <li>• Land of special usages</li> </ul>	<ul style="list-style-type: none"> <li>• Wasteland</li> <li>• Abandoned farmland</li> <li>• Other low-quality land parcels</li> <li>• Mountain plain or low-lying areas</li> </ul>
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- (6) Prior to the commencement of the construction works, the supervision engineer should carry out a strict review of the land use plan for temporary facilities to assure minimized occupation of farmland (in particular paddy field) and forest land.

Prior to road excavation and pipeline excavation, a survey of the existing pipelines should be properly carried out to avoid damages to existing pipelines during construction.

The construction contractors should identify suitable public water sources and municipal tap water or existing drinking water sources in the nearby villages should be selected. Drilling of new wells is strictly banned.

## 5. Management of construction sites and facilities

### 5.1 Management of construction sites

The construction sites mainly include the construction areas of the main works, the construction and production areas and the construction access roads.

#### 5.1.1 Construction areas of main works

The construction sites mainly include the construction areas of the main works, the construction and production areas and the construction access roads.

##### 5.1.1.1 Pollution source analysis for the construction areas of main works

Construction activities of the main works cover a number of construction stages including clearing and grubbing, subgrade construction, pipeline and supporting infrastructure construction, pavement construction, side slope trimming and ecological restoration. In addition to the supporting pipeline network, the Project includes a special pipeline construction component. The environmental impacts generated in the construction of the main works under the Project mainly include the following aspects:

- (1) Clearing and grubbing: Loose soil, construction wastes, crushed stone and other

debris may be generated in this process, which, if not properly treated, will cause dust and solid waste pollution and thus soil erosion.

- (2) Subgrade and pipeline construction: Vegetation on the subgrade and pipelines will be damaged and surface will be exposed to result in certain changes of the local ecological structure in areas along the road and pipeline; In the meanwhile, waste soil will be generated from earthwork excavation and dust pollution and soil erosion from direct excavation or delayed fencing or temporary waterproofing during earthwork fill; dust may also arise during material transportation.
- (2) Pavement construction: asphalt smoke generated in the process of mixing and transportation, placement and compacting of asphalt mixtures in the construction of roads with asphalt concrete pavement contains heavy load of toxic and hazardous substances such as polycyclic aromatic hydrocarbons and benzo [a] pyrene, which is harmful to the physical health of operators and local residents.
- (3) Slope trimming: Failure in timely slope trimming will lead to impacts of soil erosion and dust pollution.
- (4) Ecological restoration: Construction behaviors such as temporary stockpiling of earth materials and compacting of construction plants will inevitably cause damages to vegetation on land around the boundaries of the right of way of road and pipelines and lead to aggravated soil erosion around the project area.
- (5) Construction noises: All the aforesaid construction stages will require the use of many construction plants and transportation vehicles, which will radiate strong noises. Some equipment even generates vibration influencing the local residents and schools. The main construction plants include pile drivers, excavators, bulldozers, loaders and rollers while the transportation vehicles mainly include various trucks and dump trucks.

#### 16.2.1.1. Pollution control measures in the construction areas of the main works

- (1) The following pollution control measures should be taken during clearing and grubbing:

Serious attention should be paid to dust suppression through water spraying so as to abate dust pollution.

Construction wastes and debris as generated should be cleared out of site in a timely manner and enclosed transportation vehicles must be used for transportation of earth, debris and construction wastes, which should be subject to reasonable disposal according to the requirements of “Section VII ECOP of Construction Material Stockpiling Sites”.

In order to prevent soil erosion, the respective water and soil conservation measures should be taken according to the requirements in “Section VIII Water and Soil Conservation Management”.

- (2) The following pollution control measures should be taken in subgrade

construction:

Strict control should be implemented on the subgrade to avoid damages from over-excavation to surrounding vegetation and any felling of trees outside the construction areas is prohibited.

Construction wastes and debris as generated should be cleared out of site in a timely manner and enclosed transportation vehicles must be used for transportation of earth, debris and construction wastes, which should be subject to reasonable disposal according to the requirements of “Section VII ECOP of Construction Material Stockpiling Sites”

Water should be sprayed on construction site to abate dust pollution.

In order to prevent soil erosion, the respective water and soil conservation measures should be taken according to the requirements in “Section VIII Water and Soil Conservation Management”

- (3) The following pollution control measures should be taken during pavement construction:

Centralized asphalt mixing plant must be used and the mixing plant should be located inside the construction and production area. No asphalt mixing plant should be located in the construction area of the main works.

- (4) The following pollution control measures should be taken during pipeline construction:

Upon the completion of the pipeline construction works, roads and greenbelts should be restored in time and urban artificial trees and lawns should be grown to avoid change of the original urban eco-system.

Waste transportation vehicles should not choose urban roads so as to avoid the increase of local traffic and traffic congestion. In addition, waste transportation should be timed in such a way to avoid the morning and evening peak hours as well as the peak hours of pedestrian circulation and material transportation.

The transportation routes in the construction stage should be optimized to avoid areas sensitive to noise pollution. Nighttime material loading and unloading operations are banned; specific personnel should be assigned to be responsible for guiding the material transportation vehicles entering the construction sites; honking is prohibited in the construction sites; artificial conveyance of materials should be adopted during loading and unloading operations and casting or dumping of materials from trucks and nighttime material loading and unloading are prohibited.

An enclosed construction method should be adopted on the construction sites, which should be isolated from the surrounding environment with fences and fine mesh nets to insulate dust and fly ash on the construction site and avoid impacts on the surrounding environment.

During construction, watertight test, backfilling and vegetation restoration should be carried out for installed pipelines in a timely manner along the construction progress so as to reduce exposed surface and temporary stockpiles of earthwork.

- (5) The following pollution control measures should be taken upon slope trimming:

Exposed slopes should be trimmed in time to reduce time of exposure.

Exposed slopes should be covered with dust prevention nets or sprayed with water for dust suppression to avoid dust pollution.

Respective water and soil conservation measures should be taken according to the requirement of Section VIII --- Management of Water and Soil Conservation.

- (6) The following pollution control measures should be taken upon ecological restoration:

Ecological restoration of damaged land should be carried out prior to the completion of the construction works and such damaged land should at least be restored to the status prior to construction.

Arable top soil stripped during the construction should be stockpiled temporarily on a relatively flat area on the construction site and fenced up with bagged earth cofferdam. Temporary gutters and sand sedimentation measures should be provided around the stockpiles. The stockpiled top soil should be covered with dust prevention nets and reused for ecological restoration upon completion of the construction activities.

- (7) Pollution control measures for construction noises:

The construction time should be subject to strict control. Construction activities using plants and equipment generating strong noises on construction sites within a distance of less than 150m from the residential areas must be suspended at night (from 22:00 pm to 06:00 am). On construction sites where the construction activities must be implemented in a continuous way, the contractor should contact in a timely manner, depending on the specific cases, the local environmental protection departments and obtain a nighttime construction permit according to the respective provisions and issue a public announcement to obtain maximum public support.

Mobile or temporary sound barriers and other noise prevention measures should be used on sensitive sites in the vicinity of the construction site (with a distance of less than 50m).

The construction site should be located far away from schools and hospitals where possible. The construction time for construction sites in the neighborhood of schools involving the use of strong-noise machinery should be negotiated and agreed with the schools and no construction activities should be arranged during the exam hours of the schools where possible.

- (8) Others: Burning of wastes is prohibited on construction sites.

### **5.1.2 Construction and production areas**

#### **5.1.2.1 Pollution source analysis for construction and production areas**

Construction and production areas mainly include asphalt mixing plants, concrete mixing plants, lime soil mixing plants and precast yards and the key sources of pollution are:

- (1) Loose soil, construction wastes, crushed stone and other debris generated in the process of clearing and grubbing, which, if not properly treated, will cause dust and solid waste pollution and soil erosion.
- (2) Asphalt smoke generated in the process of asphalt mixing;
- (3) Dust generated in the process of concrete mixing;
- (4) Dust generated in the process of lime soil mixing;
- (5) Dust generated in the process of material loading and unloading and storage;
- (6) Dust generated by construction and transportation vehicles;
- (7) Wastewater generated in the process of concrete curing on the precast yards;
- (8) Noises and vibration generated in the process of equipment operation and transportation.

#### **5.1.2.2 Pollution control measures for the construction and production areas**

- (1) The following pollution control measures should be taken in the process of clearing and grubbing:

Serious attention should be paid to dust suppression through water spraying so as to abate dust pollution. Construction wastes and debris as generated should be cleared out of site in a timely manner.

In order to prevent soil erosion, respective water and soil conservation measures should be taken according to the requirement of Section VIII --- Management of Water and Soil Conservation.

- (2) Pollution control measures that should be taken in the process of asphalt mixing include:

Procurement of commodity asphalt mixtures should be regarded as the top priority.

Mixing plants with excellent sealing performance and high dust removal efficiency should be selected for asphalt concrete mixing plants and semi-enclosed bitumen boiling operation process should be banned.

- (3) Pollution control measures that should be taken in the process of concrete mixing include:

Commodity concrete should be selected as the top priority.

Wet mixing should be selected as the method of concrete mixing and the mixing process should be carried out in an enclosed state.



- (4) Pollution control measures to be taken in the process of lime soil mixing include:

Wet mixing should be selected for the lime soil mixing plant, which should be operated in a fenced enclosure.

- (5) Material loading and unloading and stockpiling process

Windproof and covering measures or dust suppression measures should be taken in the process of transportation, temporary storage and loading and unloading of earth, cement and lime among other bulk materials.

The material stockpiling site should be flat and solid.

Fencing measures should be taken for stockpiling sites of construction materials, such as cement, lime and sand and stone, which should be covered with tarpaulins to reduce pollution from stormwater scouring.

- (6) Pollution control measures to be taken for dust pollution generated by construction and transportation vehicles include:

Vehicle washing facilities should be provided at the entrances and exits of the construction sites so that vehicles are washed and cleaned upon departure. Roads connecting the vehicle washing equipment and the exit of the construction site should be paved with concrete, asphalt or crushed brick to avoid possible take-away of mud and debris out of the site.

Enclosed transportation vehicles must be used for transportation of earth, debris and construction wastes.

- (7) Pollution control measures to be taken against wastewater generated in the process of concrete curing at the precast yards include:

Wastewater from concrete mixing must not be discharged in an uncontrolled way and should be collected and treated in the sedimentation tank and reused for dust suppression on the construction sites. Upon the completion of the construction works, the sedimentation tanks should be backfilled for ecological restoration.

- (8) Pollution control measures to be taken for construction noises should include:

Shock absorbers should be provided on the bases of fixed mechanical equipment with strong vibration (e.g. mixers). Fixed strong noise sources should be provided with sound insulators (e.g. the power-generation trucks) or positioned and operated indoors. The construction time should be subject to strict control. Construction activities using plants and equipment generating strong noises on construction sites within a distance of less than 150m from the residential areas must be suspended at night (from 22:00 pm to 06:00 am).

- (9) Others:

Damaged land should be ecologically restored to at least the pre-construction state after the construction works is completed.

Arable top soil stripped during the construction should be stockpiled temporarily

on a relatively flat area on the construction site and fenced up with bagged earth cofferdam. Temporary gutters and sand sedimentation measures should be provided around the stockpiles. The stockpiled top soil should be covered with dust prevention nets and reused for ecological restoration upon completion of the construction activities.

Burning of wastes is prohibited on construction sites.

### **5.1.3 Construction access roads**

#### **5.1.3.1 Pollution source analysis for the construction access roads**

Environmental impacts generated from opening and construction of access road are mainly reflected in the following aspects:

- (1) Dust pollution from road surfaces during operation of trucks and equipment;
- (2) Noise pollution generated in the process of vehicle operation;
- (3) Damages to surface vegetation and soil erosion resulting from temporary land occupation.

#### **5.1.3.2 Analysis of pollution control measures for access roads**

- (1) Pollution control measures against dust generated from road surfaces:

Pavement of new access roads and hardening of sites should be handled based on the design usage. For example, reusable load-bearing bricks (components) may be used for access roads allowing heavy-duty vehicles while reusable seepage bricks may be used for pavement of ordinary footpaths.

The access roads should be maintained and cleaned every day and dust-prone sections should be sprayed with water for dust suppression.

- (2) Noise pollution control measures:

Transportation vehicles should be maintained according to Section 5.2 Construction equipment management.

Requirements in Section XVIII Construction Traffic Management should be followed.

- (3) Ecological impact control measures:

Newly constructed access roads should be ecologically restored to at least the pre-construction state after the construction works is completed.

In order to prevent soil erosion, respective water and soil conservation measures should be taken according to the requirement of Section VIII --- Management of Water and Soil Conservation

Arable top soil stripped during the construction should be stockpiled temporarily on a relatively flat area on the construction site and fenced up with bagged earth cofferdam. Temporary gutters and sand sedimentation measures should be provided around the stockpiles. The stockpiled top soil should be covered with dust prevention nets and reused for ecological restoration upon completion of the construction activities.

Occupied or damaged local roads should be relocated or subject to protective treatment such as pavement rehabilitation and landscaping. In addition, compensation of a certain amount should be paid to local governments to safeguard the righteous interests of local governments and residents.

## **5.2 Construction equipment management**

### **5.2.1 Pollution source analysis for construction equipment**

In the construction process of roads and pipeline networks, the operation of construction plants will bring a number of adverse impacts on the surrounding environment and sensitive sites, which are mainly reflected in the following aspects:

- (1) Oil leakage from equipment results in contamination of soil and water.
- (2) Noise generated from equipment operation;
- (3) Waste gas and tail gas emitted by fuel-powered machinery and vehicles.
- (4) Waste engine oil, waste cotton yarns and other solid wastes generated in the process of equipment maintenance and repair.

It is therefore of great significance to strengthen the equipment management and maintenance.

### **5.2.2 Pollution control for construction equipment**

In order to strengthen management of construction equipment, the following pollution control measures are proposed:

- (1) Pollution control measures through reduction of oil leakage

State-of-the-art equipment and machinery should be selected, if possible, to effectively reduce the number of oil leakage and machinery repair and thus the generation of oily wastewater.

In the process of inevitable oil leakage, solid oil-absorbing materials (e.g. cotton yarns, wood chips, oil-absorbing paper) should be used, if possible, and the waste oil should be collected and transformed into the solid substances to avoid excessive generation of oily wastewater.

Maintenance and servicing of machinery, equipment and transportation vehicles should be carried out at centralized maintenance sites along each road section, if possible, for the sake of easy collection of oily wastewater.

Horizontal sedimentation tanks should be provided in the machinery maintenance sites and the oily wastewater will be collected in the sedimentation tanks for simple treatment such as acid-alkaline neutralization, sedimentation, oil separation and debris removal before discharge. The sedimentation tanks should be backfilled with soil for landscaping upon completion of the construction works.

The ground surface of the equipment maintenance sites should be paved and subject to anti-seepage treatment to avoid possible contamination of soil caused by oil leakage.

Records of equipment repair and maintenance should be developed to enable periodical maintenance based on the operation status of equipment.

(2) Pollution control measures against equipment operation noises:

The construction contractor must select construction equipment and machinery and transportation vehicles conforming to the relevant national standards and select, if possible, low-noise construction plants.

Shock absorbers should be provided on the bases of fixed mechanical equipment with strong vibration. Fixed strong noise sources (e.g. the power-generation trucks) should be provided with sound insulators or positioned and operated indoors.

Maintenance and servicing of the various construction equipment should be strengthened to keep them in fine operation to fundamentally reduce the intensity of noise and vibration sources.

(3) Pollution control measures against tail gas and exhaust gas from equipment:

The construction contractor must select construction equipment and machinery and transportation vehicles conforming to the relevant national health protection standards and assure that the exhaust gas emission of such equipment and vehicles conforms to the relevant national standards.

(4) Pollution control measures against solid wastes:

Waste oil and chemical solvents are hazardous wastes and should be separately stored based on their nature. Sites for temporary storage of hazardous wastes should be provided with obvious signs and constructed in accordance with the "Pollution control standards for storage of hazardous wastes" (GB18597-2001). Such hazardous wastes should be treated and disposed by a qualified unit and must not be dumped in a random way.

Toxic and hazardous wastes requiring recovery (e.g. oil buckets) should be recovered by material suppliers in principle and such responsibilities should be defined in the material procurement contract.

Recovery and disposal of hazardous wastes generated in a decentralized way (e.g. oil gloves, oil yarn heads) should be carried out by qualified agencies authorized by the PMO.

Oil and grease leaked into the soil should be collected in a timely manner with scrapping devices and sealed up and transported to a qualified treatment plant for centralized treatment.

When it is unlikely to carry out the maintenance and servicing of machinery, equipment and transportation vehicles at a designated maintenance site for each road section, containers or solid oil-absorbing materials should be used to collect the oily wastewater generated from such equipment, which should be sealed up and transported to an external site for further treatment. A nearby disposal plant with the required qualifications for disposal of such wastes should

be selected.

## **6. ECOP for construction camps**

### **6.1 Pollution source analysis of construction camps**

Pollution sources in the construction camps mainly comprise of pollutants generated in the domestic activities of the construction workers, including:

- (1) Loose soil, construction wastes, crushed stone and other debris generated in the process of site leveling for the construction camps, which, if not properly treated, will cause dust and solid waste pollution and soil erosion.
- (2) Domestic wastewater, including washing wastewater, bathing wastewater and food and beverage wastewater.
- (3) Domestic exhaust gas, including exhaust gas and smoke from cooking gas combustion.
- (4) Solid wastes, mainly comprising of domestic wastes of workers and sludge from septic tanks.
- (5) Ecological environment impacts: Land occupation by the construction camps belongs to temporary occupation and the following environmental impacts will be generated during the land occupation period:
  - a) change of land use;
  - b) damages to surface vegetation;
  - c) aggravated soil erosion.

### **6.2 Pollution control for construction camps**

- (1) With regard to the various pollution sources in the construction and operation processes of the construction camps, the construction contractor should take the following pollution control measures:

Construction wastes and debris as generated should be cleared out of site in a timely manner and enclosed transportation vehicles must be used for transportation of earth, debris and construction wastes, which should be subject to reasonable disposal according to the requirements of “Section VII ECOP of Construction Material Stockpiling Sites”.

Serious attention should be paid to dust suppression through water spraying so as to abate dust pollution.

In order to prevent soil erosion, respective water and soil conservation measures should be taken according to the requirement of Section VIII --- Management of Water and Soil Conservation

- (2) The following pollution control measures should be taken against domestic sewage of the construction camps:

Oil or grease traps should be provided in the canteen and a qualified unit with the waste digestion qualification certificate and business license approved by the competent authority should be employed to assure timely removal of wastes.

Temporary toilets and septic tanks should be provided on the construction camps and should be subject to anti-seepage treatment.

Drainage gutters and sedimentation tanks should be provided on the construction camps. Filters should be installed on sewer pipes of canteen, washrooms and shower rooms. Construction wastewater should not be discharged into the municipal sewage pipeline or natural rivers until properly settled. In the meanwhile, the drainage ditches should be kept tidy and free of obstacles to assure smooth drainage.

The construction camps should be kept in a smooth drainage condition and free of ponding of black and odor wastewater and unregulated urination and defecation.

Uncontrolled dump and discharge of domestic wastewater into agricultural irrigation canals is prohibited. No domestic solid wastes and construction wastes should be stockpiled around the aforesaid areas.

(3) Domestic exhaust gas control measures:

Clean energy, such as natural gas, electricity, should be used for cooking on the construction camps according to the requirements of local EP authorities.

(4) Solid waste treatment measures:

Recoverable wastes (e.g. waste paper, etc.) should be recovered and disposed by an authorized unit.

Enclosed garbage stations should be provided in the construction camps for timely collection, removal and digestion of domestic solid wastes of staff according to the respective requirements.

Enclosed slop pails should be provided outside the canteen and be emptied and cleaned in a timely manner.

The septic tanks should be emptied and cleaned by the authorized unit and should be backfilled upon the completion of the construction works.

(5) Control measures for ecological impacts:

All temporary facilities should be demolished and the occupied site restored to the pre-construction state within one month as of the completion of the construction works.

Arable top soil stripped during the construction should be stockpiled temporarily on a relatively flat area on the construction site and fenced up with bagged earth cofferdam. Temporary gutters and sand sedimentation measures should be provided around the stockpiles. The stockpiled top soil should be covered with dust prevention nets and reused for ecological restoration upon completion of the construction activities.

(6) Other environmental protection requirements:

The civil works contractor should strictly abide by the following bans in the construction process of the construction camps:

Use of clay bricks in construction of temporary facilities in the construction camp is prohibited and the safety and fire protection requirements and relevant

national regulations should be respected.

The construction camps should be clearly distinguished from the construction areas and separation measures should be taken to assure that the construction camps remain in a tidy and orderly condition.

Burning of wastes is prohibited in the construction camps.

## **7. ECOP for construction material stockpiling sites**

Road pavement structures involved in the Project include cement concrete pavement and asphalt concrete pavement. The key materials of road construction are sand and stone, cement and bitumen. Reinforced concrete pipes are used in the pipeline network and the key materials involved are sand and stone and cement.

### **7.1 Sand and stone quarries**

The construction sites of the road and pipeline construction works of the Project do not have the conditions for setting up dedicated quarries. Site survey reveals that the subproject areas have rich reserves of sand and stone materials. Rich reserves of rubbles, (block) stone, aggregates and gravels needed for construction of pavement and structures are present in the vicinity of the project area. The quarries are uniformly distributed and capable of producing materials to a certain scale and conforming to the quality standard of construction materials. With convenient transportation condition from the quarries to the construction sites, it is unnecessary to set up new quarries.

### **7.2 Borrowing sites**

#### **7.2.1 Analysis of environmental impact factors for the borrowing sites**

Heavy volume of earthwork is involved in the road and pipeline network construction. Analysis shows that the impacts on environment caused by the borrowing sites are mainly reflected in the following aspects:

- (1) Relatively serious dust pollution may arise in the borrowing site excavation process if no actions are taken.
- (2) Soil erosion may arise if no fencing or temporary waterproofing actions are taken in a timely manner prior to borrowing site operation.
- (3) Borrowing site operation may damage surface vegetation and bring adverse impacts on ecological environment.
- (4) Surface vegetation damages and surface exposure caused by earthwork excavation may bring adverse impacts on local landscape.

#### **7.2.2 Control of environmental impacts from the borrowing sites**

In order to avoid possible adverse environmental impacts arising from setting up borrowing sites for the road and pipeline construction works of the Project, this ECOP proposes the following environmental protection measures:

(1) General requirements:

Deep excavation should be avoided in the construction process and all efforts should be made to achieve balance between excavation and earthwork fill. If borrow fill is needed, the prior choice is to purchase commodity soil or seeking waste soil from urban construction projects so as to avoid setting up new borrowing sites and thus fundamentally eliminate the environmental impacts of borrowing sites.

Centralized borrow fill should be selected for the Project to reduce the number of borrowing sites.

(2) Dust control measures:

Attention should be paid to dust suppression through water spraying in the course of borrow fill operation to reduce dust pollution resulting from earthwork excavation.

(3) Soil erosion control:

In order to prevent soil erosion, respective water and soil conservation measures should be taken according to the requirement of Section VIII --- Management of Water and Soil Conservation.

(4) Control of ecological impacts:

During excavation, the top soil should be preserved for land rehabilitation. The top soil should be stockpiled temporarily on a relatively flat area on the construction site and fenced up with bagged earth cofferdam. Temporary gutters and sand sedimentation measures should be provided around the stockpiles. The stockpiled top soil should be covered with dust prevention nets and reused for ecological restoration of the borrowing sites upon completion of the construction activities.

Vegetation restoration should be carried out upon the completion of the construction works according to the requirements in Section XII --- Ecological Protection Management.

(5) Control of landscape impacts

Respective environmental protection measures should be taken according to the requirements of Section XVII --- Control of Landscape Impacts.

## **7.3 Soil-spoiling and waste disposal sites**

### **7.3.1 Analysis of environmental impact factors for the soil-spoiling and waste disposal sites**

A certain volume of construction wastes and debris may be generated in the construction process of the road and pipeline network works, mainly including waste soil from excavation, waste road construction materials, waste rock and mud from site clearing, which, if not disposed in a reasonable way, may bring the following environmental impacts:

- (1) Exposed surface of the soil-spoiling and waste disposal sites may incur relatively serious dust pollution if no action is taken.



- (2) Soil erosion may arise if no fencing or temporary waterproofing actions are taken in a timely manner at the soil-spoiling and waste disposal sites.
- (3) Damages to surface vegetation may bring adverse impacts on ecological environment.
- (4) Surface vegetation damages and surface exposure caused by earthwork excavation may bring adverse impacts on local landscape.

### **7.3.2 Control of environmental impacts from soil-spoiling and waste disposal sites**

In order to avoid adverse environmental impacts from the establishment of the soil-spoiling and waste disposal sites, this ECOP proposes the following environmental protection measures:

(1) General requirements:

If any waste soil is generated, the top choice is to have such waste soil reused on the same construction site or other construction sites or reused for vegetation restoration in the borrowing sites so as to avoid setting up new waste soil disposal sites and fundamentally eliminate environmental impacts in this regard. If reuse of waste soil is unlikely, a local survey should be carried out to find out if any designated digestion sites exist locally for construction wastes and debris. If any, the required formalities of removal and transportation should be fulfilled and the construction wastes should be delivered to the designated places for digestion.

(2) Dust control measures:

Layered compaction may effectively suppress dust on the soil-spoiling and waste disposal sites.

Dust suppression should be carried out through water spraying to reduce dust pollution caused by exposed surface.

(3) Soil erosion control:

In order to prevent soil erosion, respective water and soil conservation measures should be taken according to the requirement of Section VIII --- Management of Water and Soil Conservation.

(4) Control of ecological impacts:

Before the soil-spoiling and waste disposal site is mobilized, the top soil should be excavated and used for land rehabilitation. The top soil should be stockpiled temporarily on a relatively flat area on the construction site and fenced up with bagged earth cofferdam. Temporary gutters and sand sedimentation measures should be provided around the stockpiles. The stockpiled top soil should be covered with dust prevention nets and reused for ecological restoration of the soil-spoiling and waste disposal sites upon completion of the construction activities.

Vegetation restoration should be carried out upon the completion of the borrow

fill operation according to the requirements in Section XII --- Ecological Protection Management.

(5) Control of landscape impacts

Respective environmental protection measures should be taken upon the completion of the construction works according to the requirements of Section XVII --- Control of Landscape Impacts.

## **8. Management of water and soil conservation**

Water and soil conservation in the road and pipeline network construction works should be implemented following the principle where “the water and soil conservation activities are integrated with the main works of road and pipeline network construction and equal emphasis is laid on the main works, the ancillary works and the temporary works so that both the fundamental and indicative causes of soil erosion are eliminated through integrated efforts of prevention and control focusing on prevention. In addition, the water and soil conservation facilities should be distributed and arranged in a reasonable way to not only cater for the local circumstances and pursue effectiveness, but also highlight the importance of water and soil conservation in the construction stage. Serious attention should be paid to landscaping and reclamation of borrowing sites and waste soil disposal sites involved in the road and pipeline network construction works and fences should be erected around the soil-spoiling and waste disposal sites before any disposal operation commences.

### **8.1 Distribution of water and soil conservation facilities and construction arrangement**

a) Distribution of preventive and control measures

Soil erosion likely to arise in the construction of the Project mainly occurs in the subgrade zones and the waste soil disposal sites. The roadbed and pipeline trough excavation involves the longest duration and the focus of soil erosion prevention should be the treatment of side slope and distribution of drainage facilities. The focus of soil erosion prevention in the soil-spoiling and waste disposal sites include temporary fencing, drainage facilities and vegetation restoration.

b) Construction progress scheduling

Soil erosion likely to arise in the construction of the Project mainly occurs in the construction stage of the Project. The key erosion type is hydraulic erosion and the focus of erosion prevention is stormwater diversion. Since a relatively sound stormwater system is included in the design of the main works, a part of the stormwater system should be implemented in advance and connected with the natural ditches and existing drainage facilities to perform its function of water and soil conservation at the earliest possible date.

### **8.2 Prevention and control zone of the main works**

- 15.1. Top soil stockpiling is not permitted in catchment areas of surface runoffs, in sensitive zones such as roads or river ways in the vicinity of the Project, in areas affecting construction or road traffic. In order to reduce the quantity of protection measures, top soil should be stockpiled at unoccupied low-lying land parcels where possible. If the top soil is temporarily stockpiled on both sides of the right-of-way of the subgrade, a cofferdam of bagged earth should be built up around the stockpile to avoid possible slides; temporarily stockpiled top soil should be used as topping soil for future side slope landscaping.
- 15.2. Slope protection should be carried out in a timely manner. Since roads included under the Project are urban roads, the subgrade slope protection should, in principle, take ecological protection as the main solution and lightweight supports as the secondary solution, with land development on both sides taken into account. Based on the geological and hydrological condition of the project area, geotextile net grass protection slope should be used along the filled embankment and retaining walls at certain individual sections.
- 15.3. For sections of the embankment crossing ponds and running along the rivers where the slope extends into the water ponds or rivers, the slope ratio from the constant water level +0.5m down to the bottom of the slope is 1:1.75 and masonry rubble surfacing with a thickness of no less than 0.6m should be selected for the waterfront side; the slope ratio for the part from the constant water level + 0.5m upward to the designed elevation of the subgrade is 1:1.5.
- 15.4. Temporary retaining ditches should be provided outside the boundary of low-lying areas in the project area to prevent stormwater scours in rain season.
- 15.5. Sand sedimentation tanks should be provided at the outlet of the subgrade drainage gutters.

### **8.3 Prevention and control zone for the construction and production areas**

The construction and production areas mainly include asphalt mixing plant, concrete mixing plant, lime soil mixing plant and precast yard, etc.

- (1) On-site soil erosion is the focus of prevention and control in the construction and production areas. To accommodate frequent passage of vehicles and need of material stockpiling, the entire site should be hardened and paved with cement concrete.
- (2) Temporary retaining ditches should be provided outside the boundary of low-lying areas in the project area to prevent stormwater scours in rain season.
- (3) Top soil and material stockpiles should be covered with dust prevention nets to prevent stormwater scours and pollution to surrounding environment.
- (4) A reasonable construction schedule should be developed to shorten the time of temporary land occupation and vegetation restoration or land rehabilitation should be immediately implemented for the temporarily occupied land parcels upon completion of the Project.

- (5) The key tasks of land rehabilitation in the late stage of the Project include demolition of construction facilities, removing aggregates, sand and other construction materials spilled in the course of concrete mixing and landscaping or rehabilitation of land parcel where the construction site is located to restore the land parcel to its original state to the best possibility.

The following ECOP should be executed in the soil erosion prevention and control zone of the concrete mixing plant:

- (1) Construction requirements:
- a) The layout design of the concrete mixing plants should respect the principle of “minimized number and centralized construction” to minimize the area of temporary land occupation.
  - b) Concrete mixing plants should be located at places with a relatively high elevation to avoid external scours.
  - c) The concrete mixing plant should be concrete-paved surface.
  - d) Necessary dust suppression and prevention measures should be taken for the concrete mixing plants, e.g. addition of dust prevention devices to the cement cylinders.
  - e) Water should be sprayed periodically in clear days (dry days) to suppress dust at the concrete mixing plants;
  - f) Sedimentation tanks should be dredged in a timely manner and sediments should not be stockpiled around the sedimentation tanks in a random way.

- (2) Prevention and control measures

Surface water on site is the focus of prevention and control for the concrete mixing plants. To accommodate frequent passage of vehicles and need of material stockpiling, it is recommended to have the entire site hardened and paved with cement concrete. Since a large volume of sand and stone aggregates is stockpiled on site, surface water contains high content of sand in rainy days. In addition, the wastewater from washing of cement tankers and mixing equipment contains high content of cement and may result in water pollution if directly discharged. Therefore, 1 sand sedimentation tank is to be provided at each concrete mixing plant and the surface water on site will be settled in the sand sedimentation tank and then reused.

## **8.4 Prevention and control zone for the construction access roads**

The access roads to be constructed for the road and pipeline construction works of the Project are roads for transportation of construction materials and waste soil (and debris). If it is truly necessary to build new access roads under the Project, waste and dry land should be selected in terms of land occupation. In addition, the scope of access roads should be minimized to reduce damages to vegetation and soil due to temporary land occupation by the access roads.

- (1) Construction requirements

- a) If possible, an existing road should be selected and financed after

negotiation with local authorities and developed on a win-win basis into an access road through widening and hardening.

- b) Newly developed access roads should be routed in such a way that large-scale excavation and riverside land parcels are avoided.
  - c) Water should be sprayed periodically in clear and windy days for dust suppression.
- (2) Design of prevention and control measures

Since access roads run through farmland on both sides, drainage gutters will be excavated on one side and connected to the drainage gutters of the temporary soil-spoiling and waste disposal site and subgrade in order to minimize land occupation. Type II trapezoidal section will be selected for the drainage gutter.

## **8.5 Prevention and control zone of the construction camps**

- (1) Grass and shrubs should be planted in areas except the camps and the hardened areas as a measure of temporary landscaping and beautification of the construction camps.
- (2) Brick masonry drainage gutters should be constructed for fast discharge of ponded water on site.
- (3) At the end of the Project, the camps and the hardened areas should be demolished for land rehabilitation and vegetation restoration.

## **8.6 Prevention and control zone of the borrowing sites**

- (1) Necessary stormwater interception and drainage facilities should be built before the borrowing site is put into operation. Drainage gutters should be provided around the borrowing site and sedimentation tanks at the exits so that stormwater from the borrowing site is settled and then discharged into the natural ditches in the vicinity. Interception ditches should be provided on the outer side of the slope platform and upper slope of the borrow area and connected to the drainage gutters.
- (2) If possible, excavation should be followed with backfill and landscaping to avoid extensive surface exposure from continuous excavation and the resulted serious soil erosion. Prior to landscaping, top soil should be backfilled to the landscaping area and the land rehabilitation measures should be taken.
- (3) It is difficult to achieve fast restoration of vegetation on the upper slope, which, in case of strong rainfall, should be temporarily covered to avoid runoff scours.
- (4) Upon the completion of the construction works, vegetation restoration or land rehabilitation should be immediately implemented at the borrowing sites.

## **8.7 Prevention and control zone for the soil-spoiling and waste disposal sites**

- a) In case of any implementation difficulty, soil-spoiling and waste disposal sites

- need to be set up in preferably mountain plain or low-lying areas.
- b) Based on the topographical features of the soil-spoiling and waste disposal site, retaining wall should be constructed at the bottom part of the soil-spoiling and waste disposal site prior to disposal operation. Such retaining wall should be constructed in such a way that the location and topographical features of the waste disposal stockpiles are taken into account and the retaining walls are safe, cost-effective and reasonable.
  - c) Interception ditches should be constructed at the upper slope of the soil-spoiling and waste disposal site to intercept slope runoffs and sedimentation tanks should be built on both ends. Energy digestion facilities should be provided if the interception ditch has a big end slope.
  - d) The disposed wastes should be rolled and compacted in time. A 1-2m wide terrace should be provided at a spacing of 5-6m along the elevation of the disposed waste and drainage gutters should be provided on the terrace.
  - e) Upon the completion of the construction works, ecological restoration should be immediately implemented to the soil-spoiling and waste disposal sites.

## **9. Ambient air quality management**

Pollutants generating impacts on the ambient air quality in the construction stage of the Project mainly include construction dust and vehicle tail gas.

### **9.1 Construction dust**

- (1) The construction access roads are simple gravel roads and water will be sprayed periodically to reduce dust.
- (2) Fine particle bulky materials stockpiled on construction sites should be enclosed or covered and water should be sprayed over the stockpiles, based on the nature of the material, to effectively suppress dust.
- (3) Road fences should be set up for environmentally sensitive sites (zones) along the road sections or pipeline sections under construction.
- (4) Removal of construction wastes should be carried out with a closed container and aerial casting is prohibited. The construction wastes should be stored by type in accordance with the relevant classification management requirements of municipal wastes and should be cleared and digested in a timely manner. Water should be sprayed to an appropriate extent ahead of the clearing operation.
- (5) Management of transportation vehicles should be strengthened and those transporting dust-prone materials should be covered with tarpaulins.
- (6) Water spraying should be carried out during demolition for the sake of dust suppression. The construction wastes should be cleared out of site within 3 days as of the completion of the demolition activity and the relevant requirements on demolition management should be respected.
- (7) Dust-prone areas on the construction sites should be enclosed with fences or

sprayed with water for dust suppression.

- (8) Earthwork materials on construction sites should be stockpiled at a centralized place and properly covered; vehicles should not be overloaded to avoid spillage en route due to vibration.
- (9) Vehicle washing facilities should be provided at the entrance and exit of construction sites and surface mud and earth should be cleaned before vehicles leave the site.
- (10) The storage sites of materials and formworks on site should be flat and solid;
- (11) The construction sites should be cleaned and sprayed with water in a timely manner;
- (12) On account of the dominant wind direction and the objects of environmental protection in the vicinity, stockpiling sites of fine-particle bulky materials and other key dust sources should be located more than 300m away at the downwind side of objects of environmental protection.
- (13) Burning of wastes is prohibited.

## **9.2 Automobile tail gas**

- (1) Construction machinery and vehicles in excellent operating condition should be selected;
- (2) Fuel-powered construction machinery and vehicles must be utilized in normal state to assure compliant emission of tail gas.
- (3) The equipment should be utilized in a reasonable way and equipment maintenance and repair should be strengthened.

## **10. Vibration and acoustic environment quality management**

### **10.1 Vibration environment quality management measures**

The vibration control measures include source control, media control, building protection, reasonable planning and layout, scientific management and other comprehensive control measures.

Management of vibration sources involves gradual renovation of transportation vehicles, stronger efforts in maintenance and servicing of vehicles and adoption of new vibration reduction technologies. Control of vibration media may be achieved through installation of vibration isolation ditches or walls and other vibration barriers to reduce the environmental impacts of vibration. The impacts of vibration at the environmentally-sensitive sites may also be reduced through changing the function of buildings and taking other effective measures.

### **10.2 Acoustic environment quality management measures**

Noise sources at different stages of the construction stage will produce impacts of different degrees on the acoustic environment quality of the project area. Stronger

efforts of management should be made and respective environment control measures should be taken to minimize such impacts.

- a) State-of-the-art and reliable low-noise equipment should be selected upon type selection;
- b) The construction period in a day lasts from 8:00am to 20:00pm and construction activities should be banned in the noon nap hours from 12:00am to 14:00pm. Nighttime construction is restricted, but if continuous nighttime construction is truly necessary, a certificate should be obtained from local construction administration authority, an approval granted by local EP authority and a public announcement made to local residents.
- c) The construction progress should be reasonably scheduled to avoid simultaneous operation of multiple high-noise mechanical plants on the same construction site and at the same time. During construction, efforts should be made to speed up the progress and shorten the duration of noise impacts so as to minimize the impacts of construction noises on the operators.
- d) For mechanical equipment generating relatively high noise, vibration reduction technology or vibration-reduction bearings and damping materials should be applied to the equipment base;
- e) Noises of transportation vehicles may produce certain impacts on the sensitive sites of acoustic environment along the route. Therefore, the construction contractor needs to strengthen the construction workers' awareness of environmental protection, learn local customs and habits and reasonably schedule the transportation time and take self-conscious measures to limit speed and prohibit honking for vehicles and other construction plants operating in high-density residential areas and other environmentally-sensitive areas so as to effectively prevent and reduce noise impacts.
- f) Mechanical equipment generating relatively high noise should be located on the far side of the residential area and noise-reducing fences should be erected around construction sites with a distance of less than 5m from residences, schools and similar buildings.
- g) Advices should be given to the construction contractor to reasonably arrange and allocate the construction workers to reduce the operation time of high-noise machinery operators. Earmuffs may be provided to reduce noise impacts on the construction workers.
- h) All the mechanical equipment should be effectively maintained and serviced on a periodical basis to keep such equipment in an excellent condition for the purpose of reducing noise and extending equipment service life.
- i) Strict management requirements should be implemented on construction intensity, machinery and vehicle operators and code of operation.

## **11. Water environment quality management**

- (1) Wastewater from site washing, vehicle washing, construction material washing, concrete curing and aggregate washing on the construction sites should be



collected via the sluice and then mixed and diluted before entering the temporary sedimentation tank for treatment. The temporary sedimentation tank should be appropriately sized to assure a standard wastewater retention time of more than 12 hours. Treated wastewater will be reused in site washing, construction material washing, concrete curing and aggregate washing on the construction sites.

- (2) Stronger efforts should be made in construction management to strictly control oil leakages of the construction plants; drainage system and water and soil conservation measures should be properly implemented for the temporary stockpiling areas to prevent possible impacts on the water environment by soil erosion at the waste soil stockpiling sites.
- (3) The construction units must carry out the treatment measures for construction and production wastewater and domestic sewage to assure that such wastewater is properly treated and disposed.
- (4) Environmental protection education for construction workers should be strengthened to enhance their environmental awareness and prevent and stop any random dumping of wastes and wastewater by construction workers.
- (5) Waste oil and other solid wastes involved in the construction process must neither be dumped or cast into nor placed around the water systems and should, instead, be transported to designated sites or treated according to the relevant requirements in a timely manner.

## **12. Ecological protection management**

- (1) The layout of the construction sites should be reasonably optimized to minimize the scope of construction activities and reduce the level of damages to vegetation from implementation of the construction works.
- (2) Construction materials outsourced for the construction works, such as stone, sand, cement, etc., should be transported on a demand-driven basis to minimize land occupation and vegetation damage. Upon completion of the construction works, the construction sites should be cleaned and landscaped in time to restore damaged vegetation to the maximum extent.
- (3) Temporary protective fences should be erected before the commencement of the construction works to protect trees left undisturbed on the construction sites based on the site visit results.
- (4) No signs other than the identification label should be attached to the trees. Stockpiling of construction materials or parking of mechanical equipment around the tree protection zones is neither permitted.
- (5) Temporary interception ditches should be constructed on the construction site to provide a flood diversion canal for the surface runoff passage damaged by the Project so as to divert flood formed in rain season and avoid runoff scours.
- (6) The construction contractor should minimize the duration of temporary land occupation and control the earthwork construction time provided that the construction quality is assured and a stable excavation and fill slope should be

maintained to reduce impacts on areas outside the construction area of the Project.

- (7) Ecological restoration of the construction sites should be carried out prior to the final acceptance of the Project.

The following principles should be followed for ecological restoration:

- a) Ecological restoration should be carried out, where possible, utilizing top soil stored in the process of clearing and grubbing instead of excavating new soil.
- b) Landscaping should be implemented through combination of trees, shrubs and grass. In addition to trees, some evergreen broadleaf shrubs with high growth density should also be planted as undergrowth plant so that extensive landscaping is achieved and no unoccupied space is left to prevent invasion by alien species.
- c) Alien species should not be selected as landscaping plants.

Areas requiring ecological restoration include:

- a) Land parcels around the right-of-way of the road and pipeline construction works in the main works area where vegetation is damaged due to road construction;
- b) Land parcels within the scope of land use for the construction and production areas;
- c) Newly opened access roads;
- d) Land parcels within the scope of land use for the construction camps;
- e) Borrowing sites and soil-spoiling and waste disposal sites.

### **13. Social environment management**

In order to mitigate the impacts on the livelihood of local residents due to construction of the road and pipeline construction works, the following environmental impact control measures should be taken:

- (1) The various LAR subsidies should be allocated to the concerned village groups and individuals based on the compensation standards of Guangxi and Hezhou City, the local circumstances and the agreements signed with the LAR affected households. The various compensations should be reasonably allocated and utilized through full promotion of democracy and respect of the basic citizen rights; the arable land and labor force should be reasonably adjusted through full enforcement of the relevant policies.
- (2) Local roads occupied or damaged in the construction of the proposed road and pipeline networks should be relocated or subject to protective treatment such as pavement rehabilitation and landscaping. In addition, compensation of a certain amount should be paid to local governments to safeguard the righteous interests of local governments and residents. Gravel roads occupied by the sewage pipeline construction works should be restored upon completion of the respective works.

- (3) Construction and transportation vehicles should avoid the peak hours of local roads to prevent traffic congestion and accidents.
- (4) Connection with the relevant roads and installation of safety signs should be implemented before the construction works is completed and put into operation.

## **14. Solid waste treatment management**

According to the requirements of the relevant laws and regulations, solid wastes such as construction wastes, waste soil (debris) and domestic solid wastes must be properly collected and reasonably treated.

- (1) Arrangements should be made to achieve comprehensive use of construction wastes in the road and pipeline construction works simultaneously implemented, with the remnants stockpiled at a designed stockpiling place on the construction site and transported in a timely manner based on the construction progress to the solid waste landfills of each project town for disposal.
- (2) Removal of construction wastes should be carried out with a closed container and aerial casting is prohibited. The construction wastes should be stored by type in accordance with the relevant classification management requirements of municipal wastes and should be cleared and digested in a timely manner.
- (3) Water should be sprayed to an appropriate extent ahead of the clearing operation.
- (4) Domestic wastes should be collected in the garbage bins and bags provided on the construction sites and then transported to Hezhou Domestic Waste Landfill for further treatment and disposal;
- (5) The waste soil contains a certain portion of mellow soil, which should be used in wasteland reclamation and forestation of the project area. The remaining soil may be used as subgrade fill of the road works and bedding fill on both sides of channels in the vicinity.
- (6) Burning of toxic and hazardous substances is not permitted on construction sites. Toxic and hazardous substances should be disposed according to the relevant requirements and stipulations.

## **15. Hazardous wastes and flammables and explosives**

### **15.1 Management measures for hazardous wastes, flammables and explosives**

Some hazardous wastes (e.g. waste diesel, waste engine oil, waste lubricants, and waste paint) and flammables and explosives (e.g. diesel, engine oil) are involved in the construction process of the road and pipeline construction works. If not properly handled upon storage and transportation, significant environmental impacts may arise.

- a) Management measures for storage of hazardous wastes and flammables and explosives:
  - a) Upon delivery of diesel, engine oil, lubricants and paints into the

construction site, the inspectors should carefully check the package and confirm if there are any leakages. The delivered goods should be rejected if any leakages are identified;

- b) A special storage space should be provided for hazardous wastes and flammables and explosives stored in the construction and production areas. Warning signs should be erected; floor should be subject to anti-seepage treatment and absorbing bags, sand and chips among other emergency response materials should be prepared.
  - c) Labels should be attached to hazardous wastes and flammables and explosives;
  - d) Storage of diesel, engine oil, lubricants and paints should comply with the requirements of storage type and data specified in the storage certificate.
  - e) During the maintenance and repair of mechanical equipment, waste diesel, waste engine oil and waste lubricants should be collected and stored in dedicated containers and transported on a periodical basis to Guangxi Hazardous Waste Treatment and Disposal Center.
- b) Fire prevention management measures
- a) Laws, bylaws and regulations on fire safety management promulgated by the national and local governments should be enforced and the enterprise work standards should be followed.
  - b) Fire operation approval procedure should be strictly followed and unapproved fire operation should be prohibited.
  - c) Strict management methods should be developed for flammables and explosives and effective measures should be taken for safety assurance;
  - d) Greater efforts should be made in electricity safety education and unapproved connection of electric cables is prohibited.
  - e) On-site rescue measures for fire incidents and accidents
    - A: In the event of a fire accident, rescue activities should be organized on site based on the fire accident emergency response plan. Rescue personnel entering the scene must carry protective devices and unrelated persons should not be allowed to enter the accident scene.
    - B: Fire causes should be identified and suitable fire extinguishers should be selected;
    - C: Once the fire is extinguished, a special monitoring personnel should be assigned to prevent possible resurgence. The rescue time may be extended when necessary;
    - D: The fire accident scene should be cleaned in time and burned materials and articles properly disposed.
  - f) Fire extinguishers of the corresponding types should be provided in the storage places of diesel, engine oil, lubricants and paints.

## **15.2 Risk control measures and emergency response plan**

### **15.2.1 Risk control measures**

- (1) An emergency response network should be set up and an emergency leading group should be established and an emergency response director appointed;  
An emergency response network headed by the Municipal PMO and comprising of the Environmental Protection Bureau, the Public Security Bureau, the Fire Brigade and the Water Resources Bureau among other relevant units should be set up while a hazardous goods transportation accident handling group comprising of staff with accident handling capability should be established to be responsible for emergency response to hazardous goods transportation accidents.
- (2) Strict management rules and regulations on transportation of hazardous wastes and flammables and explosives should be developed based on survey results and stronger efforts should be made in managing and preventing unanticipated environmental pollution accidents on roads;
- (3) Management of transportation of hazardous wastes and flammables and explosives should be strengthened and an emergency response plan for traffic accidents involving hazardous wastes and flammables and explosives should be developed. Transportation of hazardous wastes and flammables and explosives should be registered at the public security and transportation administration authority. On-the-job training should be provided for the relevant management staff and practitioners to make sure each engineer is certified for his/her job to avoid occurrence of accidents.
- (4) Drivers and passengers should be highly alert to observe road signs in the transportation process of hazardous wastes and flammables and explosives. Traffic safety deserves greater attention in particular along residential areas and rivers. Unauthorized half-way stoppage is not permitted.

### **15.2.2 Risk emergency response plan**

The construction contractor should develop a detailed emergency plan so that emergency response actions are implemented in a uniform way and the responsibilities of the responsible persons and the concerned departments are defined to assure that accidents are put under control within the shortest possible time and damages to the environment are minimized. The emergency response plan of the Project should be incorporated into the regional emergency response plan. In order to carry out the rescue activities at the fastest speed and reduce damages and losses resulting from accidents of hazardous wastes and flammables and explosives to the minimum, an emergency response and rescue headquarter for accidents of hazardous wastes and flammables and explosives should be established to be responsible for organizing and commanding rescue activities upon accidents of hazardous wastes and flammables and explosives in the region. The main contents of the emergency response plan include:

- (1) Alarming and contract information;

- (2) Leveled response procedure;
- (3) Emergency environmental monitoring, disaster relief, emergency rescue and control measures;
- (4) Organization plan of emergency personnel evacuation and withdrawal;
- (5) Restoration measures;

Restoration measures for an accident mainly refer to the restoration of contaminated soil and water. For seriously contaminated soil, the contaminated top soil should be stripped and delivered to the hazardous waste center for treatment; for contaminated water, active purification measures should be taken, e.g. removal of surface pollutants, etc., which should be sent to the WTP or the incineration plant for treatment.

- (6) Emergency training plan.

## **16. Public participation**

The construction contractors should provide adequate information to the public in the affected area, in particular, local residents likely to be directly affected by the construction activities in the project area. Key measures to be taken include:

- (1) Setting up a bulletin board at the entrance of the construction site to disclose information such as project name, key construction works, construction time as well as the contact person and contact information for complaints and advices;
- (2) Making arrangements for site environment engineer to answer questions from the public on environmental protection;
- (3) Fulfilling the relevant formalities for and disclose to the local residents information on any nighttime construction required for the sake of construction technology and workmanship. Information to be disclosed in such cases include beginning and ending time of as well as the permit granted by the environmental protection authority on nighttime construction.
- (4) A public announcement should be posted at least five days in advance at the construction site as well as the premises of affected households and enterprises to notify the public of the beginning and ending time of any possible suspension of municipal services (including water supply, power supply, telephone and bus service) needed for the implementation of the construction works.
- (5) All feedbacks, comments and questions from the public should be recorded and archived. Questions raised by the public should be answered and responded in a timely manner, with the results of answers and responses recorded and archived for future inspection by the supervision unit.

## **17. Landscape impact control**

Landscape impacts brought by the construction of the road and pipeline construction works mainly include damages to the natural landform and landscape and disharmony with the surrounding environment caused by activities of main works excavation, borrowing site excavation, waste and debris stockpiling at the soil-spoiling and waste

disposal sites. In order to control the landscape impacts arising from the construction of the Project, the following control measures are proposed in this ECOP:

- (1) In order to achieve better compatibility and coordination between the project and the surrounding landscape, the earthwork and excavation slope should be connected with the natural ground and an arc-shaped slope may be selected for better visual effect. The slope surface should retain a certain roughness to facilitate easy implementation of surface protection or grass vegetation measures. In order to improve the visual effect of the retaining wall, shrubs and evergreen trees or even climbing plants may be planted to put the retaining wall under shelter.
- (2) As the access roads are mostly located on both sides of existing roads, it is thus recommended that stronger efforts are made in advertisement of environmental protection to promote the awareness of environmental protection of both the administration and construction staff and prohibit random disposal of domestic and production wastes.
- (3) Operations at the soil-spoiling and waste disposal sites and the construction materials temporary stockpiling sites must be carried out strictly within the specified area. Random disposal of wastes must be prohibited to avoid pollution to landscape and environment.
- (4) Upon the completion of the construction works, grease and garbage in the soil-spoiling and waste disposal sites, quarries, construction access roads and construction camps should be removed in time and ground leveled to restore the original landform and vegetation where possible and achieve the harmony between project construction and natural environment in the vicinity.

## **18. Construction traffic management**

Temporary increase of traffic caused by the construction of the roads and pipeline network will bring noise impacts and daily life inconvenience for local residents along the transportation routes. Therefore, the following construction traffic management measures are proposed in this ECOP.

- (1) A reasonable construction schedule should be developed to shorten the time of temporary land occupation.
- (2) Enclosed transportation vehicles must be used for transportation of earth, debris and construction wastes.
- (3) Transportation of construction materials at night time should be prohibited on any construction access road with a centralized area of residence in a distance of less than 50m.
- (4) Construction and transportation vehicles should avoid the peak hours of local roads to prevent traffic congestion and accidents.
- (5) Construction vehicles should travel along designated routes and unauthorized change of routes is prohibited to avoid possible damages to farmland and forest land;

- (6) Construction nameplates should be installed at obvious positions to indicate the name of project, scope of construction site, names of EA, contractor, supervision company and monitoring unit as well as the name of project responsible person, date of commencement and completion and supervision and complaint hotline as well as the specific environmental protection measures;
- (7) The construction contractor should post commencement notices around the construction site 7 days prior to the scheduled date of commencement of the respective construction works to disclose information including project overview, construction plan, name of responsible construction units and name of project manager and complaint and appeal telephone numbers.
- (8) Nighttime construction should be restricted. If nighttime construction is needed in any special circumstances, the impacts by nighttime construction on the neighborhood should be controlled and a prior notice should be sent to obtain the understanding of the local residents;
- (9) The height of construction fences should not be smaller than 1.8m for ordinary road sections and 2.5m for key road sections in the urban area. The advertisement slogans should be attached in a standardized way; the walls should have blue color as the base color and be kept clean all year long and free of scribbling and spraying.

## **19. Supervision plan**

Responsibilities of construction supervision should be incorporated into the environment supervision of the road and pipeline construction works to implement total quality management of the Project following the requirements of both construction quality and environment quality.

### **19.1 Scope of construction supervision**

Areas of and along the road and pipeline network construction works, mainly construction sites, soil-spoiling and waste disposal sites, concrete mixing plants and areas causing environmental pollution to the surrounding environment due to production and construction.

### **19.2 Contents of construction supervision**

- (1) Reviewing and verifying whether the environmental protection measures proposed in this ECOP are incorporated in the design proposal and the construction drawing design;
- (2) Assisting the construction unit in organizing environmental protection training for construction and management staff;
- (3) Reviewing clauses on environmental protection in the project contract;
- (4) Carrying out the supervision of water, sound and air environment quality in the construction process, the environmental impact mitigation measures and the environmental protection works and organizing staged acceptance based on the respective standards;



- (5) Keeping systematic records of the environmental impacts of the construction activities, effects of the environmental protection measures and the implementation status of the environmental protection activities;
- (6) Giving timely feedbacks to the construction supervision team on the relevant environmental protection measures and any unanticipated issues arising in the construction process and recommending solutions;
- (7) Responsible for preparing the construction supervision plans and summary reports.

### **19.3 Terms of reference for construction supervision**

- (1) A sound and robust safeguard system should be set up for construction supervision.

It is required that a full-time environmental protection personnel should be assigned in the construction supervision team to conduct total quality management in accordance with the construction quality and environmental quality requirements. The environmental protection and construction supervision work of the Project will be supervised by the Municipal PMO, environmental specialist and the environmental protection bureau.

- (2) Environmental protection management methods as well as their detailed rules of implementation should be developed.

Environmental protection regulations, such as environmental protection management methods and the detailed rules of implementation of the environmental protection work should be developed based on the specific characteristics of the Project.

- (3) A sound work procedure for construction supervision should be established.

- a) Work record system, i.e. the “Supervision Diary”, which describes the results of inspection, environmental problems and cause analysis and responsible units as well as the preliminary solution, etc.
- b) The various environmental protection checklists specified in the ECOP annexes should be prepared on a periodical basis.
- c) Corrective measures should be proposed to any environmental problems existing in the construction activities of the construction contractor and their implementation status should be followed up with, including issuing notices of corrective actions, checklists and archiving of inspection documents.
- d) Reports on the implementation status of the Project should be submitted to the Municipal PMO on a weekly basis.

## **20. Construction safety and health**

### **20.1 Occupational health**

- (1) Actions should be taken to ensure the integrity of all the buildings on the construction site; temporary buildings, which should be structurally safe and

reliable and able to resist impacts of a certain level generated by local bad weather, should have lighting to an appropriate level and be able to insulate some dust and noises.

- (2) The construction contractor should ensure that qualified first aid is available. Appropriate first aid devices should be provided at the construction sites and documented emergency handling procedure should be developed for remote sites so that the patient can be transferred to a suitable medical institution;
- (3) Occupational health and safety training should be provided all newly recruited construction workers to introduce to them basic work rules on the construction site, rules of personal protection and how to prevent the other staff members from being injured;
- (4) Correct signs should be provided to indicate hazardous areas, devices, materials, safety measures, emergency exits, etc.
- (5) If a worker's hand or arm is vibrated while using a hand tool or a power tool or if a worker's body is vibrated while standing or sitting on a vibrating surface, such vibration should be controlled through selection or installation of a vibration pad or a damping device or limiting the exposure time;
- (6) The risk of clamping should be eliminated in the design of a machine to ensure that the protruded part of a machinery causes no harm to the human body in normal operation;
- (7) Warning signs should be attached on all powered electric devices and wires; all electricity wires, cables and electric tools on hand should be checked for any damaged or exposed wires and the maximum permissible operating voltage of tools on hand should be determined in accordance with the manufacturer's recommendations. All electrical equipment operating in humid (or possibly humid) environment should be double-insulation / grounded;
- (8) Appropriate eye protection devices (such as welding goggles and / or masks) should be provided for all operators participating or assisting in the welding operations.
- (9) Guardrails (with middle and peripheral baffles) should be installed at the edge of all vulnerable and dangerous areas. In addition, the construction workers should be provided with fall prevention devices (including safety belts and distance limiting ropes).
- (10) The construction contractor should determine and provide the construction workers with appropriate personal protective devices that can adequately protect the workers themselves, other workers and occasional visitors and should not bring unnecessary inconvenience to the user.
- (11) The construction contractor should establish procedures and systems for reporting and recording occupational accidents and diseases and hazardous events and accidents;
- (12) Health education should be provided to construction workers, e.g. implementing information communication strategies, enhancing face-to-face counseling, addressing systemic problems that affect individual behavior and

encouraging individuals to take protective measures; in addition, the construction workers should be encouraged to use insect repellent, clothing, mosquito nets and other blocking methods to avoid disease spreading via mosquito bites.

## **20.2 Health and epidemic prevention**

- (1) The respective health standards should be satisfied in terms of meals, drinking water, rest places provided for staff on the construction sites.
- (2) Dormitories, canteens, bathrooms and toilets should be properly ventilated and illuminated, with full-time personnel assigned and responsible for their routine maintenance.
- (3) Openable windows must be provided for dormitories on construction sites.
- (4) Valid health permits issued by the relevant departments should be available at canteens and all cooking devices should be cleaned according to the respective specifications and all cooks should hold valid health certificates;
- (5) The canteens should be located away from toilets, garbage stations, toxic and hazardous places and other pollution sources.
- (6) Independent preparation rooms and storage room should be provided in the canteens and mouse guards of no less than 0.2m high should be provided at the bottom of the doors.
- (7) Toilets, sanitary facilities, drainage gutters and dark and humid areas should be sterilized on a periodical basis;
- (8) Enclosed containers should be provided in the living areas; flies should be periodically killed and containers emptied in a timely manner;
- (9) Clinics should be provided on construction sites and equipped with health kits, frequently used drugs and bandages, tourniquets, neck care, stretchers and other first aid devices.
- (10) Any incidents of infectious diseases, food poisoning, acute occupational poisoning of the construction workers should be promptly reported to the local health and epidemic prevention authorities and construction administration authorities so that corresponding actions are taken in accordance with the relevant provisions of the health and epidemic prevention authorities.

## **21. Traffic safety**

Traffic accidents have become one of the most common causes of public injury and death in the world. All project staff must maintain traffic safety while traveling and leaving the workplace and operating the project equipment on free roads or public roads. The security measures to prevent and control the injury and death of traffic accidents should be designed to protect project workers and road users and victims of road traffic accidents. Based on the size and nature of the project activities, the following safety actions should be taken:

- (1) Safety education and training should be organized on a periodical basis to

particularly make the drivers aware of the importance of safe driving.

- (2) To avoid fatigue driving, actions should be taken to limit driving time and make sure drivers drive in turns. To minimize traffic accidents, driving on dangerous roads and time periods should be avoided.
- (3) Vehicles should be regularly maintained using manufacturer-approved spare parts, which should be purchased in a timely manner to prevent possible serious accidents due to equipment faults or premature failure of spare parts.
- (4) Separation of pedestrian and motor vehicles should be realized.
- (5) Traffic safety control measures should be taken and road signs and signal should be used to warn pedestrians and vehicles of any traffic dangers; road signs may be improved through cooperation with the local community and the competent authorities improve visibility of road signs and enhance traffic safety in an all-around way.
- (6) Traffic safety and pedestrian safety education should be conducted in the communities in the vicinity of the project area and schools.
- (7) To assure that appropriate first aid is provided in case of any accidents, communications should be kept with the emergency response workers.
- (8) Locally purchased materials should be used where possible to minimize transportation distance;
- (9) Driving techniques should be improved and it must be regarded as a mandatory requirement that drivers must hold licenses.

## **22. Physical and cultural resources**

### **22.1 Cultural relics protection**

Results of relevant surveys show that no cultural relics and ancient buildings are involved in the construction area of the road and pipeline construction works.

In accordance with Article 32 of the Law of the People's Republic of China on Cultural Relics Protection (Oct. 28, 2002), "in the course of construction of a project or agricultural production, all units and individuals that discover cultural relics shall keep the scene intact and immediately report to the local administrative department for cultural relics; after receiving the report, the department shall, except under special circumstances, rush to the scene within 24 hours and put forth its proposals on the handling of the matter within seven days. The administrative department for cultural relics may report to and request the local people's government to inform the public security organ of the matter and to seek its assistance in keeping the scene intact; and where important cultural relics are discovered, the matter shall immediately be reported to the administrative department for cultural relics under the State Council, which shall put forth its proposal on the handling of the matter within 15 days after receiving the report. The cultural relics discovered in such a manner as mentioned in the preceding paragraph belong to the State, and no unit or individual may plunder, privately divide or conceal them." It is stipulated in Article 26 of the Regulations of Guangxi Zhuang Autonomous Region on Cultural Relics Protection that "In the course of construction

of a project or agricultural production, all units and individuals that discover cultural relics shall keep the scene intact and immediately report to the local administrative department for cultural relics; after receiving the report, the department shall rush to the scene within 24 hours and put forth its proposals on the handling of the matter within seven days. The administrative department for cultural relics may report to and request the local people's government to inform the public security organ of the matter and to seek its assistance in keeping the scene intact." Based on the aforesaid legal and regulatory requirements, this ECOP proposes the following management requirements on cultural relics discovered during construction:

If any cultural relics are discovered during construction, the construction works should be immediately suspended to protect the scene and a report should be immediately delivered to the local cultural relics administration department. No further action taken should be taken without authorization. Upon receipt of the opinion of the cultural relics administration department on further action, the construction contractor should develop its construction program for the concerned section based on the opinion of the cultural relics administration department and should not resume the construction until a consent is obtained from the cultural relics administration department. No unit and individuals should continue the construction or carry out any production activities in the archaeological excavation area until such excavation is completed. No unit or individual should plunder, privately divide or conceal any cultural relics discovered during construction.

Figure 22.1-1 shows the procedure for handling cultural relics discovered in the construction stage.

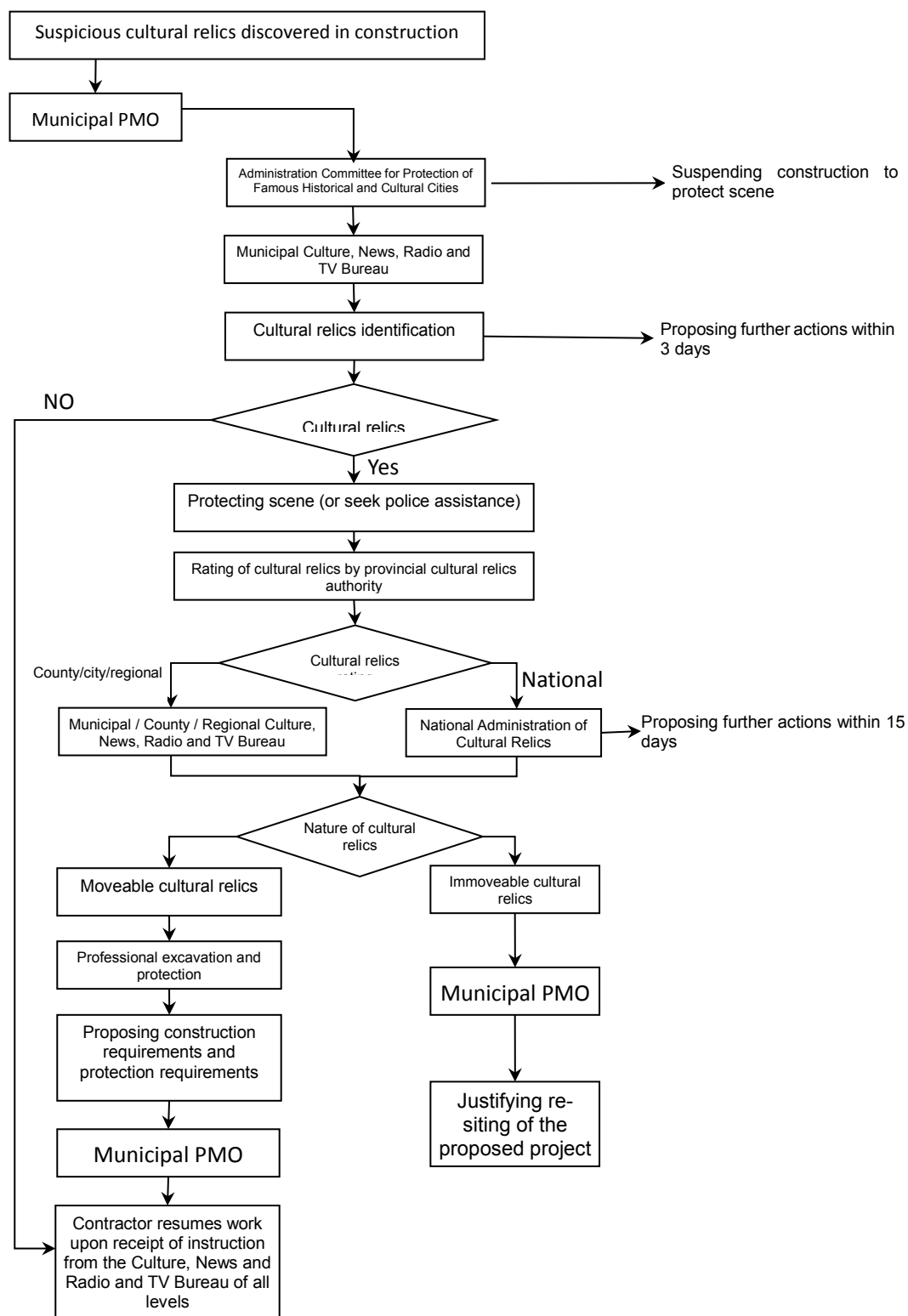


Figure 22.1-1 Flowchart for the Procedure of Handling Cultural Relics Discovered During Construction

## **23. Environmental protection training and education**

Training and education on environmental protection should include the following contents:

- (1) Prior to the commencement of the Project, the Municipal PMO should assign an environmental specialist to provide environmental protection training for the contractors and construction supervision agencies of the road and pipeline construction works;
- (2) Prior to the commencement of the construction works, the contractor of the road and pipeline construction works should organize training and examinations for the operators on the construction sites on laws and regulations on environmental protection and health and sanitation;
- (3) The contractor of the road and pipeline construction works should organize staff training on the risk emergency response plan as well as emergency response rehearsals on a yearly basis.
- (4) The contractor of the road and pipeline construction works should organize occupational health training and physical examination on a half-year basis for operators handling toxic and hazardous substances and provide guidance to such operators on correct use of occupational disease prevention devices and personal labor protection devices.

**Annex Table 1: Summary of Environmental Protection Measures**

Item		Environmental Protection Measures	
ECOP for the construction site preparation stage		(1)	Determining the scope of permanent and temporary land occupation (construction and production areas, construction camps and construction access roads) for the road and pipeline network works and fulfilling the relevant formalities of land use for the Project.
		(2)	A survey of the existing pipelines should be properly carried out to avoid damages to existing pipelines during construction.
		(3)	The construction contractors should, through consulting the town project organization, identify suitable public water sources and select municipal tap water or existing drinking water sources in the nearby villages. Drilling of new wells is strictly banned.
Construction site management	Control of environmental impacts in the construction areas of the main works	Clearing and grubbing	(1) Serious attention should be paid to dust suppression through water spraying so as to abate dust pollution.
			(2) Construction wastes and debris as generated should be cleared out of site in a timely manner and enclosed transportation vehicles must be used for transportation of earth, debris and construction wastes, which should be subject to reasonable disposal according to the requirements of “ECOP of Construction Material Stockpiling Sites”.
		Subgrade construction	(1) Strict control should be implemented on the subgrade to avoid damages from over-excavation to surrounding vegetation and any felling of trees outside the construction areas is prohibited.
			(2) Construction wastes and debris as generated should be cleared out of site in a timely manner and enclosed transportation vehicles must be used for transportation of earth, debris and construction wastes, which should be subject to reasonable disposal according to the requirements of “ECOP of Construction Material Stockpiling Sites”.
			(3) Water should be sprayed on construction site to abate dust pollution.
		pavement construction	(1) Centralized asphalt mixing plant must be used and the mixing plant should be located inside the construction and production area. No asphalt mixing plant should be located in the construction area of the main works.
		pipeline construction	(1) Upon the completion of the pipeline construction works, roads and greenbelts should be restored in time and urban artificial trees and lawns should be grown to avoid change of the original urban eco-system.
			(2) Waste transportation vehicles should not choose urban roads so as to avoid the increase of local traffic and traffic



Item			Environmental Protection Measures
			congestion. In addition, waste transportation should be timed in such a way to avoid the morning and evening peak hours as well as the peak hours of pedestrian circulation and material transportation.
			(3) The transportation routes in the construction stage should be optimized to avoid areas sensitive to noise pollution. Nighttime material loading and unloading operations are banned; specific personnel should be assigned to be responsible for guiding the material transportation vehicles entering the construction sites; honking is prohibited in the construction sites; artificial conveyance of materials should be adopted during loading and unloading operations and casting or dumping of materials from trucks and nighttime material loading and unloading are prohibited.
			(4) An enclosed construction method should be adopted on the construction sites, which should be isolated from the surrounding environment with fences and fine mesh nets to insulate dust and fly ash on the construction site and avoid impacts on the surrounding environment.
			(5) During construction, watertight test, backfilling and vegetation restoration should be carried out for installed pipelines in a timely manner along the construction progress so as to reduce exposed surface and temporary stockpiles of earthwork.
		Slope trimming	(1) Exposed slopes should be trimmed in time to reduce time of exposure
			(2) Exposed slopes should be covered with dust prevention nets or sprayed with water for dust suppression to avoid dust pollution.
		Ecological restoration	(1) Ecological restoration of damaged land should be carried out prior to the completion of the construction works and such damaged land should at least be restored to the status prior to construction.
			(2) Arable top soil stripped during the construction should be stockpiled temporarily on a relatively flat area on the construction site and fenced up with bagged earth cofferdam. Temporary gutters and sand sedimentation measures should be provided around the stockpiles. The stockpiled top soil should be covered with dust prevention nets and reused for ecological restoration upon completion of the construction activities.
		Construction noises	(1) The construction time should be subject to strict control. Construction activities using plants and equipment generating strong noises on construction sites within a distance of less than 150m from the residential areas must be suspended at night (from 22:00 pm to 06:00 am). On construction sites

Item			Environmental Protection Measures
			where the construction activities must be implemented in a continuous way, the contractor should contact in a timely manner, depending on the specific cases, the local environmental protection departments and obtain a nighttime construction permit according to the respective provisions and issue a public announcement to obtain maximum public support.
			(2) Mobile or temporary sound barriers and other noise prevention measures should be used on sensitive sites in the vicinity of the construction site (with a distance of less than 50m).
			(3) The construction site should be located far away from schools and hospitals where possible. The construction time for construction sites in the neighborhood of schools involving the use of strong-noise machinery should be negotiated and agreed with the schools and no construction activities should be arranged during the exam hours of the schools where possible.
		Others	(1) Burning of wastes is prohibited on construction sites.
	Control of environmental impacts in the construction and production areas	Clearing and grubbing	(1) Serious attention should be paid to dust suppression through water spraying so as to abate dust pollution.
			(2) Construction wastes and debris as generated should be cleared out of site in a timely manner and disposed in a reasonable way according to the ECOP of construction material stockpiling sites.
		Asphalt mixing	(1) Procurement of commodity asphalt mixtures should be regarded as the top priority.
			(2) Mixing plants with excellent sealing performance and high dust removal efficiency should be selected for asphalt concrete mixing plants and semi-enclosed bitumen boiling operation process should be banned.
		Concrete mixing	(1) Commodity concrete should be selected as the top priority.
			(2) Wet mixing should be selected as the method of concrete mixing and the mixing process should be carried out in an enclosed state.
		Lime soil mixing	(1) Wet mixing should be selected for the lime soil mixing plant, which should be operated in a fenced enclosure.
		Material loading and unloading and stockpiling	(1) Windproof and covering measures or dust suppression measures should be taken in the process of transportation, temporary storage and loading and unloading of earth, cement and lime among other bulk materials.
			(2) The material stockpiling site should be flat and solid.
			(3) Fencing measures should be taken for stockpiling sites of construction materials, such as cement, lime and sand and

Item			Environmental Protection Measures
			stone, which should covered with tarpaulins to reduce pollution from stormwater scouring.
		Construction and transportation vehicles	(1) Vehicle washing facilities should be provided at the entrances and exits of the construction sites so that vehicles are washed and cleaned upon departure. Roads connecting the vehicle washing equipment and the exit of the construction site should be paved with concrete, asphalt or crushed brick to avoid possible take-away of mud and debris out of the site.
			(2) Enclosed transportation vehicles must be used for transportation of earth, debris and construction wastes.
		Precast yards	(1) Wastewater from concrete mixing must not be discharged in an uncontrolled way and should be collected and treated in the sedimentation tank and reused for dust suppression on the construction sites. Upon the completion of the construction works, the sedimentation tanks should be backfilled for ecological restoration.
		Construction noises	(1) Shock absorbers should be provided on the bases of fixed mechanical equipment with strong vibration (e.g. mixers).
			(2) Fixed strong noise sources should be provided with sound insulators (e.g. the power-generation trucks) or positioned and operated indoors.
			(3) The construction time should be subject to strict control. Construction activities using plants and equipment generating strong noises on construction sites within a distance of less than 150m from the residential areas must be suspended at night (from 22:00 pm to 06:00 am).
		Others	(1) Damaged land should be ecologically restored to at least the pre-construction state after the construction works is completed.
			(2) Arable top soil stripped during the construction should be stockpiled temporarily on a relatively flat area on the construction site and fenced up with bagged earth cofferdam. Temporary gutters and sand sedimentation measures should be provided around the stockpiles. The stockpiled top soil should be covered with dust prevention nets and reused for ecological restoration upon completion of the construction activities.
			(3) Burning of wastes is prohibited on construction sites.
	Control of environmental	Road dust	(1) Pavement of new access roads and hardening of sites should be handled based on the design usage. For example, reusable load-bearing bricks (components) may be used for access roads allowing heavy-duty vehicles while reusable seepage bricks may be used for pavement of ordinary footpaths.
			(2) The access roads should be maintained and cleaned every day and dust-prone sections should be sprayed with water for dust

Item			Environmental Protection Measures
		Noise control	suppression. (3)
			(1) Transportation vehicles should be maintained according to Section 5.2 Construction equipment management.
			(2) Requirements in Section XVIII Construction Traffic Management should be followed.
		Control of ecological impacts	(1) Newly constructed access roads should be ecologically restored to at least the pre-construction state after the construction works is completed.
			(2) Arable top soil stripped during the construction should be stockpiled temporarily on a relatively flat area on the construction site and fenced up with bagged earth cofferdam. Temporary gutters and sand sedimentation measures should be provided around the stockpiles. The stockpiled top soil should be covered with dust prevention nets and reused for ecological restoration upon completion of the construction activities.
			(3) Occupied or damaged local roads should be relocated or subject to protective treatment such as pavement rehabilitation and landscaping. In addition, compensation of a certain amount should be paid to local governments to safeguard the righteous interests of local governments and residents.
Construction equipment management	Pollution control measures of oil leakage		(1) State-of-the-art equipment and machinery should be selected, if possible, to effectively reduce the number of oil leakage and machinery repair and thus the generation of oily wastewater.
			(2) In the process of inevitable oil leakage, solid oil-absorbing materials (e.g. cotton yarns, wood chips, oil-absorbing paper) should be used, if possible, and the waste oil should be collected and transformed into solid substances to avoid excessive generation of oily wastewater.
			(3) Maintenance and servicing of machinery, equipment and transportation vehicles should be carried out at centralized maintenance sites along each road section, if possible, for the sake of easy collection of oily wastewater.
			(4) Horizontal sedimentation tanks should be provided in the machinery maintenance sites and the oily wastewater will be collected in the sedimentation tanks for simple treatment such as acid-alkaline neutralization, sedimentation, oil separation and debris removal before discharge. The sedimentation tanks should be backfilled with soil for landscaping upon completion of the construction works.
			(5) The ground surface of the equipment maintenance sites should be paved and subject to anti-seepage treatment to avoid possible contamination of soil caused by oil leakage.
			(6) Records of equipment repair and maintenance should be

Item		Environmental Protection Measures
		developed to enable periodical maintenance based on the operation status of equipment.
	Control of equipment noises	(1) The construction contractor must select construction equipment and machinery and transportation vehicles conforming to the relevant national standards and select, if possible, low-noise construction plants.
		(2) Shock absorbers should be provided on the bases of fixed mechanical equipment with strong vibration. Fixed strong noise sources (e.g. the power-generation trucks) should be provided with sound insulators or positioned and operated indoors.
		(3) Maintenance and servicing of the various construction equipment should be strengthened to keep them in fine operation to fundamentally reduce the intensity of noise and vibration sources.
	Pollution control of equipment tail gas and exhaust gas	(1) The construction contractor must select construction equipment and machinery and transportation vehicles conforming to the relevant national health protection standards and assure that the exhaust gas emission of such equipment and vehicles conforms to the relevant national standards.
	Pollution control of solid wastes	(1) Waste oil and chemical solvents are hazardous wastes and should be separately stored based on their nature. Sites for temporary storage of hazardous wastes should be provided with obvious signs and constructed in accordance with the "Pollution control standards for storage of hazardous wastes" (GB18597-2001). Such hazardous wastes should be treated and disposed by a qualified unit and must not be dumped in a random way.
		(2) Toxic and hazardous wastes requiring recovery (e.g. oil buckets) should be recovered by material suppliers in principle and such responsibilities should be defined in the material procurement contract.
		(3) Recovery and disposal of hazardous wastes generated in a decentralized way (e.g. oil gloves, oil yarn heads) should be carried out by qualified agencies authorized by the PMO.
		(4) Oil and grease leaked into the soil should be collected in a timely manner with scrapping devices and sealed up and transported to a qualified treatment plant for centralized treatment.
		(5) When it is unlikely to carry out the maintenance and servicing of machinery, equipment and transportation vehicles at a designated maintenance site for each road section, containers or solid oil-absorbing materials should be used to collect the oily wastewater generated from such equipment, which should be sealed up and transported to an external site for further treatment. A nearby disposal plant with the required

Item		Environmental Protection Measures
ECOP for construction camps		qualifications for disposal of such wastes should be selected.
	Site leveling	Construction wastes and debris as generated should be cleared out of site in a timely manner and enclosed transportation vehicles must be used for transportation of earth, debris and construction wastes, which should be subject to reasonable disposal according to the requirements of "ECOP of Construction Material Stockpiling Sites".
		Serious attention should be paid to dust suppression through water spraying so as to abate dust pollution.
	Domestic sewage control	(1) Oil or grease traps should be provided in the canteen and a qualified unit with the waste digestion qualification certificate and business license approved by the competent authority should be employed to assure timely removal of wastes.
		(2) Temporary toilets and septic tanks should be provided on the construction camps and should be subject to anti-seepage treatment.
		(3) Drainage gutters and sedimentation tanks should be provided on the construction camps. Filters should be installed on sewer pipes of canteen, washrooms and shower rooms. Construction wastewater should not be discharged into the municipal sewage pipeline or natural rivers until properly settled. In the meanwhile, the drainage ditches should be kept tidy and free of obstacles to assure smooth drainage.
		(4) The construction camps should be kept in a smooth drainage condition and free of ponding of black and odor wastewater and unregulated urination and defecation.
		(5) Uncontrolled dump and discharge of domestic wastewater into agricultural irrigation canals is prohibited. No domestic solid wastes and construction wastes should be stockpiled around the aforesaid areas.
	Domestic exhaust gas control measures	(1) Clean energy, such as natural gas, electricity, should be used for cooking on the construction camps according to the requirements of local EP authorities.
	Solid waste treatment measures	(1) Recoverable wastes (e.g. waste paper, etc.) should be recovered and disposed by an authorized unit.
		(2) Enclosed garbage stations should be provided in the construction camps for timely collection, removal and digestion of domestic solid wastes of staff according to the respective requirements.
		(3) Enclosed slop pails should be provided outside the canteen and be emptied and cleaned in a timely manner.
		(4) The septic tanks should be emptied and cleaned by the authorized unit and should be backfilled upon the completion of the construction works.
	Construction site restoration	(1) All temporary facilities should be demolished and the occupied site restored to the pre-construction state within one month as

Item		Environmental Protection Measures	
			of the completion of the construction works.
		(2)	Arable top soil stripped during the construction should be stockpiled temporarily on a relatively flat area on the construction site and fenced up with bagged earth cofferdam. Temporary gutters and sand sedimentation measures should be provided around the stockpiles. The stockpiled top soil should be covered with dust prevention nets and reused for ecological restoration upon completion of the construction activities.
	Other requirements	(1)	Use of clay bricks in construction of temporary facilities in the construction camp is prohibited and the safety and fire protection requirements and relevant national regulations should be respected.
		(2)	The construction camps should be clearly distinguished from the construction areas and separation measures should be taken to assure that the construction camps remain in a tidy and orderly condition.
		(3)	Burning of wastes is prohibited in the construction camps
ECOP for construction material stockpiling sites	Control of environmental impacts from the borrowing sites	General requirements	(1) Deep excavation should be avoided in the construction process and all efforts should be made to achieve balance between excavation and earthwork fill. If borrow fill is needed, the prior choice is to purchase commodity soil or seeking waste soil from urban construction projects so as to avoid setting up new borrowing sites and thus fundamentally eliminate the environmental impacts of borrowing sites.
			(2) Centralized borrow fill should be selected for the Project to reduce the number of borrowing sites.
		Dust control	Attention should be paid to dust suppression through water spraying in the course of borrow fill operation to reduce dust pollution resulting from earthwork excavation.
		Control of ecological impacts	(1) During excavation, the top soil should be preserved for land rehabilitation. The top soil should be stockpiled temporarily on a relatively flat area on the construction site and fenced up with bagged earth cofferdam. Temporary gutters and sand sedimentation measures should be provided around the stockpiles. The stockpiled top soil should be covered with dust prevention nets and reused for ecological restoration of the borrowing sites upon completion of the construction activities.
			(2) Vegetation restoration should be carried out upon the completion of the construction works according to the requirements in Section XII --- Ecological Protection Management.

Item			Environmental Protection Measures
		Control of landscape impacts	(1) Respective environmental protection measures should be taken according to the requirements of Section XVII --- Control of Landscape Impacts.
	Control of environmental impacts from soil-spoiling and waste disposal sites	General requirements	(1) If any waste soil is generated, the top choice is to have such waste soil reused on the same construction site or other construction sites or reused for vegetation restoration in the borrowing sites so as to avoid setting up new waste soil disposal sites and fundamentally eliminate environmental impacts in this regard.
			(2) If reuse of waste soil is unlikely, a local survey should be carried out to find out if any designated digestion sites exist locally for construction wastes and debris. If any, the required formalities of removal and transportation should be fulfilled and the construction wastes should be delivered to the designated places for digestion.
		Dust control	(1) Layered compaction may effectively suppress dust on the soil-spoiling and waste disposal sites.
			(2) Dust suppression should be carried out through water spraying to reduce dust pollution caused by exposed surface.
		Control of ecological impacts	(1) Before the soil-spoiling and waste disposal site is mobilized, the top soil should be excavated and used for land rehabilitation. The top soil should be stockpiled temporarily on a relatively flat area on the construction site and fenced up with bagged earth cofferdam. Temporary gutters and sand sedimentation measures should be provided around the stockpiles. The stockpiled top soil should be covered with dust prevention nets and reused for ecological restoration of the soil-spoiling and waste disposal sites upon completion of the construction activities.
			(2) Vegetation restoration should be carried out upon the completion of the borrow fill operation according to the requirements in Section XII --- Ecological Protection Management.
		Control of landscape impacts	(1) Respective environmental protection measures should be taken upon the completion of the construction works according to the requirements of Section XVII --- Control of Landscape Impacts.
	Soil erosion control plan	Construction areas of the main works	(1) Top soil stockpiling is not permitted in catchment areas of surface runoffs, in sensitive zones such as roads or river ways in the vicinity of the Project, in areas affecting construction or road traffic. In order to reduce the quantity of protection measures, top soil should be stockpiled at unoccupied low-lying land parcels where possible. If the top soil is temporarily



Item		Environmental Protection Measures
		stockpiled on both sides of the right-of-way of the subgrade, a cofferdam of bagged earth should be built up around the stockpile to avoid possible slides; temporarily stockpiled top soil should be used as topping soil for future side slope landscaping.
		(2) Slope protection should be carried out in a timely manner. Since roads included under the Project are urban roads, the subgrade slope protection should, in principle, take ecological protection as the main solution and lightweight supports as the secondary solution, with land development on both sides taken into account. Based on the geological and hydrological condition of the project area, geotextile net grass protection slope should be used along the filled embankment and retaining walls at certain individual sections.
		(3) Temporary retaining ditches should be provided around earth stockpiles to prevent stormwater scours in rain season.
		(4) For sections of the embankment crossing ponds and running along the rivers where the slope extends into the water ponds or rivers, the slope ratio from the constant water level +0.5m down to the bottom of the slope is 1:1.75 and masonry rubble surfacing with a thickness of no less than 0.6m should be selected for the waterfront side; the slope ratio for the part from the constant water level + 0.5m upward to the designed elevation of the subgrade is 1:1.5.
		(5) Sand sedimentation tanks should be provided at the outlet of the subgrade drainage gutters.
	Prevention and control zone for the construction and production areas	(1) On-site soil erosion is the focus of prevention and control in the construction and production areas. To accommodate frequent passage of vehicles and need of material stockpiling, the entire site should be hardened and paved with cement concrete.
		(2) Temporary retaining ditches should be provided outside the boundary of low-lying areas in the project area to prevent stormwater scours in rain season.
		(3) Top soil and material stockpiles should be covered with dust prevention nets to prevent stormwater scours and pollution to surrounding environment.
		(4) A reasonable construction schedule should be developed to shorten the time of temporary land occupation and vegetation restoration or land rehabilitation should be immediately implemented for the temporarily occupied land parcels upon completion of the Project.
	Prevention and control zone for the construction access roads	(1) Proper engineering protection and drainage facilities must be constructed for newly developed access roads.
		(2) A reasonable construction schedule should be developed to shorten the time of temporary land occupation and vegetation

Item		Environmental Protection Measures
		restoration or land rehabilitation should be immediately implemented for the temporarily occupied land parcels upon completion of the Project.
	Prevention and control zone for the construction camps	(1) Grass and shrubs should be planted in areas except the camps and the hardened areas as a measure of temporary landscaping and beautification of the construction camps.
		(2) Brick masonry drainage gutters should be constructed for fast discharge of ponded water on site.
		(3) At the end of the Project, the camps and the hardened areas should be demolished for land rehabilitation and vegetation restoration.
	Prevention and control zone for the borrowing sites	(1) Necessary stormwater interception and drainage facilities should be built before the borrowing site is put into operation. Drainage gutters should be provided around the borrowing site and sedimentation tanks at the exits so that stormwater from the borrowing site is settled and then discharged into the natural ditches in the vicinity. Interception ditches should be provided on the outer side of the slope platform and upper slope of the borrow area and connected to the drainage gutters.
		(2) If possible, excavation should be followed with backfill and landscaping to avoid extensive surface exposure from continuous excavation and the resulted serious soil erosion. Prior to landscaping, top soil should be backfilled to the landscaping area and the land rehabilitation measures should be taken.
		(3) It is difficult to achieve fast restoration of vegetation on the upper slope, which, in case of strong rainfall, should be temporarily covered to avoid runoff scours.
		(4) Upon the completion of the construction works, vegetation restoration or land rehabilitation should be immediately implemented at the borrowing sites.
	Prevention and control zone for the soil-spoiling and waste disposal sites	(1) In case of any implementation difficulty, soil-spoiling and waste disposal sites need to be set up in preferably mountain plain or low-lying areas.
		(2) Based on the topographical features of the soil-spoiling and waste disposal site, retaining wall should be constructed at the bottom part of the soil-spoiling and waste disposal site prior to disposal operation. Such retaining wall should be constructed in such a way that the location and topographical features of the waste disposal stockpiles are taken into account and the retaining walls are safe, cost-effective and reasonable.
		(3) Interception ditches should be constructed at the upper slope of the soil-spoiling and waste disposal site to intercept slope runoffs and sedimentation tanks should be built on both ends.

Item		Environmental Protection Measures
		Energy digestion facilities should be provided if the interception ditch has a big end slope.
		(4) The disposed wastes should be rolled and compacted and then drainage gutters should be provided.
		(5) Upon the completion of the construction works, ecological restoration should be immediately implemented to the soil-spoiling and waste disposal sites.
Ecological restoration	(1)	Ecological restoration should be carried out, where possible, utilizing top soil stored in the process of clearing and grubbing instead of excavating new soil.
	(2)	Landscaping should be implemented through combination of trees, shrubs and grass. In addition to trees, some evergreen broadleaf shrubs with high growth density should also be planted as undergrowth plant so that extensive landscaping is achieved and no unoccupied space is left to prevent invasion by alien species.
	(3)	Alien species should not be selected as landscaping plants.
Cultural relics protection	(1)	If any unmovable cultural relics (including ancient ruins, ancient tombs, etc.) are discovered during construction, the construction works should be immediately suspended to protect the scene under the supervision of the construction supervision engineer. No unauthorized action is permitted and a report should be immediately delivered to the local cultural relics administration department.
	(2)	After the appraisal or clearing is taken by the cultural relics administration department, the EA should develop its construction program for the concerned section and should not resume the construction until a consent is obtained from the cultural relics administration department.
	(3)	Any moveable cultural relics (including substances of daily life or production activities of different ages) discovered during construction must be handed over to the cultural relics administration department and must not be withheld for one's own possession.
Construction traffic management	(1)	A reasonable construction schedule should be developed to shorten the time of temporary land occupation.
	(2)	Enclosed transportation vehicles must be used for transportation of earth, debris and construction wastes.
	(3)	Transportation of construction materials at night time should be prohibited on any construction access road with a centralized area of residence in a distance of less than 50m.
	(4)	Construction and transportation vehicles should avoid the peak hours of local roads to prevent traffic congestion and accidents.
	(5)	Construction vehicles should travel along designated routes

Item	Environmental Protection Measures
	and unauthorized change of routes is prohibited to avoid possible damages to farmland and forest land;
	(6) Construction nameplates should be installed at obvious positions to indicate the name of project, scope of construction site, names of EA, contractor, supervision company and monitoring unit as well as the name of project responsible person, date of commencement and completion and supervision and complaint hotline as well as the specific environmental protection measures;
	(7) The construction contractor should post commencement notices around the construction site 7 days prior to the scheduled date of commencement of the respective construction works to disclose information including project overview, construction plan, name of responsible construction units and name of project manager and complaint and appeal telephone numbers
	(8) Nighttime construction should be restricted. If nighttime construction is needed in any special circumstances, the impacts by nighttime construction on the neighborhood should be controlled and a prior notice should be sent to obtain the understanding of the local residents
	(9) The height of construction fences should not be smaller than 1.8m for ordinary road sections and 2.5m for key road sections in the urban area. The advertisement slogans should be attached in a standardized way; the walls should have blue color as the base color and be kept clean all year long and free of scribbling and spraying.
Hazardous wastes and flammables and explosives	(1) Upon delivery of diesel and gasoline into the construction site, the inspectors should carefully check the package and confirm if there are any leakages. The delivered goods should be rejected if any leakages are identified;
	(2) A special storage space should be provided for oils and chemical solvents stored in the construction and production areas. Warning signs should be erected; floor should be subject to anti-seepage treatment and absorbing bags, sand and chips among other emergency response materials should be prepared.
	(3) Accident emergency response plans should be developed and workers should be trained before mobilized on the construction sites.
Public participation	(1) Setting up a bulletin board at the entrance of the construction site to disclose information such as project name, key construction works, construction time as well as the contact person and contact information for complaints and advices;
	(2) Making arrangements for site environment engineer to answer questions from the public on environmental protection;

Item	Environmental Protection Measures
	(3) Fulfilling the relevant formalities for and disclose to the local residents information on any nighttime construction. Information to be disclosed in such cases include beginning and ending time of as well as the permit granted by the environmental protection authority on nighttime construction.
	(4) A public announcement should be posted at least five days in advance at the construction site as well as the premises of affected households and enterprises to notify the public of the beginning and ending time of any possible suspension of municipal services (including water supply, power supply, telephone and bus service) needed for the implementation of the construction works.
	(5) All feedbacks, comments and questions from the public should be recorded and archived. Questions raised by the public should be answered and responded in a timely manner, with the results of answers and responses recorded and archived for future inspection by the supervision unit.
Social and environmental impact control	(1) The various LAR subsidies should be allocated to the concerned village groups and individuals based on the compensation standards of Guangxi and Hezhou City, the local circumstances and the agreements signed with the LAR affected households. The various compensations should be reasonably allocated and utilized through full promotion of democracy and respect of the basic citizen rights; the arable land and labor force should be reasonably adjusted through full enforcement of the relevant policies.
	(2) Local roads occupied or damaged in the construction of the proposed road and pipeline networks should be relocated or subject to protective treatment such as pavement rehabilitation and landscaping. In addition, compensation of a certain amount should be paid to local governments to safeguard the righteous interests of local governments and residents. Gravel roads occupied by the sewage pipeline construction works should be restored upon completion of the respective works.
	(3) Construction and transportation vehicles should avoid the peak hours of local roads to prevent traffic congestion and accidents.
	(4) Connection with the relevant roads and installation of safety signs should be implemented before the construction works is completed and put into operation.
Landscape impact control	(1) In order to achieve better compatibility and coordination between the project and the surrounding landscape, the earthwork and excavation slope should be connected with the natural ground and an arc-shaped slope may be selected for better visual effect. The slope surface should retain a certain

Item	Environmental Protection Measures
	roughness to facilitate easy implementation of surface protection or grass vegetation measures. In order to improve the visual effect of the retaining wall, shrubs and evergreen trees or even climbing plants may be planted to put the retaining wall under shelter.
	(2) As the access roads are mostly located on both sides of existing roads, it is thus recommended that stronger efforts are made in advertisement of environmental protection to promote the awareness of environmental protection of both the administration and construction staff and prohibit random disposal of domestic and production wastes.
	(3) Operations at the soil-spoiling and waste disposal sites and the construction materials temporary stockpiling sites must be carried out strictly within the specified area. Random disposal of wastes must be prohibited to avoid pollution to landscape and environment.
	(4) Upon the completion of the construction works, grease and garbage in the soil-spoiling and waste disposal sites, quarries, construction access roads and construction camps should be removed in time and ground leveled to restore the original landform and vegetation where possible and achieve the harmony between project construction and natural environment in the vicinity.
Construction health	(1) Warning signs or instructions should be provided at operation positions, equipment and sites prone to occupational hazards on the construction sites.
	(2) Occupational health training and physical examination should be organized on a periodical basis for staff handling toxic and hazardous substances and guidance should be provided on correct use of occupational disease prevention devices and personal labor protection devices.
	(3) The construction contractor should provide the construction workers with safety helmets, safety belts and personal labor protection devices, such as safety boots, working clothing, etc. compatible to the operations they are engaged in.
	(4) Low-noise equipment should be selected and automated and enclosed construction technologies should be promoted on construction sites to reduce machinery noises. Operators should wear ear plugs during operation for hearing protection.
	(5) Forced ventilation facilities should be provided in operation areas where good natural ventilation is not guaranteed due to the presence of corrosion resistance or waterproofing operations. Operators working in sites involving toxic and hazardous gases should wear gas masks or protective masks.
	(6) Water spraying facilities should be provided in dusty operation

Item	Environmental Protection Measures
	sites reduce the dust concentration and operators should wear dust masks; operators in welding operations should wear protective masks, goggles and gloves and other personal protective equipment.
	(7) Summer cooling supplies should be provided on construction sites where high-temperature operations are involved and reasonable arrangements should be made for work and rest timetable.
Health and epidemic prevention	(1) The respective health standards should be satisfied in terms of meals, drinking water, rest places provided for staff on the construction sites.
	(2) Dormitories, canteens, bathrooms and toilets should be properly ventilated and illuminated, with full-time personnel assigned and responsible for their routine maintenance.
	(3) Openable windows must be provided for dormitories on construction sites. Beds in staff dormitories should not be more than 2 tiers and large multi-person bed is prohibited.
	(4) Valid health permits issued by the relevant departments should be available at canteens and all cooking devices should be cleaned according to the respective specifications and all cooks should hold valid health certificates;
	(5) The canteens should located away from toilets, garbage stations, toxic and hazardous places and other pollution sources.
	(6) Independent preparation rooms and storage room should be provided in the canteens and mouse guards of no less than 0.2m high should be provided at the bottom of the doors.
	(7) Toilets, sanitary facilities, drainage gutters and dark and humid areas should be sterilized on a periodical basis;
	(8) Enclosed containers should be provided in the living areas; flies should be periodically killed and containers emptied in a timely manner;
	(9) Clinics should be provided on construction sites and equipped with health kits, frequently used drugs and bandages, tourniquets, neck care, stretchers and other first aid devices.
	(10) Any incidents of infectious diseases, food poisoning, acute occupational poisoning of the construction workers should be promptly reported to the local health and epidemic prevention authorities and construction administration authorities so that corresponding actions are taken in accordance with the relevant provisions of the health and epidemic prevention authorities.
3 2 0 1 - < 3 m	(1) Prior to the commencement of the Project, the Municipal PMO

Item	Environmental Protection Measures
	should assign an environmental specialist to provide environmental protection training for the contractors and construction supervision agencies of the road and pipeline construction works;
	(2) Prior to the commencement of the construction works, the contractor of the road and pipeline construction works should organize training and examinations for the operators on the construction sites on laws and regulations on environmental protection and health and sanitation;
	(3) The contractor of the road and pipeline construction works should organize staff training on the risk emergency response plan as well as emergency response rehearsals on a yearly basis.
	(4) The contractor of the road and pipeline construction works should organize occupational health training and physical examination on a half-year basis for operators handling toxic and hazardous substances and provide guidance to such operators on correct use of occupational disease prevention devices and personal labor protection devices.



## Annex Table 2: Construction Site Checklist Prior to Mobilization

Name of subproject:

Contract No. and Subproject

Location:

Name of construction site:

Weather condition:

Checked by:

Date of construction site check:

S.N	Environmental issues	Yes	No	N/A	Note / Recommended actions
1	Is the Project located in a national / provincial/ county-level nature reserve? (If yes, the Project should be cancelled.)				
2	Is the Project located in an experimental zone of a national / provincial / county-level nature reserve? (If yes, the Project is eligible for construction, but permits from the concerned authorities are mandatory.)				
3	Will land acquisition for the Project cause significant deterioration or changes of the natural environment of a protection area, a recommended protection area or an area with unique ecological significance?				
4	Will the Project cause temporary or permanent relocation of or impacts of any other forms on the national / provincial or recommended national / provincial physical and cultural resources or physical and cultural resources identified through discussions with the APs?				
5	Does the Project involve any physical and cultural resources that are extremely sensitive for local residents (e.g. tombs)?				
6	Are there any known archaeological, historical or cultural relics (including ancient tombs, mausoleums) in the project area?				
7	Are there any endangered species (aquatic or terrestrial) in the project area?				
8	Are there any natural habitats in the project area?				
9	Are there any wetlands or saturated soil zones (permanent or temporary) in the project area?				
10	Will the construction of the Project cause any short-term impacts on the villagers' rights of use of the infrastructures, services and relevant resources?				
11	Are there a large number of objects of				

	environmental protection (hospitals, schools, residential areas, villages, etc.) in the project-affected area?				
12	Is transplanting needed for the sidewalk trees involved in the Project?				
13	Are there any existing power supply facilities (cables, poles, transformers), telecommunication facilities, water supply and drainage facilities and heating facilities in the construction site of the Project?				
14	Are there any conflicts with local traffic due to use of access roads (urban roads) for constructional purposes?				
15	Others (Please specify)				

### Annex Table 3: Checklist for Environment Protection Inspection on Construction Sites

Guangxi Hezhou Urban Water Infrastructure and Environment Improvement Project      Serial No.:

Date:

**Instructions:**

This table is the checklist for environmental protection inspections in the construction stage of the road and pipeline network construction component of Guangxi Hezhou Urban Water Infrastructure and Environment Improvement Project and includes the environmental protection measures tailored to the specific subprojects and the local environmental conditions, which may be added or adjusted if necessary.

Name of subproject:      Contract No. and Subproject Location:

Name of construction site:      Weather condition:

Current construction stage:

Date of environmental protection inspection:      Specific time:

Weather condition:

Checked by:

Inspection Item		Implementation Status			Note
		Yes	No	N/A	
ECOP for the construction site	(1) Whether the relevant formalities are fulfilled for the project sites (construction and production areas, construction camps, construction access roads and construction material stockpiling sites) ?				
	(2) Whether a survey of the existing pipelines has been properly carried out to avoid damages to existing pipelines during construction?				
	(3) Whether the construction contractors				

		Inspection Item	Implementation Status			Note	
			Yes	No	N/A		
		have, through consulting the town project organization, identified suitable public water sources and selected municipal tap water or existing drinking water sources in the nearby villages? Whether drilling of new wells is strictly banned?					
		(4) Others (Please specify)					
Construction site management	Control of environmental impacts in the construction areas of the main works	Clearing and grubbing	(1) Whether serious attention is paid to dust suppression through water spraying so as to abate dust pollution?				
			(2) Whether construction wastes and debris as generated are cleared out of site in a timely manner and enclosed transportation vehicles are used for transportation of earth, debris and construction wastes?				
	Subgrade construction Pipeline construction	(1) Whether strict control is implemented on the subgrade and pipeline excavation to avoid damages from over-excavation to surrounding vegetation? Whether any felling of trees outside the construction areas is prohibited?					
		(2) Whether waste soil as generated is cleared out of site in a timely manner and enclosed transportation vehicles are used for transportation of earth, debris and construction wastes?					
		(3) Whether water is sprayed on construction site for dust suppression so as to abate dust pollution?					
	Pavement construction	(1) Whether centralized asphalt mixing plant is used and the mixing plant is located inside the construction and production area? Whether it is prohibited to locate asphalt mixing plant in the construction area of the main works?					
		Slope trimming	(1) Whether exposed slopes are trimmed in time to reduce time of exposure?				
	(2) Whether exposed slopes are covered with dust prevention nets or sprayed						



Inspection Item			Implementation Status			Note
			Yes	No	N/A	
		local EP authority and apply for permits for nighttime construction and disclose such information to obtain maximum public support?				
		(2) Whether mobile or temporary sound barriers and other noise prevention measures are used on sensitive sites in the vicinity of the construction site (with a distance of less than 50m)?				
		(3) Whether the construction site are located far away from schools and hospitals where possible? Whether the construction time for construction sites in the neighborhood of schools involving the use of strong-noise machinery is negotiated and agreed with the schools and no construction activities are arranged during the exam hours of the schools where possible?				
	Others	(1) Whether burning of wastes is prohibited on construction sites?				
	Control of environmental impacts in the construction and production areas	Clearing and grubbing	(1) Whether serious attention is paid to dust suppression through water spraying so as to abate dust pollution?			
			(2) Whether construction wastes and debris as generated are cleared out of site in a timely manner?			
		Asphalt mixing	(1) Whether procurement of commodity asphalt mixtures is regarded as the top priority?			
			(2) Whether mixing plants with excellent sealing performance and high dust removal efficiency are selected for asphalt concrete mixing plants and semi-enclosed bitumen boiling operation process is banned?			
		Concrete mixing	(1) Whether commodity concrete is selected as the top priority?			
			(2) Whether wet mixing is selected as the method of concrete mixing and the mixing process is carried out in an			

Inspection Item		Implementation Status			Note
		Yes	No	N/A	
		enclosed state?			
	Lime soil mixing	(1) Whether wet mixing is selected for the lime soil mixing plant, which is operated in a fenced enclosure?			
	Material loading and unloading and stockpiling	(1) Whether windproof and covering measures or dust suppression measures are taken in the process of transportation, temporary storage and loading and unloading of earth, cement and lime among other bulk materials?			
		(2) Whether the material stockpiling site is flat and solid?			
		(3) Whether fencing measures are taken for stockpiling sites of construction materials, such as cement, lime and sand and stone, which are covered with tarpaulins to reduce pollution from stormwater scouring?			
	Construction and transportation vehicles	(1) Whether vehicle washing facilities are provided at the entrances and exits of the construction sites so that vehicles are washed and cleaned upon departure? Whether roads connecting the vehicle washing equipment and the exit of the construction site are paved with concrete, asphalt or crushed brick to avoid possible take-away of mud and debris out of the site?			
		(2) Whether enclosed transportation vehicles are used for transportation of earth, debris and construction wastes?			
	Precast yard	(1) Whether wastewater from concrete mixing are collected and treated in the sedimentation tank and reused for dust suppression on the construction sites? Whether the sedimentation tanks are backfilled for ecological restoration upon the completion of the construction works?			
	Construction	(1) Whether shock absorbers are provided on the bases of fixed mechanical equipment with strong vibration (e.g.			

Inspection Item		Implementation Status			Note	
		Yes	No	N/A		
		mixers)?				
		(2) Whether fixed strong noise sources are provided with sound insulators (e.g. the power-generation trucks) or positioned and operated indoors?				
		(3) Whether the construction time is subject to strict control and construction activities using plants and equipment generating strong noises on construction sites within a distance of less than 150m from the residential areas are suspended at night (from 22:00 pm to 06:00 am)?				
	Others	(1) Whether damaged land is ecologically restored to at least the pre-construction state after the construction works is completed?				
		(2) Whether arable top soil stripped during the construction is stockpiled temporarily on a relatively flat area on the construction site and fenced up with bagged earth cofferdam? Whether temporary gutters and sand sedimentation measures are provided around the stockpiles? Whether the stockpiled top soil is covered with dust prevention nets and reused for ecological restoration upon completion of the construction activities?				
		(3) Whether burning of wastes is prohibited on construction sites?				
Control of environmental impacts of construction access roads	Road dust	(1) Whether pavement of new access roads and hardening of sites are handled based on the design usage?				
		(2) Whether the access roads are maintained and cleaned every day and dust-prone sections sprayed with water for dust suppression?				
	Noise control	(1) Whether transportation vehicles are maintained according to the requirements in “Construction equipment management”?				
		(2) Whether the requirements in				



Inspection Item			Implementation Status			Note
			Yes	No	N/A	
	Control of ecological impacts	"Construction Traffic Management" are followed?				
		(1) Whether newly constructed access roads are ecologically restored to at least the pre-construction state after the construction works is completed?				
		(2) Whether arable top soil stripped during the construction is stockpiled temporarily on a relatively flat area on the construction site and fenced up with bagged earth cofferdam? Whether temporary gutters and sand sedimentation measures are provided around the stockpiles? Whether the stockpiled top soil is covered with dust prevention nets and reused for ecological restoration upon completion of the construction activities?				
		(3) Whether occupied or damaged local roads are relocated or subject to protective treatment such as pavement rehabilitation and landscaping upon the completion of the construction works? Whether compensation of a certain amount is paid to local governments to safeguard the righteous interests of local governments and residents?				
	Others (Please specify)					
Construction equipment management	Pollution control measures through reduction of oil leakage	(1) Whether state-of-the-art equipment and machinery are selected, if possible, to effectively reduce the number of oil leakage and machinery repair and thus the generation of oily wastewater?				
		(2) Whether solid oil-absorbing materials (e.g. cotton yarns, wood chips, oil-absorbing paper) are used in the process of inevitable oil leakage, where possible, and whether the waste oil is collected and transformed into the solid substances to avoid excessive generation of oily wastewater?				

Inspection Item		Implementation Status			Note
		Yes	No	N/A	
	(3) Whether maintenance and servicing of machinery, equipment and transportation vehicles is carried out at centralized maintenance sites along each road section, if possible, for the sake of easy collection of oily wastewater?				
	(4) Whether horizontal sedimentation tanks are provided in the machinery maintenance sites and the oily wastewater is collected in the sedimentation tanks for simple treatment such as acid-alkaline neutralization, sedimentation, oil separation and debris removal before discharge? Whether the sedimentation tanks are backfilled with soil for landscaping upon completion of the construction works?				
	(5) Whether the ground surface of the equipment maintenance sites is paved and subject to anti-seepage treatment to avoid possible contamination of soil caused by oil leakage?				
	(6) Whether records of equipment repair and maintenance are developed to enable periodical maintenance based on the operation status of equipment?				
Control of equipment noises	(1) Whether the construction contractor selects construction equipment and machinery and transportation vehicles conforming to the relevant national standards and select, if possible, low-noise construction plants?				
	(2) Whether shock absorbers are provided on the bases of fixed mechanical equipment with strong vibration and whether fixed strong noise sources (e.g. the power-generation trucks) should be provided with sound insulators or positioned and operated indoors?				
	(3) Whether maintenance and servicing of				

Inspection Item		Implementation Status			Note
		Yes	No	N/A	
	the various construction equipment are strengthened to keep them in fine operation (to fundamentally reduce the intensity of noise and vibration sources)?				
Pollution control of equipment tail gas and exhaust gas	(1) Whether the construction contractor selects construction equipment and machinery and transportation vehicles conforming to the relevant national health protection standards and assures that the exhaust gas emission of such equipment and vehicles conforms to the relevant national standards?				
Pollution control of solid wastes	(1) Whether waste oil and chemical solvents and other hazardous wastes are separately stored based on their nature? Whether such hazardous wastes are treated and disposed by a qualified unit? Whether sites for temporary storage of hazardous wastes are provided with obvious signs and constructed in accordance with the "Pollution control standards for storage of hazardous wastes" (GB18597-2001)?				
	(2) Whether toxic and hazardous wastes requiring recovery (e.g. oil buckets) are recovered by material suppliers in principle and whether such responsibilities are defined in the material procurement contract?				
	(3) Whether recovery and disposal of hazardous wastes generated in a decentralized way (e.g. oil gloves, oil yarn heads) is carried out by qualified agencies authorized by the PMO?				
	(4) Whether oil and grease leaked into the soil is collected in a timely manner with scrapping devices and sealed up and transported to a qualified treatment plant for centralized treatment?				
	(5) Whether containers or solid oil-				

Inspection Item		Implementation Status			Note
		Yes	No	N/A	
	absorbing materials are used to collect the oily wastewater generated from such equipment when it is unlikely to carry out the maintenance and servicing of machinery, equipment and transportation vehicles at a designated maintenance site for each road section and whether the collected wastewater is sealed up and transported to an external site for further treatment? Whether a nearby disposal plant with the required qualifications for disposal of such wastes is selected?				
	Others (Please specify)				
Storage requirements of chemicals	(1) Whether the inspectors carefully check the package and confirm if there are any leakages upon delivery of paints, diesel and gasoline into the construction site? Whether the delivered goods are rejected if any leakages are identified?				
	(2) Whether a special storage space is provided for storage of oils and chemical solvents and warning signs are erected; whether the floor is subject to anti-seepage treatment and absorbing bags, sand and chips among other emergency response materials are prepared?				
	(3) Whether accident emergency response plans are developed and workers are trained before mobilized on the construction sites?				
	(4) Others (Please specify)				
ECOP for construction	Site leveling	(1) Whether construction wastes and debris as generated are cleared out of site in a timely manner and enclosed transportation vehicles are used for transportation of earth, debris and construction wastes?			
		(2) Whether water is sprayed for dust suppression so as to abate dust pollution?			

Inspection Item		Implementation Status			Note
		Yes	No	N/A	
Domestic sewage control	(1) Oil or grease traps should be provided in the canteen and a qualified unit with the waste digestion qualification certificate and business license approved by the competent authority should be employed to assure timely removal of wastes.				
	(2) Temporary toilets and septic tanks should be provided on the construction camps and should be subject to anti-seepage treatment.				
	(3) Drainage gutters and sedimentation tanks should be provided on the construction camps. Filters should be installed on sewer pipes of canteen, washrooms and shower rooms. Construction wastewater should not be discharged into the municipal sewage pipeline or natural rivers until properly settled. In the meanwhile, the drainage ditches should be kept tidy and free of obstacles to assure smooth drainage.				
	(4) The construction camps should be kept in a smooth drainage condition and free of ponding of black and odor wastewater and unregulated urination and defecation				
	(5) Uncontrolled dump and discharge of domestic wastewater into agricultural irrigation canals is prohibited. No domestic solid wastes and construction wastes should be stockpiled around the aforesaid areas				
Domestic exhaust gas control	(1) Clean energy, such as natural gas, electricity, should be used for cooking on the construction camps according to the requirements of local EP authorities				

Inspection Item		Implementation Status			Note
		Yes	No	N/A	
Solid waste control	(1) Recoverable wastes (e.g. waste paper, etc.) should be recovered and disposed by an authorized unit.				
	(2) Enclosed garbage stations should be provided in the construction camps for timely collection, removal and digestion of domestic solid wastes of staff according to the respective requirements				
	(3) Enclosed slop pails should be provided outside the canteen and be emptied and cleaned in a timely manner.				
	(4) The septic tanks should be emptied and cleaned by the authorized unit and should be backfilled upon the completion of the construction works.				
Ecological impact control	(1) All temporary facilities should be demolished and the occupied site restored to the pre-construction state within one month as of the completion of the construction works				
	(2) Whether arable top soil stripped during the construction is stockpiled temporarily on a relatively flat area on the construction site and fenced up with bagged earth cofferdam? Whether temporary gutters and sand sedimentation measures are provided around the stockpiles? Whether the stockpiled top soil is covered with dust prevention nets and reused for ecological restoration upon completion of the construction activities?				
Other requirements	(1) Use of clay bricks in construction of temporary facilities in the construction camp is prohibited and the safety and fire protection requirements and				

Inspection Item			Implementation Status			Note
			Yes	No	N/A	
		relevant national regulations should be respected				
		(2) The construction camps should be clearly distinguished from the construction areas and separation measures should be taken to assure that the construction camps remain in a tidy and orderly condition.				
		(3) burning of wastes is prohibited in the construction camps.				
	Others (Please specify)					
ECOP of construction material stockpiling sites	Control of environmental impacts of borrowing sites	General requirements	(1) Deep excavation should be avoided in the construction process and all efforts should be made to achieve balance between excavation and earthwork fill. If borrow fill is needed, the prior choice is to purchase commodity soil or seeking waste soil from urban construction projects so as to avoid setting up new borrowing sites and thus fundamentally eliminate the environmental impacts of borrowing sites.			
			(2) Centralized borrow fill should be selected for the Project to reduce the number of borrowing sites			
		Dust control	(1) Attention should be paid to dust suppression through water spraying in the course of borrow fill operation to reduce dust pollution resulting from earthwork excavation.			

Inspection Item		Implementation Status			Note	
		Yes	No	N/A		
	Control of ecological impacts	(1) During excavation, the top soil should be preserved for land rehabilitation. The top soil should be stockpiled temporarily on a relatively flat area on the construction site and fenced up with bagged earth cofferdam. Temporary gutters and sand sedimentation measures should be provided around the stockpiles. The stockpiled top soil should be covered with dust prevention nets and reused for ecological restoration of the borrowing sites upon completion of the construction activities.				
	Landscape control	(1) Respective environmental protection measures should be taken according to the requirements of Section XVII --- Control of Landscape Impacts				
Control of impacts of soil-spoiling and waste disposal sites	General requirements	(1) If any waste soil is generated, the top choice is to have such waste soil reused on the same construction site or other construction sites or reused for vegetation restoration in the borrowing sites so as to avoid setting up new waste soil disposal sites and fundamentally eliminate environmental impacts in this regard.				
		(2) Whether a local survey is carried out to find out if any designated digestion sites exist locally for reasonable disposal of construction wastes and debris?				
	Dust control	(1) Layered compaction may effectively suppress dust on the soil-spoiling and waste disposal sites.				
		(2) Dust suppression should be carried out through water spraying to reduce dust pollution caused by exposed surface				



Inspection Item			Implementation Status			Note
			Yes	No	N/A	
Soil erosion control plan	Ecological impact control	(1) Whether the excavated top soil is used for land rehabilitation? Whether the top soil is stockpiled temporarily on a relatively flat area on the construction site and fenced up with bagged earth cofferdam? Whether temporary gutters and sand sedimentation measures are provided around the stockpiles and the stockpiled top soil is covered with dust prevention nets?				
	Landscape control	(1) Whether respective environmental protection measures are taken upon the completion of the construction works according to the requirements of "Control of Landscape Impacts"?				
	Others (Please specify)					
	Construction area of the main works	(1) Whether the top soil is temporarily stockpiled on both sides of the right-of-way of the subgrade; whether a cofferdam of bagged earth is built up around the stockpile to avoid possible slides?				
		(2) Whether slope protection is carried out in a timely manner according to the principles of subgrade slope protection? Whether geotextile net grass protection slope is used along the filled embankment and retaining walls at certain individual sections?				
		(3) For sections of the embankment crossing ponds and running along the rivers where the slope extends into the water ponds or rivers, the slope ratio from the constant water level +0.5m down to the bottom of the slope is 1:1.75 and masonry rubble surfacing with a thickness of no less than 0.6m should be selected for the waterfront side; the slope ratio for the part from the constant water level + 0.5m upward to the designed elevation of the subgrade is 1:1.5.				
		(4) Sand sedimentation tanks should be				

Inspection Item		Implementation Status			Note
		Yes	No	N/A	
	provided at the outlet of the subgrade drainage gutters.				
Prevention and control zone for the construction and production areas	(1) Whether the sites in the construction and production areas are paved with cement concrete?				
	(2) Whether temporary retaining ditches are provided outside the boundary of low-lying areas in the project area to prevent stormwater scours in rain season?				
	(3) Whether top soil and material stockpiles are covered with dust prevention nets to prevent stormwater scours and pollution to surrounding environment?				
	(4) Whether a reasonable construction schedule should be developed to shorten the time of temporary land occupation and vegetation restoration or land rehabilitation should be immediately implemented for the temporarily occupied land parcels upon completion of the Project.				
Prevention and control zone for the construction access roads	(1) Whether proper engineering protection and drainage facilities are constructed for newly developed access roads?				
	(2) Whether a reasonable construction schedule is developed to shorten the time of temporary land occupation?				
Prevention and control zone for the construction camps	(1) Whether grass and shrubs are planted in areas except the camps and the hardened areas as a measure of temporary landscaping and beautification of the construction camps?				
	(2) Whether brick masonry drainage gutters are constructed for fast discharge of ponded water on site?				
	(3) Whether the camps and the hardened areas are demolished for land rehabilitation and vegetation restoration at the end of the Project?				
Prevention and control zone for the construction camps	(1) Whether necessary stormwater				

Inspection Item		Implementation Status			Note
		Yes	No	N/A	
	interception and drainage facilities are built before the borrowing site is put into operation? Whether drainage gutters are provided around the borrowing site and sedimentation tanks at the exits so that stormwater from the borrowing site is settled and then discharged into the natural ditches in the vicinity? Whether interception ditches are provided on the outer side of the slope platform and upper slope of the borrow area and connected to the drainage gutters?				
	(2) Whether excavation is followed with backfill and landscaping, where possible, to prevent soil erosion? Whether top soil is backfilled to the landscaping area and the land rehabilitation measures are taken prior to landscaping?				
	(3) Whether the vegetation measures on the slope of the borrowing sites, which are difficult to achieve fast restoration, are temporarily covered during strong rainfall to avoid runoff scours?				
	(4) Whether vegetation restoration or land rehabilitation is immediately implemented at the borrowing sites upon the completion of the construction works?				
Prevention and control zone for the soil-spoiling and waste disposal sites	(1) Whether the soil-spoiling and waste disposal site is selected in a reasonable way?				
	(2) Whether a retaining wall is constructed at the bottom part of the soil-spoiling and waste disposal site based on the topographical features of the soil-spoiling and waste disposal site prior to disposal operation? Whether such retaining wall is constructed in a safe, cost-effective and reasonable manner?				
	(3) Whether interception ditches are constructed at the upper slope of the				

Inspection Item		Implementation Status			Note
		Yes	No	N/A	
	soil-spoiling and waste disposal site to intercept slope runoffs? Whether sedimentation tanks are built on both ends and whether energy digestion facilities are provided?				
	(4) Whether the disposed wastes are rolled and compacted in time? Whether a 1-2m wide terrace is provided at a spacing of 5-6m along the elevation of the disposed waste?				
	(5) Whether ecological restoration is immediately implemented to the soil-spoiling and waste disposal sites upon the completion of the construction works?				
	Others (Please specify)				
Ecological restoration	(1) Whether ecological restoration is carried out, where possible, utilizing top soil stored in the process of clearing and grubbing?				
	(2) Whether landscaping is implemented through combination of trees, shrubs and grass? Whether extensive landscaping is achieved and no unoccupied space is left to prevent invasion by alien species?				
	(3) Whether alien species are not be selected as landscaping plants?				
	(4) Others (Please specify)				
Cultural relics protection	(1) Whether the construction works are immediately suspended to protect the scene under the supervision of the construction supervision engineer when any unmovable cultural relics (including ancient ruins, ancient tombs, etc.) are discovered during construction?				
	(2) Whether the EA develops its construction program for the concerned section after the appraisal or clearing is taken by the cultural relics administration department and resumes the construction after a				

	Inspection Item	Implementation Status			Note
		Yes	No	N/A	
	consent is obtained from the cultural relics administration department?				
	(3) Whether any moveable cultural relics (including substances of daily life or production activities of different ages) discovered during construction are handed over to the cultural relics administration department?				
	(4) Others (Please specify)				
Construction traffic management	(1) Whether a reasonable construction schedule is developed to shorten the time of temporary land occupation?				
	(2) Whether enclosed transportation vehicles are used for transportation of earth, debris and construction wastes?				
	(3) Whether transportation of construction materials at night time is prohibited on any construction access road with a centralized area of residence in a distance of less than 50m?				
	(4) Whether construction and transportation vehicles avoid the peak hours of local roads to prevent traffic congestion and accidents?				
	(5) Whether construction vehicles travel along designated routes and unauthorized change of routes is prohibited to avoid possible damages to farmland and forest land?				
	(6) Others (Please specify)				
Public participation	(1) Whether a bulletin board is set up at the entrance of the construction site to disclose information of construction works and contact information for complaints and advices?				
	(2) Whether arrangements are made for environmental protection technicians to answer questions from the public on environmental protection?				
	(3) Whether the relevant formalities are fulfilled for and information is disclose to the local residents on any nighttime				

	Inspection Item	Implementation Status			Note
		Yes	No	N/A	
	construction?				
	(4) Whether a public announcement is posted at least five days in advance at the construction site as well as the premises of affected households and enterprises to notify the public of the beginning and ending time of any possible suspension of municipal services (including water supply, power supply, telephone and bus service) needed for the implementation of the construction works?				
	(5) Whether all feedbacks, comments and questions from the public are recorded and archived and subject to inspection by the supervision unit?				
	(6) Others (Please specify)				
Social and environmental impact control	(1) Whether the various LAR subsidies are allocated to the concerned village groups and individuals based on the compensation standards of Guangxi and Hezhou City? Whether the arable land and labor force are reasonably adjusted through full enforcement of the relevant policies?				
	(2) Whether construction and transportation vehicles avoid the peak hours of local roads to prevent traffic congestion and accidents?				
	(3) Whether local roads occupied or damaged in the construction of the proposed road and pipeline networks are relocated or subject to protective treatment such as pavement rehabilitation and landscaping at the end of the construction works? Whether compensation of a certain amount is paid to local governments to safeguard the righteous interests of local governments and residents?				
	(4) Others (Please specify)				

Inspection Item		Implementation Status			Note
		Yes	No	N/A	
Landscape impact control	(1) Whether measures are taken to use sheltering plants to cover the surface of the filled, excavated slopes and the retaining walls to improve the compatibility and harmony with the surrounding environment?				
	(2) Whether strong efforts are made in advertisement of environmental protection to promote the awareness of environmental protection of both the administration and construction staff and prohibit random disposal of domestic and production wastes?				
	(3) Whether operations at the soil-spoiling and waste disposal sites and the construction materials temporary stockpiling sites are carried out strictly within the specified area?				
	(4) Whether grease and garbage in the soil-spoiling and waste disposal sites, quarries, construction access roads and construction camps are removed in time and ground leveled to restore the original landform and vegetation where possible and achieve the harmony between project construction and natural environment in the vicinity upon the completion of the construction works?				
	(5) Others (Please specify)				
Occupational health	(1) Whether warning signs or instructions are provided at operation positions, equipment and sites prone to occupational hazards on the construction sites?				
	(2) Whether occupational health training and physical examination are organized on a periodical basis for staff handling toxic and hazardous substances and guidance provided on correct use of occupational disease prevention devices and personal labor protection devices?				
	(3) Whether the construction contractor provides the construction workers with personal labor protection devices?				

	Inspection Item	Implementation Status			Note
		Yes	No	N/A	
	(4) Whether low-noise equipment is selected on construction sites and operators wear ear plugs for hearing protection?				
	(5) Whether forced ventilation facilities are provided in operation areas where good natural ventilation is not guaranteed and whether operators working in sites involving toxic and hazardous gases are properly protected?				
	(6) Whether operators wear dust masks in dusty operation sites?				
	(7) Whether operators in welding operations wear protective masks, goggles and gloves and other personal protective equipment?				
	(8) Whether summer cooling supplies are provided on construction sites where high-temperature operations are involved and reasonable arrangements are made for work and rest timetable?				
	(9) Others (Please specify)				
Health and epidemic prevention	(1) Whether respective health standards are satisfied in terms of meals, drinking water, rest places provided for staff on the construction sites (and health certificates are available)?				
	(2) Whether dormitories, canteens, bathrooms and toilets are properly ventilated and illuminated, with full-time personnel assigned and responsible for routine maintenance?				
	(3) Whether openable windows are provided for dormitories on construction sites as required? Whether beds in staff dormitories are not more than 2 tiers and large multi-person bed is prohibited?				
	(4) Whether valid health permits issued by				



	Inspection Item	Implementation Status			Note
		Yes	No	N/A	
	the relevant departments are available at canteens and all cooks hold valid health certificates?				
	(5) Whether the canteens are located away from toilets, garbage stations, toxic and hazardous places and other pollution sources as required?				
	(6) Whether independent preparation rooms and storage room are provided in the canteens and mouse guards of no less than 0.2m high are provided at the bottom of the doors?				
	(7) Whether toilets, sanitary facilities, drainage gutters and dark and humid areas are sterilized on a periodical basis (and respective records are maintained)?				
	(8) Whether enclosed containers are provided in the living areas and flies are periodically killed and containers emptied in a timely manner?				
	(9) Whether clinics are provided on construction sites and equipped with health kits, frequently used drugs and bandages, tourniquets, neck care, stretchers and other first aid devices?				
	(10) Whether any incidents of infectious diseases, food poisoning, acute occupational poisoning of the construction workers are promptly reported to the local health and epidemic prevention authorities and construction administration authorities and corresponding actions are taken in accordance with the relevant provisions of the health and epidemic prevention authorities?				
	(11) Others (Please specify)				
Environmental protection training and education	(1) Whether environmental protection training is provided for the contractors and construction supervision agencies of the road and pipeline construction works?				

Inspection Item	Implementation Status			Note
	Yes	No	N/A	
(2) Whether training and examinations are organized for the operators on the construction sites on laws and regulations on environmental protection and health and sanitation?				
(3) Whether training on the risk emergency response plan as well as emergency response rehearsals are organized for staff?				
(4) Whether occupational health training and physical examination are organized for operators handling toxic and hazardous substances?				
Others (Please specify)				

Checked by: (signature)\_\_\_\_\_ Time:\_\_\_\_\_

Supervision Engineer: (signature)\_\_\_\_\_ Time:\_\_\_\_\_

**Notes:**

- (1) Information to be noted may include problems observed on site, remarks on non-conforming situations and recommended corrective or preventive actions.
- (2) In the event of any unacceptable measures or situations requiring further improvement identified during site inspection, the Supervision Engineer may immediately issue an “Instruction on Environmental Protection Corrections” to the contractor and indicate the serial number of the Instruction herein. Details of corrective actions taken by the contractor need to be recorded separately.
- (3) This table is the checklist for environmental protection inspections in the construction stage of the road and pipeline network construction component of Guangxi Hezhou Urban Water Infrastructure and Environment Improvement Project and is applicable to the specific subprojects and specific environmental problems. This table may be adjusted and corresponding measures of environmental protection may be taken, where appropriate, based on local environmental conditions and construction components.

### Annex Table 4: Instruction on Environmental Protection Corrections

Instruction on Environmental Protection Corrections	
S. N.: _____	
Contract Number and Description: _____	
Name of Subproject: _____	
Name of Construction Site: _____	
Current Construction Stage: _____	
Problems existing during site inspection:	
Checked by: _____ Date: _____	
Contractor's cause analysis and corrective actions:	
Contractor: _____ Date: _____	
Comments by Supervision Engineer:	
Supervision engineer: _____ Date: _____	
Opinions by Environmental Protection Authority (when necessary):	
Contact person: _____ Date: _____	
Deadline of correction:	
To be corrected by (Date): _____	
Contractor: _____ Date: _____	
Supervision Engineer: _____ Date: _____	
Conclusion of review:	

Reviewed by: \_\_\_\_\_ Date: \_\_\_\_\_

## Annex Table 5: Checklist of Environmental Protection Inspection Prior to Project Completion and Hand-over

Guangxi Hezhou Urban Water Infrastructure  
and Environment Improvement Project

Serial No.:

Date:

Instructions:

This table is the checklist for environmental protection inspections in the construction stage of the road and pipeline network construction component of Guangxi Hezhou Urban Water Infrastructure and Environment Improvement Project and includes the environmental protection measures tailored to the specific subprojects and the local environmental conditions, which may be added or adjusted if necessary.

Name of subproject:

Contract No. and Subproject

Location:

Name of construction site:

Current construction stage:

Date of environmental protection inspection:

Specific time:

Weather condition:

Checked by:

Item of inspection	Status of implementation		N/A	Note (e.g. problems or non-conformities observed, recommended corrective or preventive actions)
	Implemented	Not implemented		
1. Are all the construction wastes on the construction sites removed and transported to the municipal solid waste landfill site?				
2. Are actions taken against the acoustic environment protection objects along the road?				
3. Are ecological protection measures taken for the temporary waste (debris) disposal sites?				
4. Have the traffic conditions of the existing rural roads used as access roads deteriorated or improved?				
5. Have the hardened concrete mixing sites been demolished?				
6. Are land rehabilitation, restoration or landscaping measures taken for land parcels temporarily occupied				

by the concrete mixing plants?				
7. Are the temporary sedimentation tanks and sand sedimentation tanks demolished?				
8. Are land rehabilitation, restoration or landscaping measures taken for land parcels temporarily occupied by the sedimentation tanks and sand sedimentation tanks?				
9. Are the temporary road shoulder water retaining curbs and temporary chutes and drainage gutters demolished and corresponding measures of ecological restoration taken?				
11. Are sidewalk trees planted on both sides of the roads?				
12. Are the subgrade slopes landscaped?				
13. Is the road drainage system in a sound condition?				
14. Have the project owners of the subprojects carried out training and education activities?				
15. Are the local public satisfied with the road works constructed under the Project?				

\* Any local and existing item recorded as “not implemented” might indicate any condition that is non-conforming or needs further improvement. In such an event, the Supervision Engineer shall immediately issue to the Contractor an “Instruction on Environmental Protection Corrections” and note the serial number. Details of corrective actions taken by the contractor need to be recorded separately.

Site Inspector (signature):

Date:

Supervision Engineer (signature):

Date:

**Annex IV: Physical Cultural Resources Management Plan**

**World Bank Financed Guangxi Hezhou  
Urban Water Infrastructure and  
Environment Improvement Project**

**Physical Cultural Resources Management  
Plan**

Hezhou World Bank Loan Project Management Office  
Guangxi Zhengze Environmental Protection Technology Co., Ltd

November 2017

# Contents

<b>1. Guidelines and Principles of Preservation</b>	<b>1</b>
1.1 Guidelines .....	1
1.2 Relevant Laws and Regulations and World Bank safeguard policies .....	1
1.2.1 Relevant Laws and Policies of the People's Republic of China	1
1.2.2 World Bank safeguard policies and guidelines	1
<b>2. Current status of Physical Cultural Resources Protection</b>	<b>2</b>
2.1 Xiyue Street Historical and Cultural Quarter .....	2
2.2 The old site of CCP Babu Special Branch .....	8
2.3 Graves nearby Changlong Village .....	8
<b>3. Impacts on physical cultural resources</b>	<b>8</b>
3.1 Impacts on Xiyue Street Historical and Cultural Quarter .....	8
3.2 Conclusions on the Impacts on the old site of the CCP Babu Special Branch .....	9
3.3 Conclusions on the impacts on tombs nearby Changlong Village .....	9
<b>4. Management Unit</b>	<b>14</b>
<b>5. Protection measures for avoiding or mitigating impacts</b>	<b>15</b>
<b>6. Training</b>	<b>21</b>
<b>7. Environmental monitoring plan</b>	<b>21</b>



# **1. Guidelines and Principles of Preservation**

## **1.1 Guidelines**

(1) Following the guidelines of protection-orientation, reasonable utilization and strengthened management, the project shall properly balance the relationship between protection and social-economic development, resources conservation and environmental protection through integrated and positive protection and achieve sustainable development of the traditional street block in an all-round way through promotion of Hezhou Culture and stimulate the vitality of the old street.

(2) Following the principle of integrated protection in all dimensions, the project will not only preserve the historical buildings, but also the natural eco-space, cultural eco-space, economic eco-space and social eco-space that the physical cultural resources rely on.

## **1.2 Relevant Laws and Regulations and World Bank safeguard policies**

### **1.2.1 Relevant Laws and Policies of the People's Republic of China**

- (1) Environmental protection law of People's Republic of China (2016)
- (2) Law of People's Republic of China on protection of Cultural Relics (2013)
- (3) Law of the People's Republic of China on Urban and Rural Planning (2007)
- (4) UNESCO The Convention Concerning the Protection of World Cultural and Natural Heritage (1972)
- (5) Measures for the Administration of Culture Relics Preservation Projects (Ministry of Culture, 2003)
- (6) Code of conservation planning for historic cities (Ministry of Construction, 2005)
- (7) Rules for the implementation of the law of the people's republic of china on the protection of cultural relics (State Administration of Cultural Heritage, 1992)
- (8) Notice of the State Council on Strengthening Protection of Cultural Heritages (2005)
- (9) Guidance of the Ministry of Culture on strengthening the development of nation-level cultural ecological reserves (2010)
- (10) Application materials of Hezhou historical and cultural street

### **1.2.2 World Bank safeguard policies and guidelines**

The proposed subprojects of He River integrated rehabilitation subproject (from Lingfeng Bridge to Xiadao Hydropower Station), Huang'ansi drainage channel, Huang'ansi and Changlong River integrated rehabilitation will trigger the World Bank

policies for physical cultural resources OP/BP 4.11, and thus a Physical cultural resources management plan should be developed.

## **2. Current status of Physical Cultural Resources Protection**

It is observed that Xiyue Street is not located in the red line scope of the He River Integrated Rehabilitation Subproject (Guangming Bridge-Lingfeng Bridge) and Huang'ansi Flood Discharge Channel Rehabilitation Subproject. The old site of CCP Babu Special Branch is not within the construction red line of He River integrated rehabilitation subproject (Lingfeng bridge-Xiadao hydropower station), but it is in the vicinity of the construction red line of the project. Noise and odor generated by the Project will have some impacts on the physical cultural resources.

### **2.1 Xiyue Street Historical and Cultural Quarter**

#### **2.1.1 Status of planning**

Xiyue Street Historical and Cultural Quarter is located in the mid-southern urban area of Babu District and borders the old site of Pingle Special Administration to the west, Babu Bridge to the east, the Linjiang north shore to the south and the north border of Xiyue Street to the north. The Quarter covers three streets, namely, Xiyue Street, Shajie Lane and Hebian Lane and involves a planned area of protection of 5.17 ha. The core area of protection is 1.78 hectares, accounting for 34.43% of the preserved area, and the streets and lanes in the area have a full length of 509 m. In the historic and cultural quarter, there are six immovable historical relics including Babu Old River Bank, Yijing Bridge, Heweizhongjian Stone Wall, Tianyi Tobacco Shop, Qianji Pawnshop and Jiancheng Rice Shop and there are four recommended historic architectures. Land area occupied by traditional buildings, including the immovable cultural relics, historic buildings and traditional style buildings, accounts for 63.62% of the total area of the preserved zone. The scope of construction controlled area covers an area of about 3.39 ha. in total, extending from Babu Bridge to the east to Xiyue Garden to the west, from chicken wholesale market to the north and He River to the south.

#### **2.1.2 Current status of architecture protection**

Most of the existing buildings in Xiyue Street Historical and Cultural Quarter are buildings of one-story to four-stories and a few are modern buildings built in recent years. More than 38% of the buildings were built before the period of the Republic of China but well-preserved. 36% of the buildings can be traced back to the period from the 1950s to 1970s and the remaining 26% built after the 1980s. Most buildings in the quarter are brick-concrete structures, with a small portion of them frame or brick-wood structures. These buildings are generally well-preserved and only a tiny portion of them are dilapidated buildings and unapproved shanty houses. Buildings built for residential purposes and commercial & residential purposes respectively account for 55% and 45%

and are mainly located on both sides of Xiyue Street.

**Table 2-1 Catalog of Historical Buildings on Xiyue Street**

Name of buildings	Location	Protection nature	Usage	Year	Description	Characteristics and values	Current situation
Yijing Hotel	No.66 Xiyue street	Historical building	Commercial	the Republic of China era	A 3-storey brick-wooden structure with an area of 308.2 m <sup>2</sup> , the hotel used to be the gathering place for progressive activists during the period of Anti-Japanese war.		The building was already demolished prior to the application for Hezhou Historical and Cultural Quarter, and was reconstructed against the original architecture style in August 2016.
Tobacco company	No.71 and No.73 of Xiyue Street	Historical building	Commercial and residential	the Republic of China era	A 3-storey brick-wood structure with an area of 205.7 m <sup>2</sup> , the building was built as the site office of He County Tobacco company. It is a building overhang with 2 stories (with an attic on the second floor), two bays in the front and back, with flush-gable-roof and brick-wood structure, green brick walls and small tiles. The staircase is in the middle of the two buildings, with a patio for lighting. The front and rear façades are heavily decorated with beautiful western-style gray plasters.	It is among the few well-preserved representative buildings of commercial sector in Hezhou from late Qing dynasty.	Shop
Sino-Soviet	No.6	Historical	residential	the	A 3-storey brick-concrete	It is a building of	idle and uninhabited

Friendship Association	Shajie Street	building		Republic of China era	structure with an area of 664.1m <sup>2</sup> , the building has white walls and green tiles, with 5 pentagrams decorated on the wall. The association played a special role in promoting Sino-Soviet relations.	the specific historical period in Hezhou and a representative building in the historical period of the Republic of China.	
Pousutong	Xiyue Street	Historical building	residential	the Republic of China era	A 3-storey brick-wood structure with an area of 376.0m <sup>2</sup> , the building is located in No.33 Shajie Lane and nearby Sanban Bridge. It is a well-preserved architecture of the Republic of China era, where Ms He Xiangning used to live.	A representative building in the Republic of China era with value of historical research in the city development and lifestyle of urban residents in Hezhou.	idle and uninhabited
Yijing Bridge	East side of Sanban Bridge, Shajie Lane	Immovable cultural relics	transport	the Republic of China era	A stone masonry bridge that is about 20m long and 5.5 meters wide, the bridge was built in 1934 financed by Babu Chamber of Commerce and carries the inscribed text of Zhang Tingjian. It is an ancient stone bridge in Xiyue Street.		In normal service
Heweizhongjian stone wall	Xiyue Street	Immovable cultural relics	/	Qing Dynasty	The masonry wall of Heweizhongjian Stone Wall was built on 6 <sup>th</sup> of lunar January utilizing fund raised by the		Preserved as original

					squires for control floods of He River.		
Babu old embankment	Xiyue Street	Immovable cultural relics	Transport	the Republic of China era	370m long embankment along the left bank of He River, it was built with the funds raised by Shen Hongying during the Republic of China era. The entire river embankment is stacked with stones along the river.		Preserved as original
Tianyi Tobacco shop	No.23 Xiyue Street	Immovable cultural relics	Commercial and residential	the Republic of China era	IA 3-storey brick-wood structure covering an area of 665.1 1m <sup>2</sup> , the building adopt a flush-gable-roof and brick-wood structure of green brick walls. In 1948 it was established by underground communist party Fanglin branch to be the CCP underground communication station in Eastern Guangxi, functioning as the main communication station for Babu underground CCP groups during the era of the War of Liberation.	The building is the typical commercial and residential building of Hezhou during the specific period as well as the representative building during the Republic of China era.	The first floor is occupied as shops whilst the second and third floors are idle.
Qianji pawnshop	No.8 Shajie Lane, Xiyue	Immovable cultural relics	commercial	the Republic of China era	A 3-storey brick-wood structure covering a floor area of 529.7 m <sup>2</sup> , the building used to be a pawnshop run by Canton	It is among the few well-preserved representative	idle and uninhabited

	Street				merchants in Hezhou. At the main entrance it is featured with the plaque “Qianji pawnshop”. The windows of the building façade are specialized, with lacework on the mullion. The second floor is featured with a small attic of well-designed shape. The building is heavily decorated with a variety of decorations with western style. In the periphery of the buildings are mostly commercial houses.	buildings of commercial sector in Hezhou during the Republic of China era	
Jiancheng rice shop	No.10 Hebian Lane, Xiyue Street	Immovable cultural relics	residential	the Republic of China era	It is a 2-storey brick-and-wood structure covering an area of 243.1 m <sup>2</sup> . During the period of the Republic of China, it was a rice shop owned by Guangdong merchants in Hezhou. As a typical brick-wood building, the first floor has a masonry wall while the second floor has a façade mainly comprising of logs. At the entrance, there are 4 well-preserved steps.		idle and uninhabited

## **2.2 The old site of CCP Babu Special Branch**

### **2.2.1 History of the old site**

The old site of CCP Babu Special Branch is located within Xiadao Primary School of Xiadao Village, Etang Township. In 1945, the first CCP organization was established by the deputy secretary of Guangdong and Guangxi special branch. In the first lunar month in the next year, “Babu Special Branch” was established to manage the underground party affairs of Babu, Yongqing, Nanxiang, Guiling, Shatian, Hezhong, Linzhong, Pingguikuang and Zhongshan County. In those days, CCP Babu Special Branch organized teacher strikes of Zhongshan Normal School, Babu Wujie School and Babu Central School, which gave a heavy blow to local Kuomintang regime and influenced the local society deeply. As the critical base of patriotism events at that time, the old site of CCP Babu Special Branch has become the existing red culture heritage of Hezhou as well as the patriotism education base for the development of red culture tourism.

Xiadao Primary School was redeveloped on the basis of the ancient temple in 1943. the main school building is designed into a U-shaped plane with a north-facing gate and split into seven rooms (lobby in the middle, one office and two classrooms on each side. The office is right next to the hall). The buildings of the school are all multi-storied and the playground is about 100m long in the courtyard. The auditorium is located in the southern end.

### **2.2.2 Current status of the old site**

At present, the scope of Xiadao Primary School remains the same as before. A modernized 2-storey teaching building was built where the auditorium is located. The former teaching building was destroyed and only the gate was remained. To the west of the original site of the ancient temple is a newly established “CCP Babu Special Branch Memorial Hall” exhibiting the historical data of the branch. At present, the area from the old school gate to the Memorial has been preserved as the site of CCP Babu Special Branch. The Memorial has also been protected as the red patriotism education base though it was built as early as 1980s.

## **2.3 Graves nearby Changlong Village**

53 tombs of Changlong Village in the vicinity will be demolished in Project D-2: Central Axle Green Corridor Building Project.

## **3. Impacts on physical cultural resources**

### **3.1 Impacts on Xiyue Street Historical and Cultural Quarter**

According to this plan, the buildings and structures in the downstream cultural protection quarter will be preserved and a leisure circular corridor catering to the



quarter will be constructed in collaboration with the construction of composite mainstream dike of He River. The buildings and structures in the downstream cultural protection quarter will not be demolished and the only construction activity will be river dredging plus the indispensable restoration of damaged embankments. Meanwhile, for the flood drainage pump station at the estuary of Huang'ansi flood diversion channel, compound dike will be constructed for rehabilitation of the 1.2km long section of the existing preserved dike and glass gallery path will be constructed to protect the masonry embankment. A 120m-long section downstream of the estuary of Huang'ansi flood diversion channel is a part of the provincial-level protected historic quarter and a key object of protection. Therefore, the designed function of Huang'ansi flood diversion channel is flood discharge within the specified area and landscape sites, waterfront squares and garden paths among many other facilities will be constructed in the spacious floodplain on both banks.

The construction works nearby Xiyue Street should be designed in association with the local architecture style and effective measures for cultural relics protection shall be developed. Improperly designed construction measures under the Project are likely to result in irreversible consequences such as destroyed structure and contaminated and damaged cultural relics. (Details should be added according to the actual construction plan.)

### **3.2 Conclusions on the Impacts on the old site of the CCP Babu Special Branch**

The old site of CCP Babu Special Branch, located in Xiadao Primary School, is included in the scope of He River Integrated Rehabilitation subproject (from Guangming Bridge to Lingfeng Bridge). The former teaching building was destroyed and only the gate remains. To the west of the original site is a "CCP Babu Special Branch Memorial" built in the 1980s as one of the patriotism education bases in Hezhou. The proposed solution for the protection of the old site is to alter the dike design by replacing the original T-slope with a vertical retaining wall so as to shrink the scope of construction and avoid construction at the old site, which will be preserved by means of practical and effective measures. Improperly designed construction measures under the Project are likely to result in irreversible consequences such as destroyed structure and contaminated and damaged cultural relics.

### **3.3 Conclusions on the impacts on tombs nearby Changlong Village**

The tombs to be affected for land acquisition under the Project are in Changlong Village, most of which are monuments and tombs built over recent years.

- (1) Assistance from geomancers will be involved in siting of new tombs. If the new

- site belongs to a family member or close relative, then no fees will be rendered.
- (2) External assistance will be needed in digging the old tombs and changing the bone altars after the new tomb site is chosen; the affected household need to prepare wreath, joss paper needed for the day of tomb movement and provide meals to family members and relatives on that day.

During the interview, the resettlement consulting team learned that the villagers support the implementation of the project actively and are willing to relocate the tombs which are located within the scope of land acquisition. The compensation standards are also accepted.



Figure

1: Layout Map of Preservation Elements in Xiyue Street





Figure 2: Designed Red Line Map of Huang'ansi Flood Diversion Pump Station



**Figure 3: Designed Red Line Map of Binjiangnan Road**

## 4. Management Unit

The competent department of Xiyue Street Historical and Cultural Quarter is Hezhou Municipal Culture, Press, Publication, Radio, Film and TV Bureau (HCPPRFTB) and the daily management unit is Hezhou Municipal Committee for Protection and Management of Historical and Cultural City. In addition, the other relevant units include municipal PMO, the project owner, contractors and construction supervision unit.

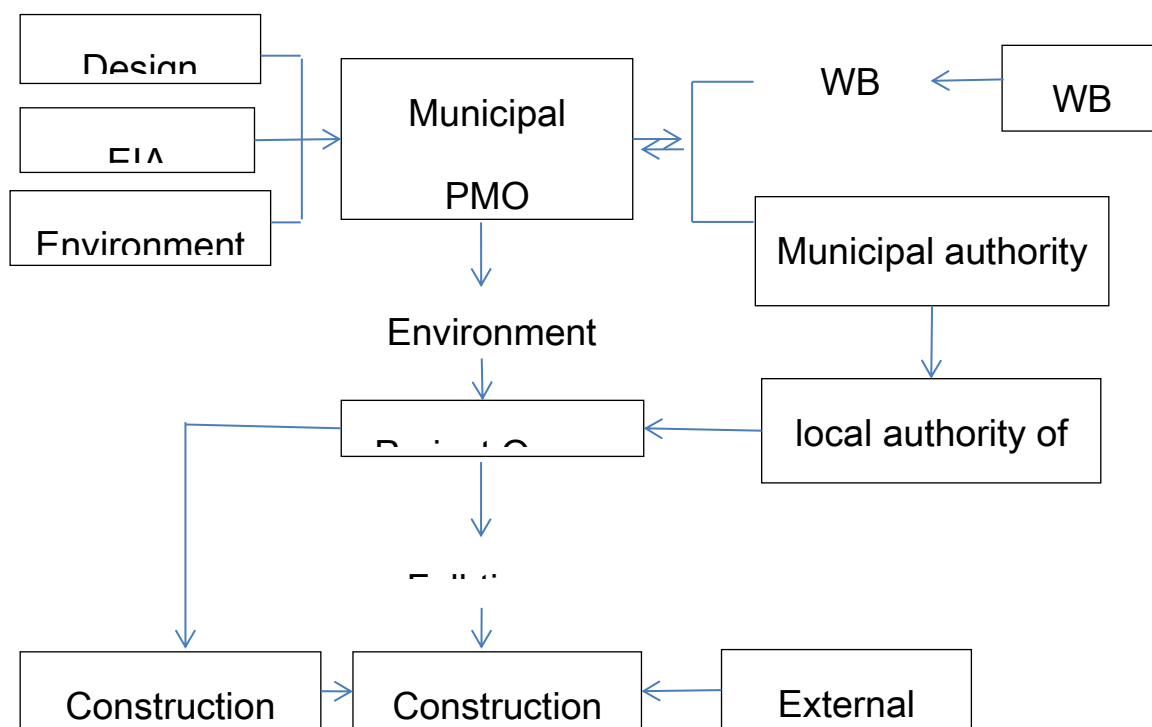


Figure 4.1-1 Organizational structure of the

**Table 4.1-1 Member Units of the Environmental Management System**

Nature of unit	Name of unit	Responsibilities
Management unit	Municipal PMO	To assign full-time environment management personnel to be responsible for environmental protection during the stages of project planning, design and implementation; to ensure the all the procedures conform to domestic and World Bank EIA and ESMP requirements and that all the environmental protection measures of ECOP are implemented smoothly.
	Project Owner	To assign full-time environment management personnel to ensure the effective implementation of environmental protection procedures during the stages of project implementation and operation so as to mitigate the adverse impacts of the project to the minimum or acceptable level and fully achieve the environmental benefits; responsible for

Nature of unit	Name of unit	Responsibilities
		funding the implementation of the environmental protection measures and preparation and archiving of relevant documents.
Supervision unit	WB mission	To assign an environmental specialist to monitor and inspect the implementation status of ECOP.
	Hezhou municipal Culture, Press, Publication, Radio, Film & TV Bureau	To perform the responsibilities of supervision and inspection as a governmental administration and supervision agency to ensure that the project procedures conform to the requirements of physical cultural resources management and to ensure that the pollution mitigation measures taken in the project implementation stage meet the needs of environmental protection of the cultural relics.
	Hezhou Municipal Committee for Protection and Management of Historical and Cultural City	To perform the responsibilities of supervision and inspection as the governmental department for administration of Xiyue street to ensure that the project procedures meet the requirements of physical cultural resources management of Xiyue street and the pollution control measures in the implementation stage meet the needs of environmental protection of the cultural relics on Xiyue street.
Implementation unit	Civil Works Contractor	To assign the site environmental engineers and implement the environmental protection measures as specified in the ECOP, meet the requirements of physical cultural resources protection of the World Bank and local competent department, develop and submit monthly environmental reports during construction period.
Consulting service unit	EIA consultant	To prepare the physical cultural resources management plan under the authorization of the project owner.
	Design consultant	To prepare FSRs and construction design schemes under the authorization of the project owner and ensure that the measures and schemes in the physical cultural resources management plan are incorporated into the deliverables.
	Engineering supervision unit	To inspect and manage the daily production activities of the construction unit under the authorization of the project owner.
	External monitoring unit	To inspect the implementation status of environmental protection measures in each subproject and carry out environmental monitoring activities during construction period under the authorization of the project owner.

## 5. Protection measures for avoiding or mitigating impacts

Xiyue Street is not located in the scope of the construction red line; for the old site of CCP Babu Special Branch in Xiadao Primary School, it is proposed to alter the dike

design by replacing the original T-slope with a vertical retaining wall so as to shrink the scope of construction and avoid construction at the old site.

Improperly designed construction measures under the Project are likely to result in irreversible consequences such as destroyed structure and contaminated and damaged cultural relics. Therefore, the following measures should be taken with particular importance in the construction activities involving Xiyue Street and the old site of CCP Babu Special Branch:

**(1) Protection Measures for the historical and cultural quarter of Xiyue Street**

- The project design must try to avoid the scope of application for national historical city and protection areas of Hezhou Municipality.
- Annex buildings and buildings to be built in the scope of application for national historical and cultural city of Hezhou Municipality shall have consistent style with the existing historical and cultural quarter of Xiyue Street.
- The original river dikes and ancient wharf will be preserved and antique leisure waterfront corridors will be constructed along the river bank to conceal all the sewers along the river and improve cityscape.
- Before entering the site, all construction workers shall be organized to study the Law on Cultural Relics Protection and local regulations on protection of cultural relics to increase the awareness of cultural relics protection as well as establish self-consciousness of historical heritage protection.
- Prior to the commencement of construction, the construction unit shall develop an effective cultural relics conservation plan in consultation with local cultural relics protection authority.
- Prior to the commencement of construction, a detailed construction scheme shall be developed. Signs should be erected on the construction sites to indicate the nature, importance, scope, and protection measures of the cultural relics among many other aspects as well as the contact persons and contact information of the cultural relics protection authority.
- Safety and stability of the cultural relics within the scope of the construction area shall be maintained. A sound safeguard system, operation procedures and work norms at the construction site shall be formulated in accordance with national laws, rules and regulations. All administrative requirements specified by management and operation units shall be followed to avoid possible damages or theft of cultural relics in the construction stage.
- Instead of using excavators and piling machines, manual excavation should be used as the major method for excavation within the scope of cultural relics protection to reduce the impacts of construction vibration on cultural relics.
- It is forbidden to set up construction camps and temporary topsoil stockpiling sites in the cultural relics protection area.
- It is forbidden to allow large vehicles and plants to enter the cultural relics protection area.
- The construction entity shall provide training on cultural relics protection to the construction workers so that they will stay away from the cultural relics as much



- as possible and avoid artificial damages to the cultural relics.
- In the construction stage, if any fossils, coins, valuable substances or cultural relics, ancient buildings structures and geological or other relics with archaeological value are excavated or discovered, the construction unit must suspend construction immediately, report to the supervision unit, the project owner and the local competent department of cultural relics protection and take effective protection measures on site. The construction shall not resume until an order of work resumption is received.
- The construction timing shall be arranged in a reasonable manner. The equipment with loud noise, strong impacts and vibration are prohibited to operate at nighttime (22:00 p.m. to 6:00 a.m.).
- The construction site shall be laid out in a reasonable manner in order to avoid excessively high noise level in some local areas.
- The construction site shall be equipped with temporary noise barrier (wall), to minimize the noise impacts on the residential area during construction.
- Knowledge of physical cultural resources shall be disseminated to advertise the historical, cultural and economic value of physical cultural resources to the residents of Xiyue Street to enable them to focus on long-term interests and, in particular, enable them to directly participate in the protection and management of physical cultural resources and formulation of protection laws, schemes, regulations among other works.

## **(2) Protection measures for the old site of CCP Babu Special Branch**

- Before the commencement of construction, the construction unit shall develop an effective old site conservation plan in consultation with local cultural relics protection bureau.
- Before entering the site, all construction workers shall be organized to study the Law on Cultural Relics Protection and local regulations on protection of cultural relics to increase the awareness of cultural relics protection as well as establish self-consciousness of historical heritage protection.
- Prior to the commencement of construction, a detailed construction scheme shall be developed. Signs should be erected on the construction sites to indicate the nature, importance, scope, and protection measures of the old site among many other aspects as well as the contact persons and contact information of the old site protection authority
- Safety and stability of the old site within the scope of the construction area shall be maintained. A sound safeguard system, operation procedures and work norms at the construction site shall be formulated and improved in accordance with national laws, rules and regulations. All administrative regulations of construction entity shall be complied with. During construction, the old site shall be protected exactly as it was and ensured to prevent from any damages or theft.
- Instead of using excavators and piling machines, manual excavation should be used as the major method for excavation within the scope of old site protection

- area to reduce the impacts of construction vibration on the old site.
- It is forbidden to set up construction camps and temporary topsoil stockpiling sites in the old site protection area.
- It is forbidden to allow large vehicles and plants to enter the old site protection area.
- The construction entity shall provide trainings on old site protection to the construction workers so that they will carry out construction works far away from the old site as much as possible, to avoid the occurrence of artificially damages to the old site.
- The construction entity shall provide training on old site protection to the construction workers so that they will stay away from the old site as much as possible and avoid artificial damages.
- In the construction stage, if any fossils, coins, valuable substances or cultural relics, ancient buildings structures and geological or other relics with archaeological value are excavated or discovered, the construction unit must suspend construction immediately, report to the supervision unit, the project owner and the local competent department of cultural relics protection and take effective protection measures on site. The construction shall not resume until an order of work resumption is received.

### **(3) Procedures for handling physical cultural resources discovered in the construction stage**

In accordance with Article 32 of the Law of the People's Republic of China on Cultural Relics Protection (April 24<sup>th</sup> 2015), "in the course of construction of a project or agricultural production, all units and individuals that discover cultural relics shall keep the scene intact and immediately report to the local administrative department for cultural relics; after receiving the report, the department shall, except under special circumstances, rush to the scene within 24 hours and put forth its proposals on the handling of the matter within seven days. The administrative department for cultural relics may report to and request the local people's government to inform the public security organ of the matter and to seek its assistance in keeping the scene intact; and where important cultural relics are discovered, the matter shall immediately be reported to the administrative department for cultural relics under the State Council, which shall put forth its proposal on the handling of the matter within 15 days after receiving the report.

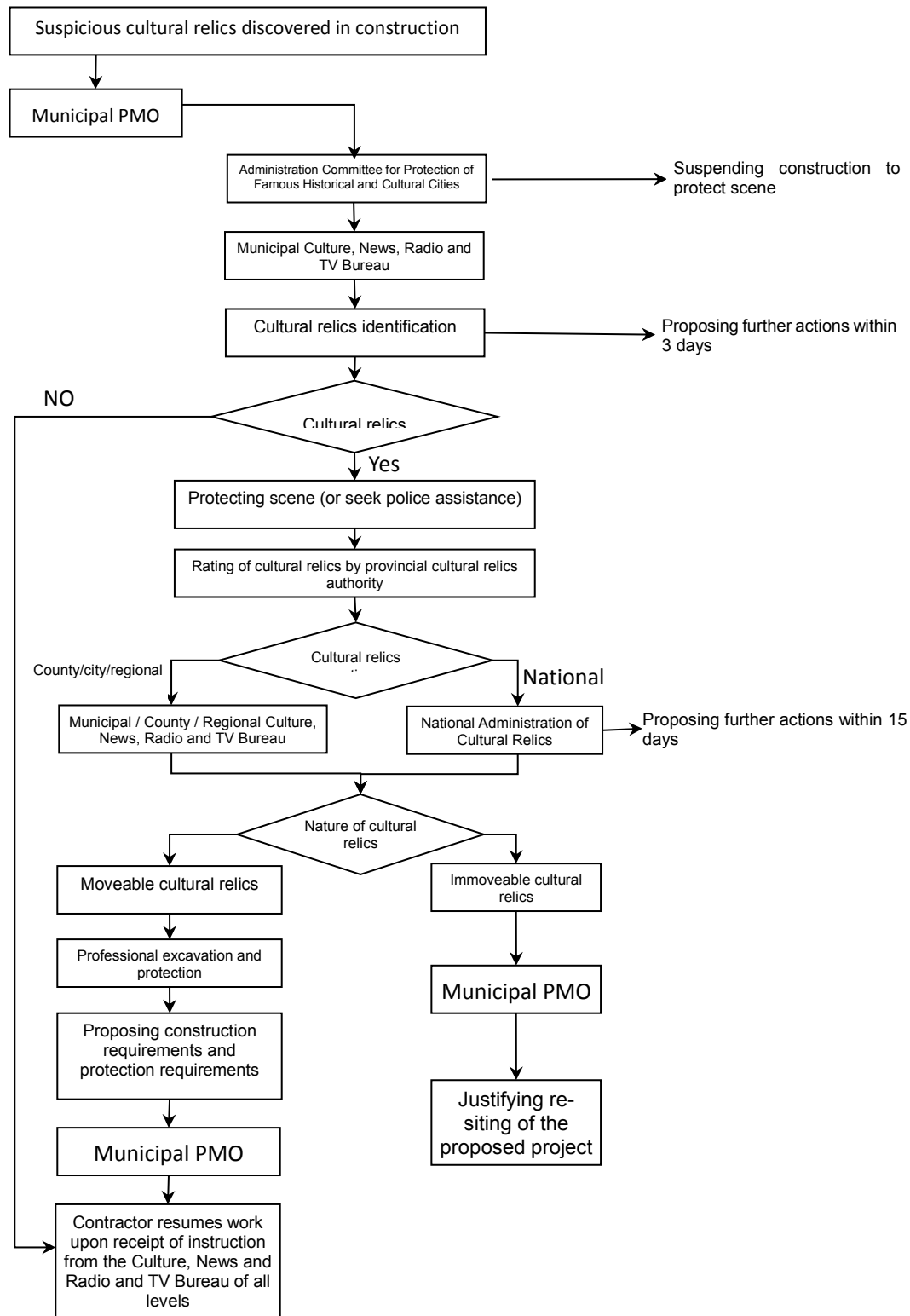
The cultural relics discovered in such a manner as mentioned in the preceding paragraph belong to the State, and no unit or individual may plunder, privately divide or conceal them."

Based on the aforesaid legal and regulatory requirements, this ECOP proposes the following management requirements on cultural relics discovered during construction:

If any cultural relics are discovered during construction, the construction works should be immediately suspended to protect the scene and a report should be immediately

delivered to the local cultural relics administration department. No further action taken should be taken without authorization. Upon receipt of the opinion of the cultural relics administration department on further action, the construction contractor should develop its construction program for the concerned section based on the opinion of the cultural relics administration department and should not resume the construction until a consent is obtained from the cultural relics administration department. No unit and individuals should continue the construction or carry out any production activities in the archaeological excavation area until such excavation is completed. No unit or individual should plunder, privately divide or conceal any cultural relics discovered during construction.

Figure 5-1 shows the procedure for handling cultural relics discovered in the construction stage.



**Figure 5-1** Flowchart for the Procedure of Handling Cultural Relics Discovered During Construction

## 6. Training

### (1) Training objects

Representatives of the PMO, project owner, supervision engineer and all subproject contractors

### (2) Training content

- Laws, regulations and theories on cultural relics protection;
- Relevant technical specifications and basic skills;
- Physical culture resources management plan;
- Environmental management regulations of the project, in particular, the environmental management regulations for the construction stage.

## 7. Environmental monitoring plan

Construction period: According to the construction contents, the physical cultural resources are not within the scope of construction red line. However, as it is located in the vicinity of the construction red line of the project, arrangements are made for noise and odor monitoring in the construction stage. Qualified supervision units will be engaged to carry out full-process supervision of the construction process, in particular, the protection status of physical cultural resources in Xiyue street Historical and Cultural Quarter. Hezhou Municipal Culture, Press, Publication, Radio, Film & TV Bureau and Hezhou Municipal Committee for Protection and Management of Historical and Cultural City are responsible for administrative supervision and inspection.

**Table 7-1 Environmental Monitoring Plan**

Period	Monitoring objects	Monitoring items	Monitoring spot	Monitoring frequency	Monitoring agency	Commission agency	Implementation standards and norms
Construction period	Ambient air	concentration of H <sub>2</sub> S、NH <sub>3</sub> and odor	Residential buildings on Xiyue Street	4 terms/year, 1 day/term, 4 times/day, throughout the whole construction period	Qualified monitoring agency	Construction unit	Hygienic standards for the design of industrial enterprises (TJ 36-79); maximum allowable concentration in residential areas; Emission standards for odor pollutants (GB14554-93)
	noise	dB (A)	Residential buildings	4 terms/year,	qualified monitoring	Construction unit	Acoustic Environmental

Period	Monitoring objects	Monitoring items	Monitoring spot	Monitoring frequency	Monitoring agency	Commission agency	Implementation standards and norms
			on Xiyue Street	2 days/term, twice/day (once each day and night), throughout the whole construction period.	agency		Quality Standard (GB3096-2008) Class II standard.

## Annex Table V : Checklist of Environmental Mitigation Measures for World Bank Financed Guangxi Hezhou Urban Water Infrastructure and Environment Improvement Project

Name of subproject:
Contract No. and Subproject Location
Name of construction site:
Current construction stage:
Date of environmental protection inspection:
Weather condition:
Checked by:

Item of inspection			Status of implementation			Note
Contents of inspection	Object of inspection	Environmental protection measures	Yes	No	N/A	
Construction of Civil works, transportation of construction materials and earthwork and stonework; construction of construction camps and access roads	Shangsong Village, dormitory buildings in the shantytown areas of Shangsong Village and Xiwan Village, residents of Xiwan Town, Pinggui District Government, Xizhaiwan, riverside residential buildings in Jinshuiwan Residential Block, Jigongzhou, Songmuji of Gonghe Village, Gongqiaotou, Longjiangdu, Hezhou Institute, Sanjia Village, Fanglin Street, Hezhou Experimental Middle School, Fanglin Village, Laozengwu, riverside residential buildings in Wenyanhuadu Residential Block, residential buildings at Xinaner Street in Babu District, residential buildings at Xiyue Street, Xialiang Village, Diandengzhai, Chushuitang, Xiadao Primary School, Xiadaozhai, Jichitan, residential buildings at Badaxi Road, Qianjin Road, Jianshezhong Road, Youxing Street, Xiyue Street and Wanquan Street, Zhushan Road, Longxing Street and Yinhe Street. Office building of Hezhou Land & Resources Bureau, office building and dormitory building of Guidong Electricity Bureau, residential buildings at Wangjiao Street, Jianshe Road, Longshan Road and Xingguang Road, shops and swimming pool of Hezhou Water Resources Bureau, residential buildings of Pinganxi Road, office building of Hezhou Health and Family Planning	Are the requirements included in the ECOP for the Embankment Construction Component of World Bank Financed Guangxi Hezhou Urban Water Infrastructure and Environment Improvement Project implemented?				

Item of inspection			Status of implementation			Note
Contents of inspection	Object of inspection	Environmental protection measures	Yes	No	N/A	
	Committee, office building and dormitory building of Hezhou Babu District Transportation Bureau, residential buildings at Jiangbeizhong Road, and residential buildings, construction sites and construction camps					
	Xianghuadao, residential buildings at Xiyue Street and Jiangbeizhong Road, dormitory buildings of Transportation Bureau, Pingjing, Lijiatang, Lining Village, Daninggang, Xiangjiayuan, Taipingzhai, Yingshi Primary School, Huangtian Town, Pinggui No. 3 Middle School, Douhang, Pengtanggang, Huangtian Town, Xinzhai, Huangtian Village, Muyuanna, Baijiazhai, Shizigang, construction sites and camps	Are the requirements included in the ECOP for the Small Waterworks Construction Component of World Bank Financed Guangxi Hezhou Urban Water Infrastructure and Environment Improvement Project implemented?				
	Residential buildings, construction sites and construction camps at Niupailan	Are the requirements included in the ECOP for the Road and Pipeline Network Construction Component of World Bank Financed Guangxi Hezhou Urban Water Infrastructure and Environment Improvement Project implemented?				
	Hezhou Institute, Hezhou Experimental Middle School, Xiadao Primary School, Pinggui No. 3 Middle School, Yingshi Primary School	Are temporary noise barriers with a height of no less than 2m and high efficiency of noise reduction erected around construction sites in the vicinity of schools? Are the construction activities scheduled in such a way that the school teaching time is avoided?				
Prevention and control of soil erosion	Construction area	Are structural measures for water and soil conservation taken in the construction areas according to the Water and Soil Conservation Program of the Project?				
	Construction area	Are planting measures taken in the construction areas according to the Water and Soil Conservation Program of the Project?				
	Temporary land occupation	Are structural measures for water and soil conservation taken in areas of temporary land occupation according to the Water and Soil Conservation Program of the Project?				
	Temporary land occupation	Are planting and restoration measures for water and soil conservation taken in areas of temporary land occupation according to the Water and Soil Conservation Program of the Project?				
	Borrow area, waste disposal site	Are structural measures for water and soil conservation taken in the borrow and waste soil disposal areas according to the Water and Soil Conservation Program of the Project?				
	Borrow area, waste disposal site	Are planting and restoration measures for water and soil				



Item of inspection			Status of implementation			Note
Contents of inspection	Object of inspection	Environmental protection measures	Yes	No	N/A	
		conservation taken in the borrow and waste soil disposal areas according to the Water and Soil Conservation Program of the Project?				
Watercourse widening, embankment construction and other water-related construction	Construction sites	Are the construction activities carried out where possible in the low-water season? and the construction time should be shortened, if possible, to reduce disturbances to water systems				
		Are the construction scope and construction time minimized during construction?				
		Is vegetation restoration carried out as soon as possible after the construction is ended to reduce impacts on the respective area?				
River dredging	Dredging sites, sludge transportation vehicles	Is information on the construction plan, the environmental impact descriptions and sludge transportation route disclosed in time to the public?				
		The dredging operation should be conducted in the low-water season and the construction time should be shortened, if possible, to reduce disturbances to water systems				
		Sludge is dewatered into sludge cakes with a moisture content of less than 50%, which are then transported in enclosed vehicles to Hezhou Municipal Domestic Solid Waste Landfill for disposal				
		Are construction plants involved in the dredging process subject to strict inspection to prevent oil leakage?				
		Are there behaviors of casting oily wastewater and solid wastes into the water systems?				
		Are respirators and other labor protection devices provided for construction workers?				
Sludge dewatering	Sludge dewatering site	Are flood interception ditches excavated around the temporary sludge storage tanks on the dewatering site and connected to the wastewater sedimentation tanks?				
		Are stormwater, tail water from sludge dewatering collected by the flood interception ditches discharged into the wastewater sedimentation tank for sedimentation before final discharge?				
		Is dewatered sludge transported out of site in a timely manner?				
		Are quick lime and deodorants provided for sterilization and				

Item of inspection			Status of implementation			Note
Contents of inspection	Object of inspection	Environmental protection measures	Yes	No	N/A	
		deodorization of the dewatering site?				
Construction activities involving cultural relics	Historical and cultural block of Xiyue Street, former site of CCP Babu Special Branch, tomb relocation involved in Changlong River Integrated Rehabilitation Component	Is the Project construction program approved?				
		Are the construction activities carried out in strict accordance with the requirements included in the Management Plan of Physical Cultural Resources for World Bank Financed Guangxi Hezhou Urban Water Infrastructure and Environment Improvement Project?				
Construction activities involving famous and ancient trees	4 banyan trees at Xialiangzhai, 2 hackberry trees, 1 banyan tree and 1 camphor tree at Jiangbeizhong Road, 3 camphor trees and 1 banyan tree at Xinaner Street, 1 camphor tree at Xiyue Street, 1 camphor tree at Jianshezhong Road and 1 camphor tree at Xinanyi Street	Are actions taken to narrow construction scope and shorten construction period as much as possible?				
		Are there behaviors of tree felling, unlicensed transplanting, bark peeling, root digging and injection of toxic and hazardous substances to trees?				
		Are there behaviors of constructing buildings or structures, laying pipelines, installing power cables, excavating borrow pits, mining sand and stone, flooding or sealing the ground, emitting fumes, discharging wastewater and dumping solid wastes, stockpiling or dumping flammables, explosives or toxic and hazardous substances in the area with a distance of less than 5m from the outer edge of the crown shadow of trees?				
		Are there behaviors of engraving, nailing, winding, hanging or supporting or stacking articles on or around tree trunks of ancient and famous trees?				
		Are construction vehicles and plants permitted to enter or roll the area with a distance of less than 5m from the outer edge of the crown shadow of trees?				
		Is the construction plan of construction activities with impacts on public transit submitted to the traffic police and transportation authorities and re-routing of public transit properly planned with a permit obtained before proceeding with such construction activities?				
Traffic organization and arrangement	Construction area, Hezhou Institute, Hezhou Experimental Middle School, Xiadao Primary School, Pinggui No. 3 Middle School, Yingshi Primary School, Fanglin Street, Tianchang Village	Is a bulletin board erected on the construction site before the construction works commences to introduce the project components and construction time and provide contact information and complaint hotlines?				
		Is prior announcement made via the news media, micro blog, WeChat, and similar platforms?				
		Are the construction works implemented on a section-by-				

Item of inspection			Status of implementation			Note
Contents of inspection	Object of inspection	Environmental protection measures	Yes	No	N/A	
		section or zone-by-zone basis and excavation and backfill carried out in the shortest possible time?				
		Are temporary access roads provided for construction works close to villages to minimize the use of and avoid damages by large plants and vehicles on the rural roads?				
		Is the traffic police mobilized and temporary signal lights and other signs provided for traffic diversion and dispatching during school peak hours?				
		Do Fanglin Street and Tianchang Village have transportation rerouting plans approved and road closure signs and rerouting signs erected by the traffic police authority during the rehabilitation of Fanglin Hydropower Station?				
Construction activities involving underground pipelines	Construction areas involving underground excavation	Has the contractor coordinated with municipal and urban development authorities to collect information of underground pipeline survey and learn about the layout of underground pipelines and established a pipeline coordination team?				
		Has prior approval obtained from municipal and urban development authorities for excavation interfering with underground pipelines?				
		Are construction plans and emergency response plans developed based on pipeline alignment and depth to avoid interference with existing underground pipelines?				
		Are the concerned authorities notified prior to the excavation of the particular construction location and schedule of excavation activities to get prepared for emergency responses?				
Construction activities involving railway lines	Intersections of Lining River and East No. 5 Branch Canal with Gui-Guang Express Railway	Are the construction program and the railway safety assurance measures approved by the competent railway administration authority?				
		Are the construction works implemented according to the construction program approved by the competent railway administration authority?				
Removal of sluice gates at Fanglin Hydropower Station	Non-irrigated land and paddy field in a total area of approximately 400mu for Tianchang Village, 200mu for Mintian Village and 1000mu for Fanglin Village	Is a small electrical irrigation station to be constructed as supplementary supply of irrigation water?				
Note: This table is the checklist for environmental protection inspections in the construction stage of Guangxi Hezhou Urban Water Infrastructure and Environment Improvement Project as a						

Item of inspection			Status of implementation			Note
Contents of inspection	Object of inspection	Environmental protection measures	Yes	No	N/A	
whole. Specific environmental protection measures for the specific subprojects and the specific local environmental condition may be added or adjusted if necessary.						