

AIB Loan Project

# **Henan Flood Emergency Rehabilitation and Recovery Project —Zhengzhou Component**

## **Dengfeng Ying River Flood Damage Reconstruction Subproject Environmental and Social Impact Assessment (ESIA) and Management Plan (ESMP)**

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## Abbreviations

AIIB	-	Asian Infrastructure Investment Bank
AH	-	Affected Household
AP	-	Affected Person
DCNRPB	-	Dengfeng City Natural Resources and Planning Bureau
DCWRB	-	Dengfeng City Water Resources Bureau
ESF	-	Environmental and Social Framework
ESS	-	Environmental and Social Standard
ESIA	-	Environmental and Social Impact Assessment
ESMP	-	Environmental and Social Management Plan
ESMPF	-	Environmental and Social Management Plan Framework
GRM	-	Grievance Redress Mechanism
HD	-	House Demolition
LA	-	Land Acquisition
LEF	-	Land-expropriated Farmer
M&E	-	Monitoring and Evaluation
MLS	-	Minimum Living Security
PMO	-	Project Management Office
PPM	-	Project-affected People's Mechanism
PRC	-	People's Republic of China
RAP	-	Resettlement Action Plan
RIB	-	Resettlement Information Booklet

## Units

Currency unit	=	Yuan (CNY)
1.00 yuan	=	\$0.15
1 hectare	=	15 mu

# 1 Foreword

On July 19, 2021, the Mount Song area experienced an extraordinary rainstorm, with the precipitation breaking the single-day record in observation history of 385mm. This rainstorm was intensive and lasting, and triggered a torrential flood quickly, which not only destroyed the banks, but also overflowed and destroyed some structures.

Due to this rainstorm, banks of 17.8km of the Ying River and 6 bridges were destroyed, the river's flood control system was seriously damaged, and its flood discharge capacity was further reduced. As the most important flood control and discharge river of Dengfeng City, the Ying River is the most important factor of the whole city's personal and property safety. Shidao Xiang, Dajindian Town, Donghua Town and Gaocheng Town along the Ying River were affected heavily, with a damaged cultivated area of 33,000 mu. Nearly 30% of the built-up area of Gaocheng Town was inundated, and nearly 45 enterprises were affected. Some existing dikes along the Ying River are damaged, and the submerged bridges connecting both banks still have safety risks, affecting the livelihood and production restoration of nearby residents seriously.

In order to thoroughly implement President Xi Jinping's important instructions on flood control and disaster relief, Premier Li Keqiang's speech during his visit to Henan, and the decisions and arrangements of the Henan Provincial Government on post-disaster reconstruction, the Zhengzhou Subproject under the AIIB Urgently Financed Henan Post-disaster Restoration Project (hereinafter, the "Project") was proposed. The Project will be of great significance for improving the emergency management capacity of the disaster-hit cities in Henan Province, protect the personal and property safety of the public, and maintain economic and social stability.

In order to restore the Ying River, and protect the personal and property safety of riverside and downstream residents, the Dengfeng City Government has decided to restore the 37km damaged segment of the Ying River from Shidao Xiang to Gaocheng Town, and improve its flood control standard. In January 2022, the Dengfeng City Development and Reform Commission approved the Feasibility Study Report of the Dengfeng Ying River Flood Damage Reconstruction Subproject (hereinafter, the "Subproject") under the Zhengzhou Subproject prepared by Ningxia Water Resources and Hydropower surveying, Design and Research Institute with Document DFGS [2022] No.1. According to the Feasibility Study Report of the Subproject, the Subproject consists mainly of river dredging, embankment restoration, bank slope protection and bridge restoration, including embankment restoration for 17.8km, bank slope protection for 29.388km, river dredging for 37.588km and restoration of 3 destroyed bridges.

The Subproject is of great significance for protecting people's property and personal safety, meeting their daily needs, and promoting the city's economic development: 1) As the most important flood control and discharge river of Dengfeng City, the Ying River is the most important factor of the whole city's personal and property safety. 2) The restoration of the Ying River will be significant for nearby residents' daily lives, water use and traffic. 3) Water and soil conservation will promote ecological restoration and beautification. 4) The Subproject will play a crucial role in building a good city image and promoting the city's economic development.

This report consists of the following chapters:

1. Foreword
2. Policies, Laws and Regulatory Framework
3. Project Description
4. E&S Baseline
5. ESIA and Mitigation Measures
6. Option Selection, and Climate Change and Response
7. Public Participation and Information Disclosure
8. Grievance redress
9. ESMP



## 2 Project Description

On July 19, 2021, the Mount Song area experienced an extraordinary rainstorm, with the precipitation breaking the single-day record in observation history of 385mm. This rainstorm was intensive and lasting, and triggered a torrential flood quickly, which not only destroyed the banks, but also overflowed and destroyed some structures. In this rainstorm, all rivers in Dengfeng City were damaged to varying degrees, especially the Ying River. Banks of 17.8km of the Ying River, and watercourses and riverbeds of 18km were destroyed, 19 bridges and 33,000 mu of farmland (10,000 mu with no harvest) damaged. Nearly 30% of the built-up area of Gaocheng Town was inundated, and nearly 45 enterprises were affected. Shidao Xiang, Dajindian Town, Donghua Town and Gaocheng Town along the Ying River were affected heavily, with direct financial losses of 95 million yuan.

In order to restore the Ying River, and protect the personal and property safety of riverside and downstream residents, the Dengfeng City Government has decided to implement the Subproject, which consists mainly of river dredging, embankment restoration, bank slope protection and bridge restoration, including embankment restoration for 17.8km, bank slope protection for 29.388km, river dredging for 37.588km and restoration of 3 destroyed bridges.

The Subproject will be implemented within the trunk stream of the Ying River in Dengfeng City only, involving no tributary. See Figure 2-1.



Figure 2-1 Range of the Subproject

### 2.1 River Dredging

The range of river dredging is the whole river segment of 37.588km, with a total amount of 1.41 million m<sup>3</sup>, including 1.14 million m<sup>3</sup> of sand and stone, and 270,000 m<sup>3</sup> of sludge. After dredging, longitudinal slope gradients will be 1/176~1/500, overall slope gradient 1/223, riverbed widths 29m~138m, and the slope gradients of both banks will be not less than 1:1.5.

#### 1) River dredging design

Natural cross sections of the Ying River in Dengfeng City are mostly irregular trapezoids. The revetments formerly renovated in Dajindian and Gaocheng Towns are outdated, and those

renovated in 2013 in Donghua Town are relatively regular. The main river channel is tens of centimeters deep, and flood land on both sides is varying in width and height, with an overall gradient of 1:224.3. Except the segment renovated in 2013 in Donghua Town, existing dikes and retaining walls on both sides are substandard and seriously damaged. In the Subproject, such measures as segment-by-segment diversion and excavation will be taken for dredging.

## 2) River centerline

The Ying River receives floods from the upstream mountain area mainly. Its centerline is fixed to coincide with the old river channel, be as straight as possible, and utilize existing slopes and hills where possible. After restoration, the centerline will be straight, and largely at the center of the trunk stream.

## 3) Shoreline arrangement

The shoreline will be arranged according to the river regime and largely parallel with the main flow of major floods. It will be arranged smoothly and gently without sharp turns, with minimum farmland occupation and house demolition, and being convenient for emergency flood control and engineering management. According to the practical situation, the shoreline will be mostly arranged on the edge of the river channel, mostly close to the existing banks, and away from existing villages, houses and extensive farmland.

## 4) Cross section

The existing channel of the Ying River mostly has a rectangular cross section formed by masonry retaining walls, and partly has a trapezoidal cross section. In the Subproject, for segments with houses, workshops and roads, retaining walls will be built to form a rectangular cross section, and the base of retaining walls will be protected. The cross section of the segment renovated in 2013 in Donghua Town (11+000-19+200) will remain unchanged, and this segment will be subject to deepening and dredging only.

## 2.2 Embankment Restoration

The damaged banks are about 17.8km long, and will be restored by backfilling with cobbles and loam soil. The locally damaged banks in Shidao Xiang and Dajindian Town will be restored, and the seriously damaged banks in the downstream Gaocheng Town segment (0+000~1+000) rebuilt. For banks with insufficient height in Donghua Town, wave walls will be added. After reconstruction, the existing tributary mouths will be kept and locally protected for a length of not more than 50m. The bank top width will be 4m, a 1:2.5 masonry slope set up on the waterfront side, and a 1:2 slope set up on the other side. Banks will be filled using the material from river dredging. Since there are cobbles and medium-fine sand on the riverbed, and silty loam on both banks, composite geomembrane (600g/m<sup>2</sup>) will be used for seepage prevention. See Figure 2-2.

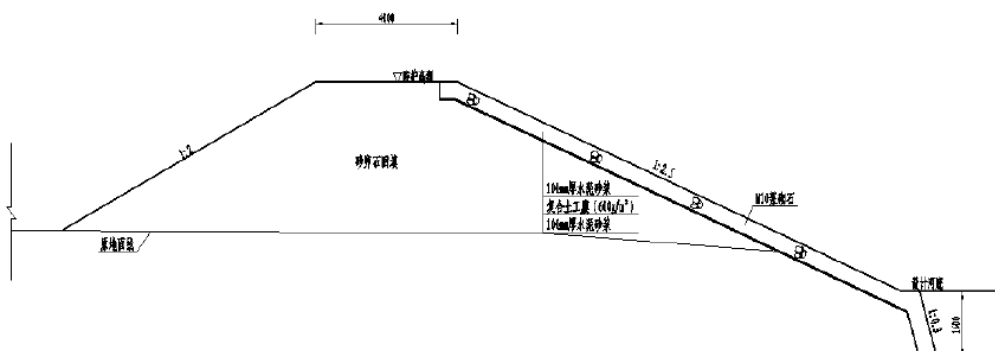


Figure 2-2 Typical Sectional View of Embankment

### 2.3 Bank Slope Protection

The bank slope protection length will be 29.388km, and masonry will be used mainly. The banks will be made into slopes with a gradient of not more than 1:1.5, with thicknesses of 0.3~0.45m, 0.3m~0.5m and 0.3m~0.6m, with a C20 concrete foundation. There is a PVC drain hole every 2m, and M10 masonry retaining walls on the top, with a parting length of not more than 10m. 0.5m thick PET net cages free from lead wires will be used for bottom protection, with tensile strength of 3.5KN and scouring resistance of 13m/s.

The slope top level is the design flood level + super-elevation in principle. See Figures 2-3 and 2-4.

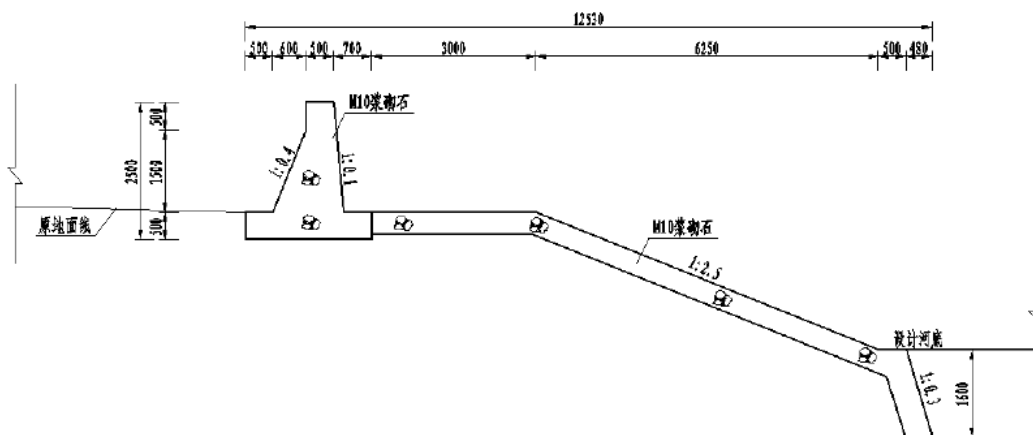


Figure 2-3 Typical Sectional View of Slope Protection (1)

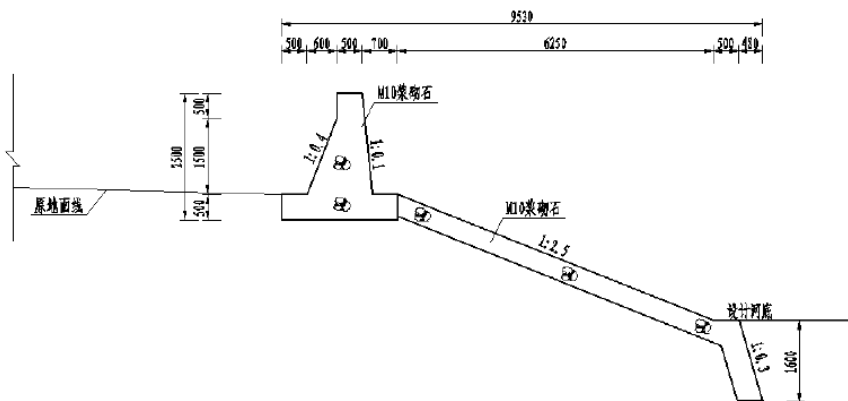


Figure 2-4 Typical Sectional View of Slope Protection (2)

### 2.4 Bridge Restoration

The submerged bridges damaged by this flood will be restored not lower than the original standard. The 3 seriously damaged submerged bridges will be rebuilt on their former sites using C25 reinforced concrete culverts, with 10m long upstream riverbed protection using 0.4m thick M10 masonry, and a 20m long downstream energy dissipating facility using a 0.64m thick M10 masonry absorption basin. The pavement is a layer of 0.24m thick C30 concrete, conforming to the Design Code for Cement Concrete Road Pavements (JTG D40-2011), with two ends connected to the existing road. See Table 2-1.

Table 2-1 Summary of Submerged Bridges for Restoration

No	Bridge	Pile No.	Number of bridge openings	Design bridge opening size
		km+m	/	m
1	Submerged bridge on Yudu Road	4+310	4	4x1
2	Submerged bridge south of Nandian Village	14+870	4	4x1
3	Submerged bridge south of Duancun Village	25+836	3	4x1

## 2.5 Construction Organization Design

### 2.5.1 Construction Diversion

The damaged submerged bridges will be subject to diversion design. The trunk stream of the Ying River (0+800~24+600) is designed to resist floods that occur every 20 years, with an embankment level of 4; the upstream segment (24+600) is designed to resist floods that occur every 10 years, an embankment level of 5.

Diversion includes cofferdam water retention and open canal diversion, where a cofferdam is set up on one side of the cross section of a submerged bridge, and an open canal set up on the other side for diversion. The cofferdam is a U-shaped earth cofferdam, with a top width of 1.5m, a height of 2m and a length of 75m, with a slope ratio of 1:1.5. A submerged pump is inside the cofferdam for drainage. The cofferdam is filled with earth from foundation pit excavation, where a 1m<sup>3</sup> excavator is used for earth excavation, a 74kW bulldozer for transfer for 60m and a 74kW tractor for compacting.

During bank slope protection and embankment restoration, a drain ditch will be dug in the middle of the river to reduce the groundwater level without diversion. The cofferdam is filled with earth from river dredging or open canal excavation, where a 1m<sup>3</sup> excavator is used for excavation, an 8t tipper for transfer for 0.5km, and a 74kW bulldozer for leveling and compacting. During demolition, a 1m<sup>3</sup> excavator is used for excavation, an 8t tipper for transfer for 2km to the temporary stockyard, and a 74kW bulldozer for cleanup.

### 2.5.2 Construction Progress

The construction process is divided into the planning stage, preparation stage, main construction stage and completion stage. The overall construction period is the sum of the latter 3 stages. Two neighboring stages can overlap.

#### 1) Planning stage

The planning stage is before the formal start of construction, when the owner is responsible for infrastructure construction, LAR, bidding, contract signing, etc. to create conditions for construction. This stage is not included in the overall construction period.

#### 2) Preparation stage

At the preparation stage, production and living facilities will be constructed to create conditions for construction. This stage lasts 0.5 month.

#### 3) Main construction stage

This stage is from the start of construction to the completion of construction, including earth and rock excavation and backfilling, concrete pouring, etc., and lasts 5 months.

#### 4) Completion stage

At this stage, the final inspection will be conducted. This stage lasts 0.5 month.

See Table 2-2.

Table 2-2 Master Construction Schedule

No.	Item	2022					
		March	April	May	June	July	August
I	Construction preparation						
1	Construction camp construction	—					
2	Construction road construction	—					
II	Main part construction						
1	River dredging		—————				
2	Embankment restoration		—————				
3	Submerged bridge restoration				—————		
II	Final inspection						—

### 3 Policies, Laws and Regulatory Framework

This report has been prepared in accordance with the applicable prevailing E&S laws and regulations of the PRC, local bylaws and regulations of Henan Province and Zhengzhou Municipality, relevant technical guidelines and standards, AIIB's ESF (amended in 2021), and the ESMPF disclosed in November 2021.

#### 3.1 Applicable E&S Laws and Regulations

- Environmental Protection Law of the PRC (January 1, 2015);
- Environmental Impact Assessment Law of the PRC (amended on December 29, 2018);
- Land Administration Law of the PRC (Amended) (January 1, 2020)
- Regulations on the Implementation of the Land Administration Law of the PRC (Order No.743 of the State Council) (September 1, 2021)
- Decision of the State Council on Deepening the Reform and Rigidly Enforcing Land Administration (SC [2004] No.28) (October 21, 2004)
- Guidelines on Improving Compensation and Resettlement Systems for Land Acquisition (MLR [2010] No.238) (November 3, 2004)
- Notice of the State Council on Intensifying Land Control (SC [2006] No.31) (August 31, 2006)
- Measures on Public Announcement of Land Acquisition (Order No.10 of the Ministry of Land and Resources) (January 1, 2002)
- Regulations on House Expropriation on State-owned Land and Compensation (Order No.590 of the State Council) (January 21, 2011)
- Notice of the Ministry of Natural Resources, Ministry of Agriculture and Rural Affairs, and National Forestry and Grassland Administration on Strictly Controlling Uses of Farmland (MNR [2021] No.166) (November 27, 2021)
- Clean Production Promotion Law of the PRC (July 1, 2012);
- Atmospheric Pollution Prevention and Control Law of the PRC (amended on October 26, 2018);
- Water Pollution Prevention and Control Law of the PRC (amended on June 27, 2017, effective from January 1, 2018);
- Ambient Noise Pollution Prevention and Control Law of the PRC (amended on December 29, 2018);
- Solid Waste Pollution Prevention and Control Law of the PRC (amended on April 29, 2020);
- Soil Pollution Prevention and Control Law of the PRC (August 31, 2018);
- Water and Soil Conservation Law of the PRC (March 1, 2011);
- Land Administration Law of the PRC (January 1, 2020);
- Cultural Relic Protection Law of the PRC (amended on November 5, 2017);
- Forest Law of the PRC (amended on December 28, 2019);
- Wild Animal Protection Law of the PRC (October 26, 2018);
- Work Safety Law of the PRC (2014);
- Occupational Disease Prevention and Control Law of the PRC (2011);
- Labor Law of the PRC (1995);
- Law on the Protection of Minors of the PRC (amended in 2020);
- Law on the Protection of Disabled Persons of the PRC (amended in 2018);
- Social Insurance Law of the PRC (amended in 2018);
- Urban and Rural Planning Law of the PRC (2015)

#### 3.2 Applicable E&S Bylaws and Policies

- Regulations on the Administration of Construction Project Environmental Protection (Order No.862 of the State Council, amended on July 16, 2017);
- Classified Administration Catalogue of Environmental Impact Assessment for Construction Projects (2021);
- Opinions on Further Strengthening Ecological Protection (MEP [2007] No.37);
- Interim Measures for the Review and Administration of the Total Emission Indicators of Key Pollutants for Construction Projects (MEP [2014] No.197);
- Notice on Further Strengthening the Administration of Environmental Impact Assessment and

- Preventing Environmental Risks (MEP [2012] No.77);
- Guide to the Drawing of Ecological Protection Redlines (MEPO [2017] No.48);
  - Catalogue for Guiding Industry Restructuring (2019);
  - Measures for Public Participation in Environmental Impact Assessment (Order No.4 of the Ministry of Ecology and Environment);
  - Regulations on Labor Protection at Workplaces with Toxic and Hazardous Substances (2002);
  - Interim Regulations on Salary Payment (1995);
  - Regulations on the Implementation of the Labor Law (2018)
  - Regulations on Environmental Protection for Construction Projects of Henan Province (2016.3.29);
  - Regulations on Water Pollution Prevention and Control of Henan Province (2019.10.1);
  - Regulations on Air Pollution Prevention and Control of Henan Province (2018.3.1);
  - Regulations on Solid Waste Pollution Prevention and Control of Henan Province (2012.1.1);
  - Notice of Zhengzhou City on Further Strengthening the Management of Urban Construction Waste Transfer Vehicles (2017);
  - 2022 Implementation Plan for Air, Water and Soil Pollution Prevention and Control of Henan Province (YHWP [2022] No.9);
  - Opinions on Strengthening the Social Stability Risk Assessment Mechanism for Major Decisions in the New Situation (2021)
  - Interim Measures of the National Development and Reform Commission on Social Stability Risk Assessment of Major Fixed Asset Investment Projects (NDRCI [2012]2492)
  - Notice of the General Office of the National Development and Reform Commission on Issuing the Outline for the Preparation of the Social Stability Risk Analysis Chapter and Assessment Report for Major Fixed Asset Investment Projects (Trial) (NDRCO [2013] No.428)
  - Notice of the General Office of the Henan Provincial Government on Deepening Social Stability Risk Assessment (HPGO [2010] No.14)
  - Opinions of the Henan Provincial Government on Complaint Assessment for Major Decisions concerning Public Interests (2007);
  - Notice of the General Office of the Henan Provincial Government on Regulating the Distribution and Use of Compensation for Acquired Collective Land(HPGO [2006] No.50);
  - Notice of the Henan Provincial Government on Adjusting Location-based Composite Land Prices of Henan Province (HPG [2016] No.48)
  - Regulations on House Expropriation on State-owned Land and Compensation (HPG [2012] No.39)
  - Opinions of the Henan Provincial Departments of Human Resources and Social Security, Finance, and Natural Resources on Subsidizing Land-expropriated Farmers for Basic Endowment Insurance (HPRSSD [2019] No.1)
  - Notice of the Henan Provincial Government on Issues concerning Location-based Composite Land Prices for Farmland (HPG [2020] No.16)
  - Notice of the Henan Provincial Departments of Human Resources and Social Security on Disclosing the Minimum Standard of Social Security Costs for Land-expropriated Farmers of 2021 (HPRSSDO [2021] No.49)
  - Notice of the General Office of the Henan Provincial Government on Policy Measures for Accelerating the Post-disaster Restoration of the Service Industry (HPGO [2021] No.64);
  - Notice of the General Office of the Henan Provincial Government on Issuing the Emergency Plan for Natural Disaster Relief of Henan Province (HPGO [2016] No.201)

### **3.3 Guidelines and Technical Standards**

- Technical guidelines for environmental impact assessment—General principles (HJ2.1-2016);
- Technical guidelines for environmental impact assessment—Atmospheric environment (HJ2.2-2018);
- Technical guidelines for environmental impact assessment—Surface water environment (HJ2.3-2018);
- Technical guidelines for environmental impact assessment—Sound environment (HJ2.4-2009)
- Technical guidelines for environmental impact assessment—Groundwater environment (HJ

610-2016);

- Technical guidelines for environmental impact assessment—Ecological impacts (HJ19-2011);
- Technical guidelines for environmental impact assessment—Soil environment (trial) (HJ964-2018);
- Technical guidelines for environmental risk assessment on construction projects (HJ/T169-2018)

### 3.4 AIIB's E&S Requirements

Since the Subproject will be funded by AIIB, AIIB's Environmental and Social Framework (ESF) applies to the Subproject. Its key elements are as follows:

- The Environmental and Social Policy (ESP), Environmental and Social Standards (ESSs), and Environmental and Social Exclusion List: The ESP specifies the compulsory requirements for the identification, assessment and management of E&S risks and impacts of AIIB-funded projects.
- ESS1: It aims to ensure the project's E&S soundness and sustainability, and include E&S factors in project decision-making and implementation. If the project may have adverse environmental or social risks and impacts (or both), ESS1 will apply. The scope of E&S assessment and management measures are proportional to the project's risks and impacts. ESS1 provides high-quality E&S assessment and management through effective mitigation and monitoring measures during project implementation.
- ESS2: If the project screening process shows that the project involves involuntary resettlement (including near-term or foreseeable involuntary resettlement directly related to the project), ESS2 will apply. Involuntary resettlement includes physical displacement (relocation, loss of residential land or housing) and economic displacement (loss of land or access to land and natural resources; loss of assets; loss or income sources or livelihoods) for the following reasons:(a) involuntary land acquisition; and (b) involuntary restriction on land use or access to legally designated parks and protected areas, whether such loss or involuntary restriction is whole or partial, permanent or temporary. ESS2 identifies detailed requirements for resettlement planning of projects involving involuntary resettlement.
- ESS3: If indigenous peoples (ethnic minorities) are found in or attached to the project area, and are likely to be affected by the project, ESS3 will apply.

### 3.5 Applicable Assessment and Emission Standards

- Ambient air: Class II in the Ambient Air Quality Standard (GB3095-2012);
- Surface water environment: Class III in the Environmental Quality Standard for Surface Water (GB3838-2002);
- Sound environment quality: Class II in the Environmental Quality Standard for Noise (GB3096-2008);
- Groundwater environment: Class III in the Quality Standard for Groundwater (GB/T14848-2017);
- Air during construction: Class II in the Integrated Emission Standard for Air Pollutants (GB16297-1996);
- Noise during construction: standard limit in the Emission Standard of Environment Noise for Construction Site Boundaries (GB12523-2011);
- Domestic wastewater during construction: utilized comprehensively without discharge;
- Ordinary solid waste: Standard for Pollution Control on General Industrial Solid Waste Storage and Land-filling (GB18599-2020)

AIIB's ESF (amended in 2021) requires that the project should follow pollution control techniques in international good practices, such as the World Bank Group's Environmental, Health and Safety Guidelines<sup>1</sup>. Therefore, international and domestic standards which are more stringent will apply to the Subproject.

#### 3.5.1 Environmental Quality Standards

- 1) Air quality

<sup>1</sup> <http://www.ifc.org/ehsguidelines>



The Ambient Air Quality Standard (GB3095-2012) divides air quality into two classes. The Class I standard applies to natural reserves, environmental sensitive areas and other special areas, and the Class II standard applies to all other areas, including urban and industrial areas. The subproject area is a Class II air quality functional area. The World Bank Group's Environmental, Health and Safety Guidelines are based on the WHO's Global Air Quality Guidelines<sup>2</sup>, which provide guidance on thresholds and limits of key air pollutants that constitute health risks. Except the guiding values, the WHO Global Air Quality Guidelines also specify temporary targets that promote the gradual shift from higher levels to lower ones. Table 2-1 compares the Class II standard of the Ambient Air Quality Standard (GB3095-2012) with the WHO's standard. The Class II limit of 24-hour SO<sub>2</sub> (0.15 mg/m<sup>3</sup>) in the Ambient Air Quality Standard (GB3095-2012) is higher than the upper limit of the World Bank Group's temporary standard (0.125mg/m<sup>3</sup>), while the 24-hour PM<sub>10</sub> (0.15 mg/m<sup>3</sup>) and PM<sub>2.5</sub> (0.075 mg/m<sup>3</sup>), and annual average NO<sub>2</sub> (0.04 mg/m<sup>3</sup>) and PM<sub>2.5</sub> (0.035 mg/m<sup>3</sup>) are the same as the upper limits in the temporary standard of the WHO. In general, the Chinese standard is highly equivalent to the WHO's guidelines or temporary target values, so the Class II standard in the Ambient Air Quality Standard (GB3095-2012), and the WHO upper limit for 24-hour SO<sub>2</sub> apply to the Subproject.

Table 3-1 Comparison between GB3095-2012 and the WHO's Global Air Quality Guidelines(unit: mg/m<sup>3</sup>)

No.	Item	Average interval	GB3095-2012 Class 2	WHO's Global Air Quality Guidelines	
				Temporary target	Target
1	SO <sub>2</sub>	1 year	0.06	Not applicable	Not applicable
		24 hours	0.15	0.05-0.125	0.04
		1 hour	0.50	Not applicable	Not applicable
2	PM <sub>10</sub>	1 year	0.07	0.02-0.07	0.015
		24 hours	0.15	0.05-0.15	0.045
3	PM <sub>2.5</sub>	1 year	0.035	0.01-0.035	0.005
		24 hours	0.075	0.025-0.075	0.015
		1 hour	Not applicable	Not applicable	Not applicable
4	NO <sub>2</sub>	1 year	0.04	0.02-0.04	0.010
		24 hours	0.08	0.05-0.12	0.025
		1 hour	0.20	Not applicable	Not applicable
5	CO	24 hours	4.0	7.0	4.0
		1 hour	10.0	Not applicable	Not applicable
6	O <sub>3</sub>	Max. 8 hours per day	0.16	0.12-0.16	0.10
		1 hour	0.20	Not applicable	Not applicable

Source: WHO's Global Air Quality Guidelines (2021) and the Chinese national standard GB3095-2012

## 2) Sound environment

The Environmental Quality Standard for Noise (GB3096-2008) defines 5 noise levels (0-4) based on tolerance to noise pollution, where Class 0 applies to areas requiring particular quietness, such as recuperation areas, Class 1 applies to residential areas, hospitals and clinics, educational institutions and research areas, Class 2 applies to mixed residential and commercial areas, Class 3 applies to industrial and logistics areas, and Class 4 applies to areas adjacent to major roads and expressways, and is subdivided into 4a and 4b, where the former applies to road traffic noise, and the latter to railway noise. According to the Technical Specifications for Functional Regionalization of Environmental Noise (GB/T15190-2014), and Environmental Quality Standard for Noise (GB3096-2008), the Class II standard in the Environmental Quality Standard for Noise (GB3096-2008) applies to the assessed area.

The standards for different areas are the same as the Class 1 noise standard values in the World Bank Group's Environmental, Health and Safety Guidelines, Environmental Quality Standard for Noise (GB3096-2008) in Table 3-2; for industrial areas and areas adjacent to major roads, the domestic standard is more stringent than the World Bank Group's standard. The subproject area is a Class 2 area, and the World Bank Group's Environmental, Health and Safety Guidelines apply.

<sup>2</sup> <https://www.who.int/zh/news-room/questions-and-answers/item/who-global-air-quality-guidelines>

Table 3-2 Environmental Quality Standard for Noise (LAeq: dB)

Category of noise functional area	Applicable areas	GB3096-2008		AIB's Environmental, Health and Safety Standard	
		Daytime	Night	Daytime	Night
0	Areas requiring particular quietness	50	40	55	45
1	Residential areas, educational institutions, etc.	55	45		
2	Mixed residential and commercial areas	60	50		
3	Industrial areas	65	55	70	70
4a	Areas adjacent to major roads	70	55		

## 3) Surface water

For the Ying River, the Class III standard in the Environmental Quality Standard for Surface Water (GB3838-2002) applies.

Table 3-3 Applicable Environmental Quality Standard for Surface Water

Standard	Item	Limited
Class III standard in the Environmental Quality Standard for Surface Water (GB3838-2002)	pH	6~9 (dimensionless)
	COD	20
	BOD <sub>5</sub>	4
	Ammonia nitrogen	1.0
	Petroleum	0.05

## 4) Soil environment

The risk screening values for other soil in Table 1 of the Soil Environment Quality—Risk Control Standard for Farmland Soil Pollution (Trial) (GB15618-2018), and those for Type 2 land in the Soil Environment Quality—Risk Control Standard for Construction Land Soil Pollution (Trial) (GB36600-2018) apply. See Tables 3-4 and 3-5.

Table 3-4 Risk Screening Values for Farmland Soil Pollution (basic items) unit: mg/kg

No.	Item*	Risk screening value				
		≤5.5	5.5<pH≤6.5	6.5<pH≤7.5	pH>7.5	
1	Cadmium	Paddy fields	0.3	0.4	0.6	0.8
		Other	0.3	0.3	0.3	0.6
2	Mercury	Paddy fields	0.5	0.5	0.6	1.0
		Other	1.3	1.8	2.4	3.4
3	Arsenic	Paddy fields	30	30	25	20
		Other	40	40	30	25
4	Lead	Paddy fields	80	100	140	240
		Other	70	90	120	170
5	Chromium	Paddy fields	250	250	300	350
		Other	150	150	200	250
6	Copper	Paddy fields	150	150	200	200
		Other	50	50	100	100
7	Bromium	60	70	100	190	
8	Zinc	200	200	250	300	

Note: Heavy metals and metalloid arsenic are counted as the total amount of the element: For paddy-upland rotation land, the more stringent risk screening value applies.

Table 3-5 Risk Screening Values for Construction Land Soil Pollution, unit:mg/kg

No.	Pollution factor	Class 2 land
1	Arsenic	60
2	Cadmium	65
3	Copper	18000
4	Lead	800

5	Mercury	38
6	Bromium	900
7	Hexavalent chromium	5.7
8	Carbon tetrachloride	2.8
9	Chloroform	0.9
10	Chloromethane	37
11	1,1-dichloroethane	9
12	1,2-dichloroethane	5
13	1,1-dichloroethylene	66
14	Cis-1,2-dichloroethylene	596
15	Trans-1,2-dichloroethylene	54
16	Dichloromethane	616
17	1,2-dichloropropane	5
18	1,1,1,2-tetrachloroethane	10
19	1,1,2,2-tetrachloroethane	6.8
20	tetrachloroethylene	53
21	1,1,1-trichloroethane	840
22	1,1,2-trichloroethane	2.8
23	Trichloroethylene	2.8
24	1,2,3-trichloropropane	0.5
25	Vinyl chloride	0.43
26	Benzene	4
27	Chlorobenzene	270
28	1,2-dichlorobenzene	560
29	1,4dichlorobenzene	20
30	Ethylbenzene	28
31	Styrene	1290
32	Methylbenzene	1200
33	M-xylene + p-xylene	570
34	O-xylene	640
35	Nitrobenzene	76
36	Aniline	260
37	2-chlorophenol	2256
38	Benzo[a]anthracene	15
39	Benzo[a]pyrene	1.5
40	Benzo[b]fluorathene	15
41	Benzo[k]fluorathene	151
42	Chrysene	1293
43	Dibenz[a,h]anthracene	1.5
44	Indeno[1,2,3-cd]pyrene	15
45	Naphthalene	70

### 3.5.2 Pollution Discharge Standards

#### 1) Air pollutants

The Class II standard in the Integrated Emission Standard for Air Pollutants (GB16297-1996) will apply.

Table 3-6 Integrated Emission Standard for Air Pollutants

Pollution	Monitored concentration limit for unorganized emission, mg/m <sup>3</sup>
Particles	1.0

#### 2) Noise

The Emission Standard of Environment Noise for Construction Site Boundaries (GB12523-2011) applies. In addition, the World Bank Group's Environmental, Health and Safety Guidelines require that the background noise gain at the closest receiving point out of the site should not exceed 3dB.

Table 3-7 Noise Limits of Construction Activities(unit: Leq [dB(A)])

Stage	Main noise sources	Noise limit	
		Daytime	Night
Construction	Bulldozers, excavators, loaders, pile drivers, concrete mixers, vibrators, electric saws, lifts	70	55

3) Wastewater discharge

All wastewater will be utilized comprehensively without discharge.

4) Solid waste

For solid waste, the Standard for Pollution Control on General Industrial Solid Waste Storage and Land-filling (GB18599-2020) applies.

### 3.6 Associated Facilities

According to the ESMPF for the Project, an “associated facility” means an activity not included in the project description in the project management agreement, but is inherently connected to the project, and identified after consultation between AIIB and the Dengfeng PMO. The key principles for identification are: (a) being directly and substantially related to the project; (b) being implemented or planned along with the project; and (c) being feasibly necessary for the project, and would not be constructed or expanded without the project.

The Subproject is located in Shidao Xiang, Dajindian Town, Donghua Town and Gaocheng Town, Dengfeng City, and consists mainly of river dredging, embankment restoration, bank slope protection and bridge restoration. The objective of the Subproject is to repair damaged banks, bridges and other structures, restore the river and ensure its safety, and protect the personal and property safety of riverside and downstream residents. The Subproject does not involve any of the above 3 principles. The Subproject is not subject to any other project, will function immediately after completion, and will not affect the surrounding environment and the public adversely.

## 4 E&S Baseline

### 4.1 Regional Background

#### 4.1.1 Geographic Location and Administrative Division

Dengfeng City is located in central northern Henan Province, in the upper reaches of the Ying River southwest of the provincial capital Zhengzhou Municipality, 80km away from Zhengzhou, between east longitude 112°43'~113°13' and north latitude 34°16'~34°35', with a land area of 1220km<sup>2</sup>.

#### 4.1.2 Topography and Geomorphology

Dengfeng City is located on the south piedmont of Mount Song, and has a mix of terrains, including mountains, hills, plateaus, basins and valley plains.

#### 4.1.3 Soil

Local soil is roughly divided into brown soil, cinnamon soil and aquic soil. Brown soil is found in mountain land with an altitude of over 800m and a gradient of over 30°, with steep mountains, cliffs, a wet climate and a diverse vegetation; cinnamon soil is found in low hills with an altitude of 200~800m; aquic soil is found in alluvial plains and swales.

#### 4.1.4 Climate

Dengfeng City has a warm temperate semi-wet continental monsoon climate, dry and cold in winter, hot and rainy in summer, dry and windy in spring, and cool and sunny in winter, with distinct seasons, and an annual average air temperature of 14.5°C, being 0.9°C in January and 26.4°C in July, an annual average air pressure of 966.6hpa, an annual average relative humidity of 60%, and an annual average rainfall of 604.6mm, where rainfall occurs in June-September mainly.

#### 4.1.5 Geology

Local geological structures are mostly fractures with developed folds, which are located in an open valley formed by structures. Mount Song is a faulted block folded mountain composed of pre-Sinian old schists, gneiss and quartz rock, and looks steep and grand.

Mount Song is located on the south edge of the north China platform and the southeast of the Songji anteklise, with a clear sequence of strata, with a complete basement and a complete capping formation. Mount Song's basement is composed of folds, followed by faults. Magmatic rock in this area is mostly archeozoic metadiorite.

The basement of this area is stable, with a seismic intensity of below VI.

#### 4.1.6 Surface Water

Dengfeng City is located in a low hilly area, and most rivers are intermittent, seasonal rivers, including the Ying, Shuangji, Sui, Wei, Xi'er and Kuang Rivers, falling into the Huai and Yellow River basins.

The Ying River originates from Lijiagou, Shidao Xiang, flows eastward through Junzhao, Shidao, Dajindian, Donghua and Gaocheng, and enters the Baisha Reservoir in Majiazhai before entering Yuzhou City and finally entering the Huai River in Zhengyangguan, Anhui. The Ying River has a full length of 557km and a catchment area of 39,890km<sup>2</sup>. The stretch in Dengfeng City is 57km long and 20-300m wide, with a catchment area of 1,037.5km<sup>2</sup>. It has a normal discharge of 0.3~0.5 m<sup>3</sup>/s, and would dry out in serious droughts. The main tributaries of the Ying River in Dengfeng City include the Hou, Gujia, Shizong, Shaoyang, Wangtang, Baiping, Wudu and Mayu Rivers.

The Shaoxi River (Shaolin River) is located left of the trunk stream of the Ying River, and originates from the north piedmont of Mount Shaoshi, with a catchment area of 121.6km<sup>2</sup>, a full length of 24.1km, in which the urban stretch is 3.0km long, and an average width of 70m. It is a seasonal river with an annual average discharge of 0.05m<sup>3</sup>/s.

The Shuyuan River (Shuangxi River) is located left of the trunk stream of the Ying River, and originates from the south piedmont of Mount Taishi, with a full length of 14km, in which the urban stretch is 5.0km long, and an average width of 60m. It is a seasonal river with an annual average discharge of 0.05m<sup>3</sup>/s.

The Baijiang River (Baiping River) originates from the Xionshan Mountain, with a full length of 14.9km, a catchment area 64.6km<sup>2</sup> and an annual average discharge of 0.05m<sup>3</sup>/s.



Figure 4-1 Water System Map of Dengfeng City

#### 4.1.7 Groundwater

Dengfeng City's strata consist of a quaternary residual slope capping formation, and carboniferous and cambrian Fengshan and Changshan bedrock. Groundwater includes karst fissure water in carbonatite mainly, from atmospheric rainfall mainly, and valley phreatic water from loose rock, from surface water seepage mainly, with burial depths of 5~30m.

#### 4.1.8 Water Resources

In 2019, Dengfeng City had a total water resource of 111.45 million m<sup>3</sup>, including 48.58 million m<sup>3</sup> of surface water and 84.32 million m<sup>3</sup> of groundwater, including an overlap of 21.45 million m<sup>3</sup>. In 2019, the city's total water supply was 146.29 million m<sup>3</sup>, including 49.55 million m<sup>3</sup> of surface water, 64.26 million m<sup>3</sup> of groundwater, and 32.48 million m<sup>3</sup> of other water (recycled wastewater and rainwater). In 2019, Dengfeng City's total water consumption was 146.29 million m<sup>3</sup>, including domestic water consumption of 41.8 million m<sup>3</sup>, agricultural water consumption of 21.93 million m<sup>3</sup>, industrial water consumption of 55.22 million m<sup>3</sup> and ecological water consumption of 27.34 million m<sup>3</sup>.

#### 4.1.9 Animal and Plant Resources

Dengfeng City is on south edge of the north warm temperate zone, and belongs to the Holarctic floral region and China-Japan floral sub-region, where natural forest vegetation includes 5 types (temperate coniferous forests, broadleaved deciduous forests, shrubs, alpine meadows and bamboo forests) and 31 formations. Artificial forest vegetation includes 19 formations. The city has 1,707 vascular plant species in 760 genera in 168 families, including 81 pteridophyte species in 36

genera in 21 families, 50 gymnosperm species in 18 genera in 8 families and 1576 angiosperm species in 706 genera in 139 families, including 1,824 glasshouse plant species in 826 genera in 180 families.

The fauna of the subproject area is within the loess hill sub-region of the Palearctic region, northeast sub-region and north China region. Due to its complex topography, lush forests and diverse environment, animal resources are rich. There are 278 known wild vertebrate species here, mainly including cattle, horse, donkey, goat, rabbit, and other domestic animals, and wild beasts like weasel, hedgehog and wild rabbit.

#### 4.1.10 Water Loss and Soil Erosion

According to the Standard for Classification And Gradation of Soil Erosion (SL190-2007), the type of local soil erosion is water erosion, with an allowable soil loss of 200t/(km<sup>2</sup>·a). In the national water and soil conservation regionalization, Dengfeng City is in the Mount Funiu mountain-hill water and soil conservation zone (III-6-2th) in the western Henan mountain-hill sub-region (III-6) in the north earth-rock mountain region (III). In the water loss and soil erosion prevention regionalization, Dengfeng City is in the Mount Funiu-Mount Zhongtiao state-level key control zone.

## 4.2 Socioeconomic Baseline

The Subproject involves Gaocheng Town, Donghua Town, Dajindian Town and Shidao Xiang in Dengfeng City. Among the 4 affected townships, Shidao Xiang has the largest cultivated area and less industrial enterprises; both Gaocheng and Donghua Towns have an industrial park (both belonging to Dengfeng Circular Economy Industrial Park), and Dajindian Town has Dengfeng High-tech Industrial Park. The industrial park in Gaocheng Town has composite material, hard material and refractory material enterprises mainly; the industrial park in Donghua Town has building material, hard material and refractory material enterprises mainly. The key pollutants of these enterprises are particulate matter and smoke, and there is almost no industrial wastewater. Dengfeng High-tech Industrial Park makes high temperature components and new materials made from tungsten and molybdenum mainly, and has 19 enterprises above designated size, and their key pollutants are particulate matter and volatile organic compounds.

In terms of fiscal revenue, Gaocheng Town has the highest general public budgetary revenue, which accounts for 4.4% of that of Dengfeng City, and Dajindian Town has the lowest. The disposable income of rural residents of Gaocheng Town is slightly higher than the average of Dengfeng City (20,217 yuan), and that of the other 3 townships is lower than the city average.

Table 4-1 Key Indicators of Economic and Social Development of the Subproject Area (2020)

City / township	Land area (km <sup>2</sup> )	Cultivated area (km <sup>2</sup> )	Industrial enterprises above designated size	Disposable income of rural residents(yuan )	General public budgetary revenue (00m yuan)	Fiscal revenue /public budgetary revenue (%)
<b>Dengfeng City</b>	1216.8	398.57	229	20217	29.4	---
<b>Gaocheng Town</b>	72.82	30.02	29	20531	1.28	4.4%
<b>Donghua Town</b>	82.71	30.88	21	7383	0.46	1.6%
<b>Dajindian Town</b>	114.44	34.69	19	19626	0.25	0.9%
<b>Shidao Xiang</b>	102.7	36.47	8	6500	0.3	1.02%

Source: local statistical yearbooks or national economic and social development reports collected by the task force

### 4.2.1 Demographics

At the end of 2020, the city's registered population was 731,800, including 368,600 males, accounting for 50.37%; and 357,900 females, accounting for 49.63%, with a gender ratio of 103:100;

an agricultural population of 308,800, accounting for 42.2%; a nonagricultural population of 423,000, accounting for 58.24%. Population density was 600/km<sup>2</sup>.

At the end of 2020, Gaocheng Town had a registered population of 61,000, including 38,100 males, accounting for 50.9%, and 36,800 females, accounting for 49.09%, with a gender ratio of 103:100. Population density was 1030/km<sup>2</sup>. The town governs 30 administrative villages, 130 natural villages and 237 village groups.

At the end of 2020, Donghua Town had a registered population of 65,000, including 34,800 males, accounting for 53.56%, and 30,200 females, accounting for 46.43%, with a gender ratio of 115:100. Population density was 793/km<sup>2</sup>. The town governs 23 administrative villages and 228 village groups.

At the end of 2020, Dajindian Town had a registered population of 65,900, including 34,000 males, accounting for 51.51%, and 32,000 females, accounting for 48.49%, with a gender ratio of 106:100. Population density was 565/km<sup>2</sup>. The town governs 34 administrative villages, 134 natural villages and 251 village groups.

At the end of 2020, Shidao Xiang had a registered population of 44,200, including 22,600 males, accounting for 51.22%, and 21,200 females, accounting for 48.79%, with a gender ratio of 106:100. Population density was 430/km<sup>2</sup>. The Xiang governs 25 administrative villages.

Table 4-2 Local Population(0,000) (2020)

Indicator	Dengfeng City	Gaocheng Town	Donghua Town	Dajindian Town	Shidao Xiang
Year-end total number of households (0,000)	17.41	1.88	1.65	1.65	1.1
Year-end population(0,000)	73.18	7.5	6.5	6.59	4.42
Male population(0,000)	36.86	3.81	3.48	3.4	2.26
Female population(0,000)	35.79	3.68	3.68	3.2	2.12
Population density (km <sup>2</sup> )	600	1030	793	565	430

Source: local 2020 statistical yearbooks or national economic and social development reports

#### 4.2.2 Local Minority Population

Dengfeng City is inhabited by multiple ethnic groups, in which Han is dominant and accounts for 99.9%. Gaocheng Town has a minority population of 75 in Hui, Korean and Li, accounting for 0.1%; Donghua Town has a minority population of 31 in Hui, Uygur, etc; Dajindian Town has a minority population of 66 in Hui, Miao, Bai, Tu, Jingpo, Naxi and She, accounting for 0.1%; Shidao Xiang has a minority population of 2,166 in Hui, accounting for 4.9%.

The Dengfeng PMO and task force conducted a special survey and a series of public participation activities on ethnic minorities in February 2022 to learn their current situation.

1) Organizational interview and fact finding: The population of the subproject area is dominated by Han, and only few minority residents have come here by marriage or job transfer. The minority residents are scattered, and can hardly be interviewed.

2) Information collection: Statistical yearbooks, reports, etc. were collected to learn the demography of the local minority population, and any difference from the Han people.

3) Free, prior and informed consultation with minority residents: AIIB's ESS3 is not triggered because no eligible ethnic minority is identified in the subproject area.

The survey on minority residents has found:

1) There is no ethnic minority that triggers ESS3 in the subproject area.

2) There is no centralized minority population, no traditional estate, and no minority language or culture in the subproject area.

Therefore, it is not necessary to prepare an ethnic minority development plan for the Subproject.

Table 4-3 Local Minority Population

Township	Gross population(0,000)	Minority population / gross population	Local minority population
Gaocheng Town	7.5	0.1%	0
Donghua Town	6.5	0.04%	0



<b>Dajindian Town</b>	6.59	0.1%	0
<b>Shidao Xiang</b>	4.42	4.9	0

### 4.2.3 Socioeconomic Baseline Data of the Subproject

See Table 4-4 for detailed socioeconomic baseline data.

Table 4-4 Local Socioeconomic Baseline Data (2020)

No.	Indicator	Gaocheng Town	Donghua Town	Dajindian Town	Shidao Xiang	Total
1	<b>Gross population(0,000)</b>	7.5	6.5	6.59	4.42	25.01
2	<b>Female population(0,000)</b>	3.68	3.68	3.2	2.12	12.68
3	<b>Direct beneficiary population</b>	7.5	6.5	6.59	4.42	25.01
4	<b>Beneficiary female population</b>	3.68	3.68	3.2	2.12	12.68
5	<b>Poor population<sup>3</sup></b>	8	7	87	638	740
6	<b>Population of monitored households likely to be impoverished</b>	3	2	20	112	137
7	<b>Per capita disposable income (yuan)</b>	20531	7383	19626	6500	\
8	<b>Jobs generated by the Subproject</b>	52	48	63	56	219
9	<b>Jobs generated by the Subproject for women</b>	24	26	31	27	108
<b>Economic structure</b>	<b>Agriculture: output of food crops (ton)</b>	16202	19068	20157	15571	70998
	<b>Stockbreeding: meat output (ton)</b>	712.77	2024.6	919	1532	5188.37
	<b>Industry: gross output value (00m yuan)</b>	43.76	35.03	3.71	6.68	89.18
<b>Energy</b>	<b>Overall energy consumption (ton of standard coal)</b>	146028	54844	10216	1893	212981

Source: Feasibility Study Report, and data provided by local governments

## 4.3 Environmental Quality Baseline

### 4.3.1 Surface Water Environment

According to the Water Environment Functional Zoning of Henan Province, the Dengfeng segment of the Ying River (Senzi Ditch-Baisha Reservoir entrance) is a Class III water body, and the Baisha Reservoir (entrance-exit) is a Class II water body. The segment of the Subproject is located between the Senzi Ditch-Baisha Reservoir entrance, and is a Class III water body, subject to the Class III standard in the Environmental Quality Standard for Surface Water (GB3838-2002). The Baisha Reservoir cross section monitoring results of the Ying River are shown in Table 4-5 based on the data published by the Zhengzhou Municipal Ecology and Environment Bureau during January-December 2021.

Table 4-5 Environmental Quality Monitoring Results of Surface Water, unit:mg/L

Cross section	Monitoring date	COD	NH <sub>3</sub> -N	Total phosphorus	Conformance
Baisha Reservoir cross section of the Ying	January 2021	11	0.2	0.049	Conforming
	February 2021	19.4	0.15	0.062	Conforming
	March 2021	15.3	0.17	0.056	Conforming
	April 2021	9.1	0.05	0.048	Conforming

<sup>3</sup>Poor population includes groups with income lower than the local standard, including MLS subjects, destitute residents, marginal MLS households and households with spending difficulty.

River	May 2021	20.6	0.06	0.055	Out of limit
	June 2021	16.5	0.07	0.038	Conforming
	July 2021	19.2	0.24	0.051	Conforming
	August 2021	11.5	0.05	0.026	Conforming
	September 2021	19.2	0.03	0.025	Conforming
	October 2021	13.7	0.02	0.044	Conforming
	November 2021	14.7	0.02	0.062	Conforming
	December 2021	12.5	0.26	0.024	Conforming
Class III standard in the Environmental Quality Standard for Surface Water (GB3838-2002)		20	1.0	0.2	/

The monitoring results show that among the water pollutants at the Baisha Reservoir cross section of the Ying River, only the monitored concentration of COD was out of limit in May 2021. Under local policies, the local water environment will be further improved.

#### 4.3.2 Acoustic Environment

The sound environment of the subproject area is subject to the Class II standard in the Environmental Quality Standard for Noise (GB3096-2008). To learn local sound environment quality, Henan Kangcun Test Technology Co., Ltd. was appointed to monitor local sound environment quality. See Tables 4-6 and 4-7.

Table 4-6 Summary of Existing Monitoring Sites of Sound Environment Quality

No.	Monitoring site	Monitoring factor
1	Sanlizhuang Village health center	L <sub>Aeq</sub>
2	Yingxin Community, Dajindian Town	
3	Fuping Community, Dajindian Town	
4	Tielugou	
5	Duancun Village	
6	Duancun Nanyao	
7	Licun Village	
8	Wenlou	
9	Caocun Village	
10	Shucun Village	
11	Liyao	
12	Wanglou	
13	Miaozhuang	
14	Shidao Village, Shidao Xiang	

Table 4-7 Summary of Monitoring Results of Sound Environment Quality

No.	Monitoring site	Monitoring results (L <sub>Aeq</sub> )				Standard limit		Conformance
		2022.02.24		2022.02.25		Daytime	Night	
		Daytime	Night	Daytime	Night			
1	Sanlizhuang Village health center	52	41	53	41	55	45	Conforming
2	Yingxin Community	52	42	53	41			Conforming
3	Fuping Community	52	41	50	40			Conforming
4	Tielugou	52	43	51	41			Conforming
5	Duancun Village	51	41	52	42			Conforming
6	Duancun Nanyao	51	41	52	42			Conforming
7	Licun Village	53	41	52	42			Conforming
8	Wenlou	52	42	53	43			Conforming
9	Caocun Village	54	42	53	41			Conforming
10	Shucun Village	52	41	51	40			Conforming
11	Liyao	54	42	53	42			Conforming
12	Wanglou	54	42	53	43			Conforming

13	Miaozhuang	52	41	53	41		Conforming
14	Shidao Village, Shidao Xiang	55	42	54	42		Conforming

It can be seen from Table 4-7 that the daytime and night noise values at all sensitive sites in the subproject area comply with the World Bank Group's Environmental, Health and Safety Guidelines.

#### 4.3.3 Air Quality

The subproject area is a Class II atmospheric functional zone, where ambient air quality is subject to the Class II standard in the Ambient Air Quality Standard (GB3095-2012). The ambient air quality monitoring results of Dengfeng City in 2021 is used here. See Table 4-8.

Table 4-8 Standard Conformance of Ambient Air Quality

Pollutant	Indicator	Monitored concentration ( $\mu\text{g}/\text{m}^3$ )	Standard value ( $\mu\text{g}/\text{m}^3$ )	Conformance
PM <sub>10</sub>	Annual average concentration	88	70	Out of limit
PM <sub>2.5</sub>	Annual average concentration	43	35	Out of limit
SO <sub>2</sub>	Annual average concentration	9	60	Conforming
NO <sub>2</sub>	Annual average concentration	21	40	Conforming
CO	Average 24h 95 <sup>th</sup> percentile concentration	1000	4000	Conforming
O <sub>3</sub>	95 <sup>th</sup> percentile of daily maximum 8h sliding average	180	160	Out of limit

It can be seen that in Dengfeng City in 2021, the SO<sub>2</sub>, NO<sub>2</sub> and CO levels in ambient air conform to the Class II standard in the Ambient Air Quality Standard (GB3095-2012), and the PM<sub>10</sub>, PM<sub>2.5</sub> and O<sub>3</sub> levels are out of limit, possibly due to sandstorms in spring, rapid economic development, energy consumption, the rapid growth of motor vehicles, and heating waste gas.

#### 4.3.4 Bottom Mud

To learn the bottom mud and soil quality conditions of the Ying River, Henan Kangcun Test Technology Co., Ltd. was appointed to monitor soil quality in February 2022 on 8 surface sampling points. See Tables 4-9 and 4-10.

Table 4-9 Summary of Existing Monitoring Sites of Bottom Mud and Soil Environment Quality

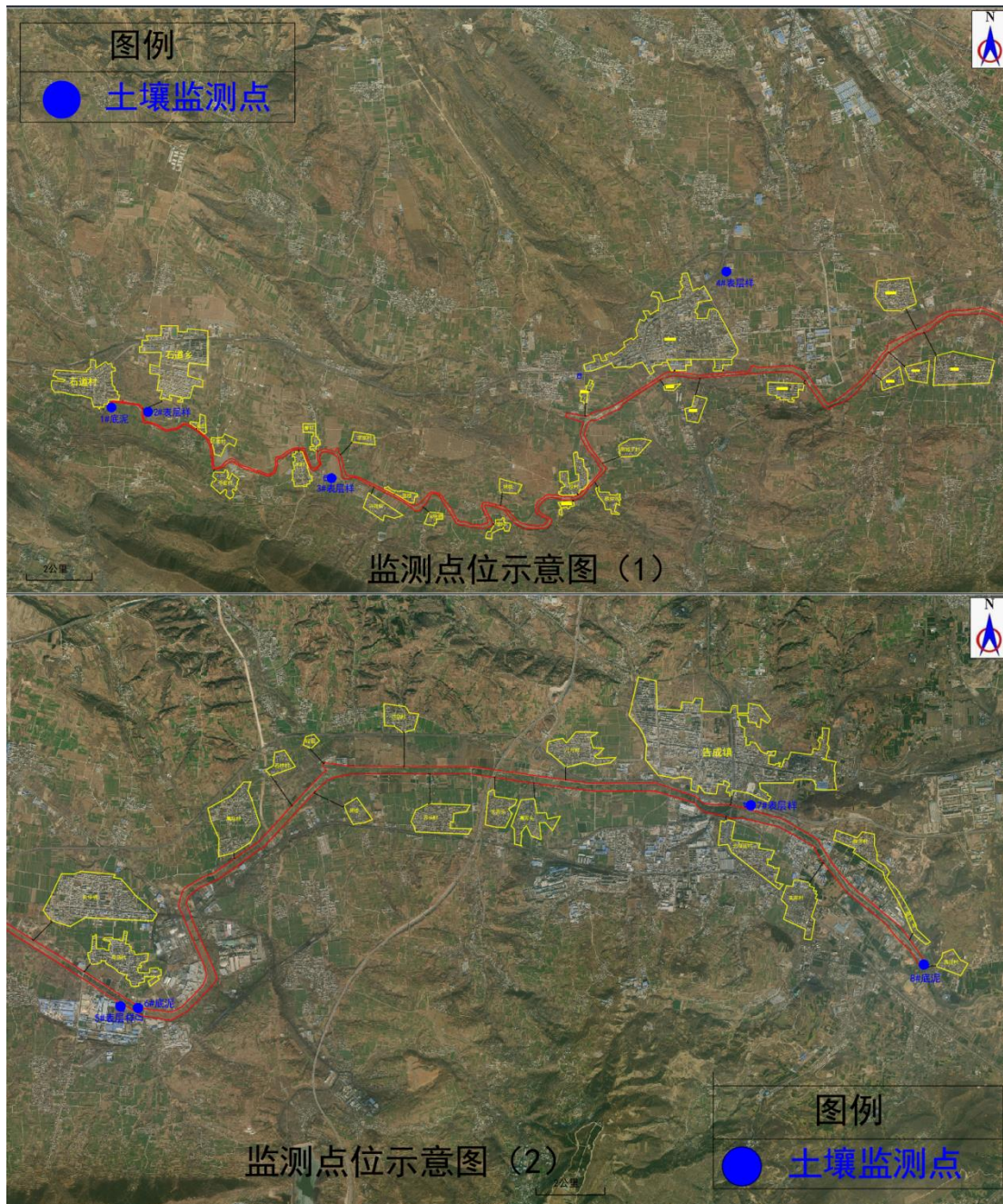
No.	Monitoring site	Monitoring factor
1	1# surface sampling point (bottom mud)	Arsenic, cadmium, hexavalent chromium, copper, lead, mercury, bromium, carbon tetrachloride, chloroform, chloromethane, 1,1-dichloroethane, 1,2-dichloroethane, 1,1-dichloroethylene, cis-1,2-dichloroethylene, trans-1,2-dichloroethylene, dichloromethane, 1,2-dichloropropane, 1,1,1,2-tetrachloroethane, 1,1,1,2-tetrachloroethane, tetrachloroethylene, 1,1,1-trichloroethane, 1,1,2-trichloroethane, trichloroethylene, 1,2,3-trichloropropane, vinyl chloride, benzene, chlorobenzene, 1,2-dichlorobenzene, 1,4-dichlorobenzene, ethylbenzene, styrene, methylbenzene, m-xylene + p-xylene, o-xylene, nitrobenzene, aniline, 2-chlorophenol, benzo[a]anthracene, benzo[a]pyrene, Benzo[b]fluorathene, Benzo[k]fluorathene, chrysene, dibenz[a,h]anthracene, indeno[1,2,3-cd]pyrene, naphthalene, zinc, chromium
2	2# surface sampling point	
3	3# surface sampling point	
4	4# surface sampling point	
5	5# surface sampling point	
6	6# surface sampling point (bottom mud)	
7	7# surface sampling point	
8	8# surface sampling point (bottom mud)	

Table 4-10 Summary of Monitoring Results of Bottom Mud and Soil Environment Quality

Monitoring factor	Unit	Results							
		1#	2#	3#	4#	5#	6#	7#	8#

Copper	mg/kg	14	18	25	23	20	16	14	21
Bromium	mg/kg	7	10	15	16	10	13	11	19
Lead	mg/kg	15.0	15.5	15.6	22.6	21.9	21.3	20.6	22.1
Cadmium	mg/kg	0.09	0.10	0.11	0.11	0.10	0.10	0.10	0.11
Hexavalent chromium	mg/kg	ND	ND	ND	ND	ND	ND	ND	ND
Arsenic	mg/kg	12.0	13.4	14.9	11.3	11.8	13.0	11.7	14.8
Mercury	mg/kg	0.073	0.046	0.177	0.022	0.432	0.315	0.105	0.025
Carbon tetrachloride	µg/kg	ND	ND	ND	ND	ND	ND	ND	ND
Chloroform	µg/kg	ND	ND	ND	ND	ND	ND	ND	ND
Chloromethane	µg/kg	ND	ND	ND	ND	ND	ND	ND	ND
1,1-dichloroethane	µg/kg	ND	ND	ND	ND	ND	ND	ND	ND
1,2-dichloroethane	µg/kg	ND	ND	ND	ND	ND	ND	ND	ND
1,1-dichloroethylene	µg/kg	ND	ND	ND	ND	ND	ND	ND	ND
Cis-1,2-dichloroethylene	µg/kg	ND	ND	ND	ND	ND	ND	ND	ND
Trans-1,2-dichloroethylene	µg/kg	ND	ND	ND	ND	ND	ND	ND	ND
Dichloromethane	µg/kg	ND	ND	ND	ND	ND	ND	ND	ND
1,2-dichloropropane	µg/kg	ND	ND	ND	ND	ND	ND	ND	ND
1,1,1,2-tetrachloroethane	µg/kg	ND	ND	ND	ND	ND	ND	ND	ND
1,1,2,2-tetrachloroethane	µg/kg	ND	ND	ND	ND	ND	ND	ND	ND
Tetrachloroethylene	µg/kg	ND	ND	ND	ND	ND	ND	ND	ND
1,1,1-trichloroethane	µg/kg	ND	ND	ND	ND	ND	ND	ND	ND
1,1,2-trichloroethane	µg/kg	ND	ND	ND	ND	ND	ND	ND	ND
Trichloroethylene	µg/kg	ND	ND	ND	ND	ND	ND	ND	ND
1,2,3-trichloropropane	µg/kg	ND	ND	ND	ND	ND	ND	ND	ND
Vinyl chloride	µg/kg	ND	ND	ND	ND	ND	ND	ND	ND
Benzene	µg/kg	ND	ND	ND	ND	ND	ND	ND	ND
Chlorobenzene	µg/kg	ND	ND	ND	ND	ND	ND	ND	ND
1,2-dichlorobenzene	µg/kg	ND	ND	ND	ND	ND	ND	ND	ND
1,4dichlorobenzene	µg/kg	ND	ND	ND	ND	ND	ND	ND	ND
Ethylbenzene	µg/kg	ND	ND	ND	ND	ND	ND	ND	ND
Styrene	µg/kg	ND	ND	ND	ND	ND	ND	ND	ND
Methylbenzene	µg/kg	ND	ND	ND	ND	ND	ND	ND	ND
m/p-xylene	µg/kg	ND	ND	ND	ND	ND	ND	ND	ND
o-xylene	µg/kg	ND	ND	ND	ND	ND	ND	ND	ND
Nitrobenzene	mg/kg	ND	ND	ND	ND	ND	ND	ND	ND
Aniline	mg/kg	ND	ND	ND	ND	ND	ND	ND	ND
2-chlorophenol	mg/kg	ND	ND	ND	ND	ND	ND	ND	ND
Benzo[a]anthracene	mg/kg	ND	ND	ND	ND	ND	ND	ND	ND
Benzo[a]pyrene	mg/kg	ND	ND	ND	ND	ND	ND	ND	ND
Benzo[b]fluorathene	mg/kg	ND	ND	ND	ND	ND	ND	ND	ND
Benzo[k]fluorathene	mg/kg	ND	ND	ND	ND	ND	ND	ND	ND
Chrysene	mg/kg	ND	ND	ND	ND	ND	ND	ND	ND
Dibenz[a,h]anthracene	mg/kg	ND	ND	ND	ND	ND	ND	ND	ND
Indeno[1,2,3-cd]pyrene	mg/kg	ND	ND	ND	ND	ND	ND	ND	ND
Naphthalene	mg/kg	ND	ND	ND	ND	ND	ND	ND	ND
Zinc	mg/kg	50	50	67	67	70	72	75	83
Chromium	mg/kg	53	65	56	48	48	59	57	53

The monitoring results conform to the Soil Environment Quality—Risk Control Standard for Farmland Soil Pollution (Trial) (GB15618-2018), and the Class II standard in the Soil Environment Quality—Risk Control Standard for Construction Land Soil Pollution (Trial) (GB36600-2018).



#### 4.4 Ecological Environment

There is no drinking water source protection area, no nature reserve, cultural heritage, no scenic zone, no ecological park, no important wetland, no endangered fauna and flora area, no spawning site, feeding area, wintering ground or migration pathway of any important aquatic organism, or any other ecologically sensitive site in the subproject area.

##### 4.4.1 Current Status of Local Plant Ecology

Mount Song belongs to the Holarctic floral region and China-Japan floral sub-region, with 389 temperate genera, accounting for 70% of all floral genera in the area, including 575 species in 189 genera in the north temperate zone, such as *Quercus*, *Carpinus*, *Ulmus* and *Linden*, and 108 species in 66 genera in the old world temperate zone, such as *Ligularia* and *Roegneria*.

There are 104 genera in 41 families from the tropical and subtropical zones, 78 genera from the pantropic, and 17 genera from the old world tropical zone in the area.

The special location determines that the area is characterized by the compatibility and transition between plants in different regions, such as those in northern, western, eastern and



central China.

#### 4.4.2 Current Status of Local Terrestrial Animal Ecology

In ancient times, Mount Song was sparsely populated, covered by thick forests and inhabited by many wild animals, especially large beasts, which have been rarely seen after the 1970s.

Wild animals in Mount Song are mostly Palearctic species in the Palearctic realm, and some take on Oriental realm features. Due to vegetation, topography, climate, altitude, food, competition, etc., animals and birds take on a degree of vertical zonality. This is the result of interaction between genetic features, ecological adaptation and external factors. Based on mobility, ecological flexibility and vegetation distribution, animals in Mount Song can be divided into two subzones:

##### 1) Piedmont and low hill animal subzone

This subzone is below 800m, with sparse vegetation, partly reclaimed into farmland, with *Lepus capensis*, yellow weasel, bat, hedgehog, *Apodemus agrarius*, *Rattus norvegicus* and house mouse dominant. Birds mainly include magpie, sparrow, turtle dove, pigeon, grey-headed woodpecker, rook, pheasant, chough, barn swallow and kestrel, and reptiles mainly include *Bufo raddei*, *Bufo gargarizans*, *Pelodiscus sinensis*, crab, *Eremias argus*, *Rana nigromaculata*, *Rana plancyi*, *Kaloula borealis*, *Rhabdophis tigrina*, etc.

##### 2) Deep mountain to peak animal subzone

This subzone is between 800m and 1,512m, covered by dense forests away from human activity. Reptiles mainly include toad, frog, turtle and *Pelodiscus sinensis*, snakes mainly include *Rhabdophis tigrina*, *Elaphe dione*, *Elaphe rufodorsata* and *Zaocys dhumnades*, and birds mainly include azure-winged magpie, black drongo, Daurian redstart, Indian cuckoo, great spotted woodpecker, gray headed woodpecker, great reed warbler, *Parus major*, *Paradoxornis webbianus*, *Zosterops japonicus*, common cuckoo, hoopoe, large billed crow, rook, jackdaw, chukar, spotted neck dove, hill pigeon, etc. After 1980, there have been more and more birds and animals due to extensive forestation.

#### 4.4.3 Current Status of Local Aquatic Ecology

There are 26 phytoplankton species in 8 phyla, including 6 and 12 species in Bacillariophyta and Chlorophyta respectively. In Dengfeng City, wet plant communities mainly include reed and *Typha angustifolia*. Local aquatic animals mainly include zooplanktons, bottom fauna, fishes, shrimps, etc., in which bottom fauna mainly includes *Limnodrilus hoffmeisteri*, *Tubifex sinicus*, *hippeitis*, *Radix swinhoei*, *Cryptochironomus*, *Chironomus plumosus*, and there are 7 zooplankton species in 3 categories (copepods, rotifers and cladocerans). There are over 30 fish species in 10 families in Dengfeng City, mostly being Cyprinidae fishes, mainly including variegated carp, silver carp, grass carp, crucian, pomfret, whitebait, catfish, etc. Local shrimps are wild, with lengths ranging from 1cm to 5-10cm, living extensively in river centers, reservoirs and ponds. No state-protected or rare fish species is found in the subproject area.

## 5 ESIA and Mitigation Measures

### 5.1 Targets of Environmental Protection

The subproject area is mainly around the Ying River, and the main sensitive sites are the riverside villages, with no school or hospital. See Table 5-1.

Table 5-1 List of E&S Sensitive Sites

Category	Target	Direction, distance	Population	Environmental quality standard
Atmospheric environment	Jiangzhuang Village	100m (left bank)	80 HHs, 320 persons	Ambient Air Quality Standard (GB3095-2012), Class II
	Quhe Village	178m (left bank)	102 HHs, 408 persons	
	Wujia Village	430m (right bank)	125 HHs, 500 persons	
	Beiyanzhuang Village	122m (right bank)	140 HHs, 480 persons	
	Gaocheng Town	123m (left bank)	530 HHs, 2120 persons	
	Star Lookout Scenic Zone	830m (left bank)	/	
	Bafang Village	225m (left bank)	180 HHs, 720 persons	
	Gaojietou Village	230m (right bank)	150 HHs, 600 persons	
	Wangjietou Village	157m (right bank)	140 HHs, 560 persons	
	Jietou Village	430m (right bank)	139 HHs, 556 persons	
	Fandian Village	490m (left bank)	50 HHs, 200 persons	
	Cuilou Village	430m (right bank)	43 HHs, 172 persons	
	Chengyao Village	314m (left bank)	12 HHs, 48 persons	
	Shiqiao Village	360m (left bank)	28 HHs, 112 persons	
	Gaoma Village	71m (left bank)	95 HHs, 380 persons	
	Donghua Town	420m (left bank)	300 HHs, 1200 persons	
	Nandian Village	140m (left bank)	142 HHs, 568 persons	
	Fusi Village	420m (right bank)	85 HHs, 340 persons	
	Zhangsi Village	220m (right bank)	46 HHs, 184 persons	
	Dongsi Village	420m (right bank)	37 HHs, 148 persons	
	Youfangtou Village	340m (left bank)	40 HHs, 80 persons	
	Sanlizhuang Village	40m (right bank)	150 HHs, 600 persons	
	Dajindian Town	20m (left bank)	510 HHs, 2040 persons	
	Nanzhai Village	290m (right bank)	27 HHs, 108 persons	
	Shuilianzhai Village	140m (right bank)	22 HHs, 88 persons	
	Bijia Village	170m (left bank)	30 HHs, 120 persons	
	Nanchengzi Village	350m (right bank)	36 HHs, 144 persons	
	Duancun Village	20m (left bank)	50 HHs, 120 persons	
	Tielugou	45m (right bank)	33 HHs, 132 persons	
	Duancun Nanyao	10m (right bank)	21 HHs, 84 persons	
	Yaolou	208m (left bank)	21 HHs, 84 persons	
	Licun Village	20m (right bank)	20 HHs, 80 persons	
Songgeda	130m (right bank)	23 HHs, 92 persons		
Xuhan Village	159m (right bank)	89 HHs, 356 persons		
Wenlou	10m (left bank)	31 HHs, 124 persons		
Lijia Village	310m (left bank)	34 HHs, 136 persons		
Caocun Village	30m (left bank)	59 HHs, 236 persons		

	Shucun Village	10m (right bank)	180 HHs, 720 persons	
	Wanglou Village	10m (left bank)	40 HHs, 80 persons	
	Liyao Village	40m (right bank)	59 HHs, 236 persons	
	Miaozhuang Village	10m (left bank)	34 HHs, 136 persons	
	Shidao Xiang	260m (left bank)	530 HHs, 2120 persons	
	Shidao Village	25m (left bank)	490 HHs, 1960 persons	
Sound environment	Sanlizhuang Village	40m (right bank)	150 HHs, 600 persons	Environmental Quality Standard for Noise (GB3096-2008), Class II
	Dajindian Town	20m (left bank)	510 HHs, 2040 persons	
	Duancun Village	20m (left bank)	50 HHs, 120 persons	
	Tielugou	45m (right bank)	33 HHs, 132 persons	
	Duancun Nanyao	10m (right bank)	21 HHs, 84 persons	
	Licun Village	20m (right bank)	20 HHs, 80 persons	
	Wenlou	10m (left bank)	31 HHs, 124 persons	
	Caocun Village	30m (left bank)	59 HHs, 236 persons	
	Shucun Village	10m (right bank)	180 HHs, 720 persons	
	Wanglou Village	10m (left bank)	40 HHs, 80 persons	
	Liyao Village	40m (right bank)	59 HHs, 236 persons	
	Miaozhuang Village	10m (left bank)	34 HHs, 136 persons	
Shidao Village	20m (left bank)	490 HHs, 1960 persons		
Surface water environment	Ying River	/	/	Environmental Quality Standard for Surface Water (GB3838-2002), Class III



Liyao Village



Shucun Village

Figure 5-1 Typical Photos of E&S Sensitive Sites



## 5.2 Environmental Impacts at the Construction Stage and Mitigation Measures

The general layout includes construction camps and temporary stockyards.

### 1) Construction camps

There are 4 construction areas, with a construction camp each, which consists of a living area and an integrated processing plant for steel bar and timber processing, and maintenance. Only simple repair and part replacement can be conducted on the construction site, and machinery overhaul is conducted at an existing repair factory in Dengfeng City. See Table 5-2.

Table 5-2 Information on Construction Sites

No.	Township	Location	Floor area
1	Shidao Xiang	190m east of Shucun Village, Shidao Xiang	4250m <sup>2</sup>
2	Dajindian Town	150m northwest of Dajindian Town	3500m <sup>2</sup>
3	Donghua Town	Dengfeng branch of Zhengzhou Desheng Company	4650m <sup>2</sup>
4	Gaocheng Town	140m east of the junction of G343 and Qingzhu Highway	3600m <sup>2</sup>
Total			16000m <sup>2</sup> (24 mu)

### 2) Temporary stockyards

The temporary stockyards in Shidao Xiang, Donghua Town and Gaocheng Town are next to the respectively construction camps, and a separate one will be set up in Dajindian Town. The temporary stockyards have a total area of 36mu, used mainly for the temporary storage of earth and rock. See Table 5-3.

Table 5-3 Information on Temporary Stockyards

No.	Township	Location	Floor area
1	Shidao Xiang	East of the Shidao Xiang construction camp	3400m <sup>2</sup>
2	Dajindian Town	280m northeast of the G207 Dajindian Bridge	6800m <sup>2</sup>
3	Donghua Town	West of the Donghua Town construction camp	9300m <sup>2</sup>
4	Gaocheng Town	East of the Gaocheng Town construction camp	4500m <sup>2</sup>
Total			24000m <sup>2</sup> (36 mu)

### 3) Surrounding environment of temporarily occupied land

#### ① Shidao Xiang camp and stockyard

In the construction site in Shidao Xiang, a construction camp and a temporary stockyard are set up. There is an abandoned brickyard on the north, and farmland is on the other 3 sides. See Figure 5-2.



Figure 5-2 Surrounding Environment of Temporarily Occupied Land in Shidao Xiang

②Dajindian Town camp

A construction camp is set up on an unused courtyard of the 4<sup>th</sup> squadron of the Dengfeng Transport Law Enforcement Brigade. This plot is bordered by a furniture mall on the west and a road on the north, and surrounded by farmland on the east and south. See Figure 5-3.



Figure 5-3 Surrounding Environment of Construction Site in Dajindian Town

③Dajindian Town stockyard

A temporary stockyard is set up 280m northeast of the G207 Dajindian Bridge, with a substation on the north, and farmland on the east and south. See Figure 5-4.



Figure 5-4 Surrounding Environment of Temporary Stockyard in Dajindian Town

④Donghua Town camp and stockyard

In the construction site in Donghua Town, a construction camp and a temporary stockyard are set up. There is a riverside road on the north, and enterprises is on the other 3 sides. See Figure 5-5.





Figure 5-5 Surrounding Environment of Temporarily Occupied Land in Donghua Town

⑤ Gaocheng Town camp and stockyard

In the construction site in Gaocheng Town, a construction camp and a temporary stockyard are set up. There is unused land on the west, a factory on the east, and a riverside road on the south. See Figure 5-6.



Figure 5-6 Surrounding Environment of Temporarily Occupied Land in Gaocheng Town

**5.2.1 Waste Gases**

Waste gases during construction mainly include construction flying dust, transport flying dust, fuel waste gases from construction machinery and vehicles, and canteen fume.

- 1) Construction flying dust

Excavation, backfilling and handling will produce flying dust inevitably, especially when it is windy and dry. The amount of flying dust is related to the construction method, equipment, season, weather, soil type, etc.

See Table 5-4.

Table 5-4 Environmental Impacts of Construction Flying Dust

Construction site	Fencing	Downwind TSP concentrates at different distances (mg/m <sup>3</sup> )					
		20m	50m	100m	150m	200m	250m
1#	None	1.54	0.981	0.635	0.611	0.504	0.401
2#		1.467	0.836	0.568	0.570	0.519	0.411
Average		1.503	0.922	0.602	0.591	0.512	0.406
3#	Metal plates	0.943	0.577	0.416	0.421	0.417	0.420
4#	Color strips	1.105	0.674	0.453	0.420	0.421	0.417
Average		1.042	0.626	0.435	0.421	0.419	0.419

It can be seen that the range of flying dust pollution is mainly within 200m downwind. The TSP concentration at 20m downwind is slightly higher than the concentration limit for unorganized emission (1.0mg/m<sup>3</sup>) in the Integrated Emission Standard for Air Pollutants (GB16297-2012). Through fencing, downwind flying dust has been reduced significantly.

Construction will be conducted along the river, and may affect close sensitive sites to some extent. Air pollution during construction has a small range and a short period, and there will be no cumulative impact. Through sprinkling and fencing, the overall air quality impact of flying dust is minor.

## 2) Transport flying dust

The amount of transport flying dust is related to driving speed, load and pavement cleanliness. Regular sprinkling (4-5 times per day) will reduce flying dust by 50~80%. See Table 5-5.

Table 5-5 Dust Suppression Test Results by Sprinkling

Distance (m)		0	20	30	50	100	200
Average hourly TSP concentration (mg/m <sup>3</sup> )	Without sprinkling	11.03	2.89	2.10	1.15	0.86	0.56
	Sprinkling	2.11	1.40	1.05	0.68	0.60	0.29
Dust suppression rate		80.2%	51.6%	50%	41.7%	30.2%	48.2%

At a distance of 50~100m, the range of influence is 35~40m. Therefore, effective sprinkling can suppress dust greatly to ensure that the TSP concentration at 50m downwind is below the concentration limit for unorganized emission (1.0mg/m<sup>3</sup>) in the Integrated Emission Standard for Air Pollutants (GB16297-2012).

The road network in the subproject area has been established, and transport flying dust will affect sensitive sites within 200m to some extent, so dust suppression, truck closure and speed restriction measures will be taken to reduce such impacts.

## 3) Fuel waste gases from construction machinery and trucks

Most construction machinery is fueled by gasoline and diesel oil, and main fuel waste gases are smoke, sulfur dioxide, nitrogen oxides, carbon monoxide, etc. Since construction machinery is scattered, the level of pollution is low. At 50m from the construction site, the average concentrations of carbon monoxide and nitrogen dioxide are 0.2mg/m<sup>3</sup> and 0.13mg/m<sup>3</sup>, and the daily average concentrations are 0.13mg/m<sup>3</sup> and 0.062mg/m<sup>3</sup> respectively, both conforming to the Ambient Air Quality Standard(GB3095-2012). In addition, waste gases emitted by trucks are scattered, mobile and intermittent, and can be dispersed quickly. Fuel waste gases will not affect local air quality significantly. The contractors should strengthen the selection and maintenance of machinery, and

ensure that waste gases conform to the national standard.

#### 4) Canteen fume

A canteen will be set up at all the 4 construction camps, and each camp will have 150 workers at most. Edible oil consumption will be 5kg/100 persons per day, or 7.5kg/d per camp. Based on a volatilization rate of 4%, 0.3kg/d of fume will be generated. Fume will be purified before discharge at a rate of not less than 90%, so the fume discharge concentration will be 0.8mg/m<sup>3</sup>, conforming to Table 1 in the Emission Standard for Cooking Fume (DB41/1604-2018), with a minor environmental impact.

### 5.2.2 Wastewater

Wastewater at the construction stage mainly includes wastewater from construction machinery and truck washing, and workers' domestic wastewater.

#### 1) Construction machinery and truck washing wastewater

Wastewater at the construction stage is from construction machinery and truck washing, with water consumption of 24m<sup>3</sup>/d. One temporary washing device will be provided at each construction site, and wastewater will be partly used for truck washing and partly for sprinkling.

#### 2) Domestic wastewater

Domestic wastewater includes washing wastewater, toilet flushing wastewater, etc. In the 6-month construction period, 28.8m<sup>3</sup>/d of domestic wastewater will be generated (based on a peak workforce of 600 and daily domestic water consumption of 60L/d per capita). The concentrations of the key pollutants are COD 300mg/L, SS 200mg/L, BOD<sub>5</sub> 180 mg/L and NH<sub>3</sub>-N 25mg/L. Such wastewater will be treated and then used for farmland fertilization without discharge.

Since the construction period is short and domestic wastewater will be treated, the impact of domestic wastewater on surface water will be minor.

### 5.2.3 Analysis of Noise Pollution Factors

Noise during construction is mainly from construction machinery and trucks.

#### 1) Construction machinery noise

Noise during construction will be mainly from construction machinery, mainly including bulldozers 85~96dB(A), excavators 80~93dB(A), loaders 85~90dB(A), etc. Such noise is local, mobile and temporary in nature, and can be treated as a point sound source. The prediction model is as follows:

$$L_2 = L_1 - 20\lg(r_2/r_1) - \Delta L$$

Where: L<sub>1</sub> and L<sub>2</sub>—noise values r<sub>1</sub> and r<sub>2</sub> away from the sound source (dB);

r<sub>1</sub>—distance from point sound source to sound receiving point 1 (m);

r<sub>2</sub>—distance from point sound source to sound receiving point 2 (m);

ΔL—noise attenuation caused by barriers, air absorption, etc. during transmission

The noise levels of the main construction machinery at full load at different distances calculated using the prediction model are as shown in Table 5-6.

Table 5-6 Noise Levels of Main Construction Machinery at Different Distances

	Machinery type	Distance from construction site (m)									
		5	10	20	40	50	60	80	100	150	200
Construction stage	Bulldozer	90	84	78	72	70	68.5	66	64	60.5	58
	Excavator	86	80	74	68	66	64.5	62	60	56.5	54
	Loader	84	78	72	66	64	62.5	60	58	54.5	52

According to the Emission Standard of Environment Noise for Construction Site Boundaries

(GB12523-2011), the construction machinery is conforming at a distance of 50m in the daytime. Since some sensitive sites are less than 50m away from the construction site boundary, the following requirements must be met to reduce ambient sound environment impacts:

- ① Select construction machinery and trucks conforming to the relevant national standards, use low-noise construction machinery and processes where possible, and strengthen the maintenance of construction machinery to noise intensity ultimately.
- ② Set up fences not lower than 2m around the construction areas.
- ③ Schedule construction rationally near villages, and avoid construction at night (22:00~6:00) and during noon breaks.
- ④ Keep noise-generating equipment far away from sensitive sites where possible.

2) Transport noise

According to the Technical guidelines for environmental impact assessment—Sound environment (HJ2.4-2009), the following prediction model is selected for transport noise:

$$L_{eq}(h)_i = (\overline{L_{oE}})_i + 10\lg\left(\frac{N_i}{V_i T}\right) + 10\lg\left(\frac{7.5}{r}\right) + 10\lg\left(\frac{\psi_1 + \psi_2}{\pi}\right) + \Delta L - 16$$

Where:  $L_{eq}(h)_i$ —hourly equivalent sound level of Type I vehicles, dB(A);

$(\overline{L_{oE}})_i$ —average A sound level of Type I vehicles at a speed of  $V_i$ (km/h) and a horizontal distance of 7.5m, dB(A);

$N_i$ —average hourly number of Type I vehicles passing through a prediction point in one day, vehicles/h;

$r$ —distance from lane centerline to prediction point, m;  $r > 7.5$ m;

$V_i$ —average driving speed of Type I vehicles, km/h;

$T$ —time for calculating equivalent sound level, 1h;

$\psi_1, \psi_2$ —flare angles from prediction point to both ends of a limited length road segment, radian

$\Delta L$ —correction arising from other factors, dB(A),

$$\Delta L = \Delta L_1 - \Delta L_2 + \Delta L_3$$

$$\Delta L_1 = \Delta L_{\text{gradient}} + \Delta L_{\text{pavement}}$$

$$\Delta L_2 = A_{\text{atm}} + A_{\text{gr}} + A_{\text{bar}} + A_{\text{misc}}$$

Where:  $\Delta L_1$ —correction arising from routing, dB(A);

$\Delta L_{\text{gradient}}$ —correction of longitudinal gradient of highway, dB(A);

$\Delta L_{\text{pavement}}$ —correction arising from pavement material, dB(A);

$\Delta L_2$ —attenuation arising from sound wave propagation path, dB(A);

$\Delta L_3$ —correction arising from reflection, etc., dB(A).

The truck traffic is 8 vehicles/h,  $(\overline{L_{oE}})_i$  is 72.2dB (A), the average driving speed  $V_i$  is 30km/h, and materials will be transported in the daytime (6:00 a.m. ~ 6:00 p.m.). See Table 5-7 for results.

Table 5-7 Summary of Traffic Noise Prediction Results

Distance Sound level	Distance from road centerline (m)								
	10	20	30	40	50	60	80	120	160
Predicted value(daytime)	70.3	64.6	62.3	60.1	58.7	57.2	55.0	48.1	44.5
Standard limit(daytime)	55								

The subproject area enjoys convenient traffic through national, provincial and rural highways, and good road conditions. Truck noise will affect residents within 80m from the road centerline to some extent. The following noise control measures should be taken: ①strengthening the management of trucks and keeping them in good condition; ②prohibiting overload to reduce noise; ③slowing trucks down and avoiding honking when they pass through sensitive sites; and ④avoiding overnight transport.

#### 5.2.4 Solid Waste

Solid waste generated during construction mainly includes construction waste and spoil during bridge demolition, and domestic waste generated by workers.

##### 1) Construction waste and spoil

Construction waste will mainly from the demolition of the submerged bridges, where masonry will be demolished using labor and steel chisels, and concrete demolished using hydraulic hammers, in which about 500m<sup>3</sup> will be reused, and 2,500m<sup>3</sup> transferred as construction waste to the west spoil ground. 1.4135 million m<sup>3</sup> of earth and stone will be excavated, 1.123 million m<sup>3</sup> utilized, and 290,500 m<sup>3</sup> of spoil will be generated, all held at the temporary stockyards. The spoil will be covered and sprinkled timely for dust suppression. No permanent spoil ground will be set up, and all construction waste and spoil (totaling 293,000 m<sup>3</sup> and 469,000t) will be sent to the west spoil ground for disposal by the government.

The west spoil ground is located in Sanwangzhuang Village, Dajindian Town, with a floor area of over 200 mu and a design capacity of 2 million m<sup>3</sup>. It has been used by 50,000 m<sup>3</sup>, and will absorb 650,000 m<sup>3</sup> in the near future, with 1.3 million m<sup>3</sup> remaining. The construction waste and spoil generated by the Subproject can be fully absorbed by this spoil ground.

The dredged material (1.41 million m<sup>3</sup>) includes sand and stone (about 1.14 million m<sup>3</sup>), and sludge (270,000 m<sup>3</sup>). Sludge will be held at the temporary stockyards along with sand and stone after drying. The spoil will be covered and sprinkled timely for dust suppression. During drying, sludge will generate such pollutants as H<sub>2</sub>S, thioethers and ammonia. The range of influence of sludge odor is usually 50m or 100m downwind. If there is any sensitive site (village, community, etc.) within 200m, drying should not be conducted. See Table 5-8.

**Table 5-8 Earth and Stone Balance Table, unit: m<sup>3</sup>**

序号	工程名称	土方开挖		土石方回填		需要回填料		利用料		调出料		调入料		弃料	
		土石	卵石	土石	卵石	土石	卵石	土石	卵石	土石	卵石	土石	卵石	土石	卵石
1	河道疏浚	269909	1140546							212319	910184			57590.5	230362
2	岸坡修复防护			179931	419839	212319	910184					212319	910184		
3	漫水桥修复		3085.71		493.71		582.58	582.58							2503
	合计	269909	1143632	179931	420333	212319	910767	582.58		212319	910184	212319	910184	57590.5	232865

##### 2) Domestic waste

The peak workforce will be 600, and generate 300kg/d of domestic waste during the 6-month construction period (0.5kg/d per capita), totaling 54t. Such domestic waste will be collected and transferred to local waste transfer stations for unified disposal.

Solid waste will be collected, stored and transferred in strict conformity with the Standard for Pollution Control on General Industrial Solid Waste Storage and Land-filling (GB18599-2020). As long as management is strengthened and all control measures are taken properly, environmental impacts of solid waste will be minor.

## 5.2.5 Ecological Impacts

### 5.2.5.1 Impacts on terrestrial environment

Construction activities mainly include river dredging and water resource work construction, and damage to the vegetation is caused during the construction of the construction camps and temporary stockyards mainly.

The construction camps and temporary stockyards will be constructed on leveled construction land with little vegetation. Their construction will have little disturbance to the vegetation. The storage of spoil at the temporary stockyards will affect some vegetation. Therefore, surface soil and vegetation should be protected before constructed. 0~30cm topsoil will be transferred and stored centrally, and backfilled after the cleanup of construction waste after construction. The vegetation will be fully restored through planting, landscaping, and water and soil conservation measures.

### 5.2.5.2 Aquatic environment impacts

#### 1) Impacts on planktons

Construction will cause water pollution, thereby affecting the survival of phytoplanktons and reducing the biomass of zooplanktons. However, fast-growing phytoplanktons can be restored quickly after construction, because clearer water will promote their photosynthesis.

#### 2) Impacts on bottom fauna

Dredging will affect bottom fauna greatly by damaging or polluting their environment formed over time. After construction, with the removal of sludge, the water environment will be better, thereby allowing for the restoration of their communities. In addition, the growth of some aquatic plants will provide a better habitat for bottom fauna.

#### 3) Impact on fishes

Suspended matter in the river will affect fishes by reducing their survival rate, changing their migratory behavior, and reducing the richness of their food organisms. Since adult fishes are more sensitive to suspended matter and can flee quickly, the increased concentration of suspended matter will affect fries and young fishes mainly. After construction, water quality will be restored quickly and improved gradually, so the impact on fishes will be reversed.

### 5.2.5.3 Ecological impact mitigation and compensation measures

#### 1) Water and soil conservation measures

The Subproject has an occupied land area of 229.53hm<sup>2</sup>, including a permanently occupied land area of 225.53hm<sup>2</sup>. According to the RAP, 47.57 mu of collective land will be acquired permanently, and 60 mu of land will be occupied temporarily for the Subproject, including 20.92 mu of abandoned factory land in Donghua and Dajindian Towns, and 30.08 mu of state-owned river flat. The LA compensation is 2,586,880 yuan (25.11% of the budget), the ground attachment compensation 1,878,100 yuan (18.23% of the budget), and the young crop compensation 57,810 yuan (0.56% of the budget). Temporary land occupation will not be compensated for.

The affected area is divided into 5 water loss and soil erosion control areas. The general layout is as follows:

#### ① River construction area

The disturbed area will be covered by anti-dust cloth to prevent flying dust. Two layers of earth-filled woven bags will be used for retention during construction. After construction, locally exposed slopes will be grassed for protection.

#### ② Building construction area

The disturbed area will be covered by anti-dust cloth to prevent flying dust. Two layers of earth-filled woven bags will be used for retention during construction.

#### ③ Temporary stockyards



The disturbed area will be covered by anti-dust cloth to prevent flying dust. Before construction, earth-filled woven bags will be used on the 4 sides for retention.

④Construction road area

The contractor is required to strip the surface soil before construction and backfill it after construction. The disturbed area will be covered by anti-dust cloth to prevent flying dust. Temporary drain ditches will be dug during construction, with a settling basin at the end.

⑤Construction and living areas

The contractor is required to strip the surface soil before construction and backfill it after construction. The disturbed area will be covered by anti-dust cloth to prevent flying dust. Temporary drain ditches will be dug during construction, with a settling basin at the end. Two layers of earth-filled woven bags will be used for retention during construction.

According to the water and soil conservation plan of the Subproject, the water and soil conservation system is as shown in Figure 5-7.



注：\*为主体工程已含水土保持措施。

Figure 5-7 System of Water and Soil Conservation Measures

2) Protective measures for terrestrial organisms

A strict construction range will be set during construction, and workers educated on environmental protection. The existing vegetation should not be damaged. Trucks should drive along planned roads in order not to damage the surrounding vegetation.

3) Protective measures for aquatic organisms

The construction scheme will be optimized. Flying dust and wastewater pollution will be controlled. Water and soil conservation measures will be taken to reduce suspended matter. Construction noise will be controlled. The management of workers will be strengthened.

4) Construction management and education

The management and education of workers will be strengthened, and their behavior regulated to ensure that they comply with the environmental laws and regulations. The construction range will be restricted to minimize the damage of existing vegetation and soil.

5) Restoration measures for terrestrial ecology

The construction camps and temporary stockyards will be constructed on leveled construction

land with little vegetation. Their construction will have little disturbance to the vegetation. During and after construction, the following measures will be taken for ecological restoration:

① Optimize the construction scheme, and conduct ecological restoration as soon as possible after construction;

② Record the vegetation of the construction camps and temporary stockyards before construction as a basis for vegetation restoration;

③ Transfer and centrally store 0~30cm topsoil, and set up temporary barriers and drain ditches around before construction.

④ After construction, clean up construction waste timely, and backfill topsoil as designed.

⑤ Make up the damaged vegetation with appropriate species to avoid alien species invasion.

6) Restoration measures for aquatic ecology

Conduct ecological compensation with common local aquatic organisms after construction to optimize the community structure and rebuild the aquatic ecosystem.

### **5.2.6 Traffic Impacts**

Among the 3 affected submerged bridges, two are unserviceable, with only one remaining. Traffic will be ensured by bypassing. The measures taken during construction are as follows:

1) Safety isolation

The construction area will be enclosed and separated from roads.

2) Traffic guidance

Road signs will be set up to disclose road condition, speed limit, warning and other information for safe driving.

3) Traffic signs

Traffic signs will be set up on construction roads, such as speed limit and warning.

4) Traffic control

The contractor should assign someone to control and facilitate traffic at key road junctions and special workplaces.

### **5.2.7 Living Conditions of Workers**

According to the local regulations, good working and living environments should be provided to workers. For example, office and living facilities on construction sites should be decorated simply and well-lit, and roofs and floors are leakage-proof and damp-proof; dormitories should be provided with air-conditioners, and male and female workers should live separately, with not more than 16 workers per room and a per capita usable area of not less than 2 m<sup>2</sup>; the canteen should have separate preparation and storage rooms, and disinfection, cold storage and ventilation facilities. In addition, COVID-19 prevention measures should be taken, such as disinfection, temperature taking and face masking.

## **5.3 Analysis of Environmental Impacts at the Operation Stage**

### **5.3.1 Ecological Impacts**

At the operation stage, the Subproject will affect aquatic organisms mainly.

1) Planktons: Fast-growing phytoplanktons can be restored quickly after construction, because clearer water will promote their photosynthesis.

2) Bottom fauna: After construction, with the removal of sludge, the water environment will be better, thereby allowing for the restoration of their communities. In addition, the growth of some aquatic plants will provide a better habitat for bottom fauna.

3) Fishes: After construction, water quality will be restored quickly and improved gradually, so the impact on fishes will be reversed.

### 5.3.2 Surface Water Impacts

The Subproject will generate no wastewater at the operation stage. Currently, water resources are not evenly distributed in space due to riverbed unevenness and local obstruction, affecting the water environment and aquatic habitats. After completion, river liquidity and self-purifying capacity will be higher, thereby improving water quality and aquatic habitats.

### 5.3.3 Groundwater Impacts

Local groundwater is from atmospheric precipitation mainly. Since the Subproject is an ecological project that aims to improve water quality, its adverse impact on groundwater is minor.

### 5.3.4 Hydrologic Regime Analysis

Bridge restoration will not affect the river discharge, water level, flow rate, etc., and will have a minor impact on the hydrologic regime.

After dredging, the water storage capacity will increase, the flow rate will be lower, and the shorelines will change, thereby changing the hydrologic regime to some extent.

## 5.4 Tasks of the SIA

According to AIIB's ESF and the ESMPF disclosed in November 2021, the purpose of the SIA is to avoid or minimize adverse E&S risks and impacts, and where such risks and impacts are inevitable, identify such risks and impacts, and develop and implement necessary mitigation measures according to the applicable PRC laws and AIIB's ESP, thereby protecting the basic rights and interests of all stakeholders, and promoting their equal participation in the Subproject. The main tasks of the SIA are:

- 1) Identifying the Subproject's primary stakeholders, and learning their needs through extensive participation;
- 2) Learning the Subproject's potential positive and negative social impacts, and identifying potential social risks according to AIIB's ESF and the ESMPF disclosed in November 2021;
- 3) Learning attitudes of women, poor residents, etc. to the Subproject, and identifying the Subproject's impacts on them;
- 4) Strengthening public participation, proposing suggestions to optimize the subproject design, and establishing GRMs; and
- 5) Developing an SMP to evade risks and realize the subproject objectives

In addition, during public consultation, the awareness of the Subproject's background, objectives and activities will be improved, thereby expanding the scope of public participation.

## 5.5 Subjects and Scope of the SIA

### 5.5.1 Subjects of the SIA

Subjects of the SIA are primary and secondary stakeholders. Primary stakeholders are direct beneficiaries of the Subproject and those affected negatively by the Subproject.

Primary stakeholders include residents, vulnerable groups and persons affected by LA in 112 villages in Shidao Xiang, Dajindian Town, Donghua Town and Gaocheng Town along the Ying River, with focus on the livelihood restoration and public participation of vulnerable groups and women.

Secondary stakeholders include the Dengfeng PMO, DCWRB, Dengfeng City Natural Resources and Planning Bureau (DCNRPB), ecology and environment bureau, emergency management bureau, statistics bureau, human resources and social security bureau, rural revitalization bureau, ethnic affairs commission, women's federation, civil affairs bureau, transport bureau, township governments, design agency, construction agency, supervising agency, etc.

### 5.5.2 Scope of the SIA

The scope of the SIA is the 112 villages in Shidao Xiang, Dajindian Town, Donghua Town and Gaocheng Town in the subproject area.

### 5.5.3 Key Points of the SIA

The SIA is focused on the following:

- 1) Identifying primary stakeholders, and learning their attitudes to and needs for the Subproject, and existing or potential issues in the subproject area;
- 2) Identifying the Subproject's potential social impacts, such as key sensitive sites, key

concerns, potential LAR impacts, willingness of nearby residents for participation, community health and safety during COVID-19; identifying ethnic minorities, impacts of nonlocal workers, and the contractors' employment and OHS systems;

3) Analyzing the Subproject's impacts on poor residents, especially their needs for, and willingness and ability to participate in the Subproject;

4) Analyzing potential GBV issues in subproject implementation, the Subproject's impacts on women and their needs for the Subproject, and identifying any gender difference;

5) Conducting information disclosure and public participation, including the APs' awareness of, support for and participation in the Subproject;

6) Incorporating social factors into the subproject design, and proposing measures to avoid or mitigate negative impacts;

7) Developing an SMP so that local residents are further aware of and participate in the Subproject.

## 5.6 Social Impact Analysis

With the support of the Dengfeng PMO, DCWRB, DCNRPB, development and reform commission, ecology and environment bureau, statistics bureau, human resources and social security bureau, rural revitalization bureau, women's federation, ethnic and religious affairs bureau, township governments, etc., the task force conducted a questionnaire survey on 400 respondents in the 4 affected townships in February 2022, covering different age groups, educational levels and occupations, including 258 males and 142 females. In addition, the task force held 9 FGDs with 61 men-times, including 11 men-times of females, accounting for 18%.

The beneficiary area of the Subproject is the 112 villages in Shidao Xiang, Dajindian Town, Donghua Town and Gaocheng Town in the subproject area.

### 5.6.1 Social Benefits

The positive impacts of the Subproject perceived by the respondents are as follows: 1) 77.25% of the respondents think that the Subproject will create a safer living environment; 2) 74.25% of the respondents think that it will reduce floods; 3) 35.25% of the respondents think that it will reduce water pollution; 4) 25% of the respondents think that it will improve local traffic; 5) 29% of the respondents it will improve the surrounding environment; 6) 25.75% of the respondents think that it will make traffic more convenient; 7) 15.75% of the respondents think that it will beautify the environment; 8) 9.75% of the respondents think that it will promote employment.

Table 5-8 Perceived Positive Impacts of the Subproject

Indicator Option	Potential positive impact								
	Creating a safer living environment	Reducing floods	Reducing water pollution	Improving local traffic	Improving the surrounding environment	Making traffic more convenient	Beautifying the environment	Promoting employment	Don't know
Sample size	309	297	141	129	116	103	63	39	0
Percent (%)	77.25	74.25	35.25	32.25	29.00	25.75	15.75	9.75	0.00

#### 5.6.1.1 River dredging and embankment restoration will reduce floods and protect the safety residents.

77.25% of the respondents think that the Subproject will create a safer living environment, and 74.25% think that it will reduce floods, so the Subproject will be significant for stabilizing the river banks, improving flood control capacity and reducing floods, and enable nearby residents to live more safely.

1) The riverbed silting of the Ying River has affected its normal flood control, drainage, irrigation and water supply functions. River dredging will restore its normal functions, promote local economic development, and improve the living environment.

2) River dredging and broadening, and embankment restoration will improve the overall flood control capacity of the Ying River.

3) The July 20 flood has caused great financial losses to Dengfeng City, and threatened the personal safety of local residents, who highly recognize the importance and urgency of river

management. According to interviews, they are very dissatisfied with the current situation of the Ying River, including its banks and bridges. The Subproject is highly expected by local residents.

**Interview 5-1: Jiangzhuang Village, Gaocheng Town, Mr. Feng (53 years)**

“After river management, it will protect our farmland, properties and lives, and we will be no longer afraid of floods.”

**5.6.1.2 Bridge restoration will reduce traffic times and improve traffic convenience.**

Some roads and bridges along or across the Ying River are seriously damaged, resulting in great traffic inconvenience. For example, the bridge near Nandian and Yangsizhuang Villages, Donghua Town is broken, and there is only a temporary path made from slag, which is inconvenient and unsafe. Therefore, the roads and bridges along or across the Ying River should be maintained or reconstructed to improve traffic conditions.

**Interview 5-2: Yangsizhuang Village, Donghua Town, Ms Wang (48 years)**

“We formerly crossed the river through the bridge, but now have to take a long detour, which is very inconvenient. The bridge must be reconstructed.”

**5.6.1.3 Improving the surrounding ecological environment and local residents' well-being**

The landscape of the Ying River has been seriously affected due to road and vegetation damage, serious air, water and soil pollution, and serious of water loss and soil erosion. The Subproject will be significant for improving the river infrastructure, conserving water and soil, reducing pollution, and creating a comfortable and beautiful natural environment.

**Interview 5-3: Shucun Village, Shidao Xiang, Mr. Han (56 years)**

“After river management, the environment here is much better, and all former messes have been removed.”

**5.6.1.4 Promoting economic development along the Ying River and creating more job opportunities**

1) The Subproject will generate some unskilled jobs during construction and operation, such as building material transport and transfer, site cleaning, catering, daily patrol, cleaning, etc. The Dengfeng PMO will urge the contractors and competent authorities to make such jobs first available to local and nearby workers, especially vulnerable persons able to work, thereby increasing their income and alleviating poverty.

2) Dengfeng City is a typical agricultural county, where residents along the Ying River mostly deal with farming and outside employment. Embankment restoration will reduce flood losses, and promote agricultural development.

3) In the July 20 flood, nearly 45 shops and enterprises were affected. For example, an aluminum factory near Jiangzhuang Village, Gaocheng Town was operated before the flood, but was closed down after the flood because its equipment was damaged. The Subproject will reduce nearby enterprises' losses, and ensure their normal operation, thereby promoting local employment.

4) Dengfeng City is a famous place of cultural relics and martial arts, and an attractive tourist destination, full of business and development opportunities. The Subproject will accelerate the restoration of local industry, services and tourism, and create a better investment environment, thereby increasing local residents' income.

Therefore, the Subproject will play a positive role in promoting local production restoration and employment.

**Interview 5-4: Jiangzhuang Village, Gaocheng Town, Mr. Liu (58 years)**

“An aluminum factory was operating before the flood, and had to be closed down after inundation. If the affected shops and enterprises continue to operate normally, there must be more job opportunities.”

**5.6.1.5 Establishing closer relations between officials and civilians, and bringing tangible benefits for the public**

Although the July 20 flood was caused by extreme weather, many problems and deficiencies have been exposed. DCWRB, the ecology and environment bureau, DCNRPB, and other government agencies collected the victims' true needs, and attitudes to and suggestions on the Subproject by various means.

The government agencies concerned have conducted active publicity, and local residents are highly willing to assist the government in implementing the Subproject, because they have realized the importance of the Subproject for their own lives and the city's development. Since there is an urgent need for restoration after the flood, the Subproject is expected and supported by all.

**5.6.2 Social Risks****5.6.2.1 Potential LAR Impacts of Subproject Construction**

**1) LA:** 47.57 mu of collective land will be acquired permanently for the Subproject, affecting 35 households with 145 persons in 7 villages in 4 townships (Shidao Xiang, Dajindian Town, Donghua Town and Gaocheng Town) of Dengfeng City, including 38.54 mu of cultivated land (81.02%) (all being ordinary farmland, excluding basic farmland), 4.51 mu of garden land (9.5%) and 4.52 mu of other farmland (9.5%).

**2) Occupation of state-owned land:** 193.3 mu of state-owned land will be occupied permanently for the Subproject, including 150.94 mu of riverside unused land and 42.36 mu of river flat.

**3) Temporary land occupation:** 60 mu of land will be occupied temporarily for the Subproject, including 31.60 mu for the construction camps and 28.40 mu for the temporary stockyards.

The Subproject does not involve HD.

It is necessary to identify the LA impacts, disclose them to the APs in advance, grant full compensation to them, collect their opinions and suggestions timely, and establish an appropriate response mechanism for potential issues. See the ARAP for details.

See Table 5-9.

Table 5-9 Summary of LA Impacts

Component	Scope of construction	Permanent land occupation											Temporary land occupation					Remarks	
		State-owned land				Collective land			HD				State-owned land			Collective land			
		Land area (mu)	AHs	APs	Time of LA	Land area (mu)	AHs	APs	House size (m <sup>2</sup> )	AHs	APs	Time of approval	Land area (mu)	AHs	APs	Land area (mu)	AHs		APs
River Dredging	The range of river dredging is the whole river segment of 37.588km. After dredging, longitudinal slope gradients will be 1/176~1/500, riverbed widths 29m~138m, and the slope gradients of both banks will be not less than 1:1.5.	/	/	/	/	/	/	/	/	/	/	/	60	/	/	/	/	/	The permanently occupied state-owned is 150.96 mu of riverside unused land and 42.37 mu of tidal flat.
Embankment Restoration	The damaged banks are about 17.8km long, and will be restored by backfilling with cobbles and loam soil. After reconstruction, the existing tributary mouths will be kept and locally protected for a length of not more than 50m.	64.4	/	/	/	15.8	14	48	/	/	/	/		/	/	/	/	/	
Bank Slope Protection	The bank slope protection length will be 29.388km, and masonry will be used mainly. M10 masonry will be used for foundations.	128.9	/	/	/	31.7	21	97	/	/	/	/		/	/	/	/	/	
Bridge restoration	The submerged bridges damaged by this flood will be restored not lower than the original standard. The 3 seriously damaged submerged bridges will be rebuilt on their former sites using C25 reinforced concrete culverts.	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	Involving no additional land occupation	
<b>Total</b>		<b>193.3</b>	/	/	/	<b>47.57</b>	<b>35</b>	<b>145</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>60</b>	/	/	/	/	/	/

Note: The temporarily occupied land is used for the construction camps and temporary stockyards mainly, and is mainly abandoned factory land and river flat mainly. Dredging spoil will be transferred to the spoil ground in the west part of Dengfeng City for land filling, not involving resettlement.

### 5.6.2.2 Potential E&S Impacts during Construction and Operation

Noise, flying dust and waste gases generated by construction machinery and trucks, domestic wastewater and domestic waste generated during construction, and bottom mud drying may affect nearby residents.

This can be verified from the questionnaire survey results. Such negative impacts include: ①87% of the respondents think that the Subproject will lead to temporary traffic inconvenience; ②45.25% of the respondents think that the Subproject will lead to dust and noise pollution; ③19.25% of the respondents think that the Subproject will lead to water loss and soil erosion, and water pollution; ④16% of the respondents think that the Subproject will affect local residents' personal and property safety; ⑤9.75% of the respondents worry about LAR impacts.

Table 5-10 Perceived Negatives Impacts of the Subproject at the Construction and Operation Stages

Indicator	Potential negative impact					
	Temporary traffic inconvenience	Dust and noise pollution	Water loss and soil erosion, and water pollution	Threat to local residents' personal and property safety	LAR impacts	Don't know
Sample size	348	181	77	64	39	64
Percent (%)	87.00	45.25	19.25	16.00	9.75	16.00

### 5.6.2.3 Community Health and Safety Impacts of Construction

1) There are many villages around the construction sites. During construction, more vehicles will pass through nearby villages, resulting in traffic convenience and safety risks, especially children and old people, who are more likely to encounter accidents. In addition, sludge and slag on vehicles may spill, thereby affecting local vehicles and pedestrians, and flying dust will be adverse to physical health.

2) During construction, noise, flying dust, waste gases, domestic wastewater and domestic waste may affect nearby residents' production and lives. Noise and dust isolation measures should be taken to minimize such impacts.

3) After the completion of the Subproject, local pedestrian and vehicular traffic will increase considerably, thereby threatening the personal safety of local residents. Safety education should be conducted.

## 5.7 Labor and Working Conditions

### 5.7.1 Labor and Impacts

Specialized construction teams will participate in subproject construction, and may include nonlocal workers. It is expected 65 nonlocal workers (42 male and 23 female), and 142 local workers (98 male and 44 female) will be needed. Male workers will do skilled jobs mainly, and female ones will do unskilled jobs mainly. Particular attention should be paid to GBV and gender discrimination to protect female workers. The proportion of female workers should not be less than 20%.

Nonlocal workers will pose social and health risks, such as epidemics (including AIDS, COVID-19, influenza, etc.), and violation of local customs (including religious, funeral, wedding, etc.).

Table 5-11 Summary of Expected Labor Input and Types of Work

Indicator Township	Nonlocal workers – female not less than 30%	Main types of work	Local workers – female not less than 30%	Main types of work	Total
Gaocheng Town	18	Project management, financial management, contract management, machinery operation, etc.	31	Construction, material transport, cooking, cleaning, etc.	49
Donghua	17	Project management,	35	Earth transport, material	52



Town		financial management, contract management, machinery operation, etc.		transport, construction, cooking, cleaning, etc.	
Dajindian Town	16	Project management, financial management, contract management, machinery operation, etc.	40	Earth transport, material transport, construction, material transport, cooking, cleaning, etc.	56
Shidao Xiang	14	Project management, financial management, contract management, machinery operation, etc.	36	Earth transport, material transport, construction, material transport, cooking, cleaning, etc.	50
<b>Total</b>	<b>65</b>	<b>/</b>	<b>142</b>	<b>/</b>	<b>207</b>

### 5.7.2 Labor and GBV Management

The Dengfeng PMO should ensure that project workers are treated fairly, and have a safe and healthy working environment. In this regard, a sound labor rights protection and regulation mechanism has been established in Dengfeng City. First, an employer must have a lawful license, and recruit workers by lawful means. Second, all labor contracts and relationships should be registered. Third, regular and special inspections are conducted to see if an employer uses no child labor, protects female and underage workers, observes the working time and salary provisions, etc. Fourth, a signboard is set up at the workplace, notifying workers of their lawful rights and means of rights protection. Fifth, the duties of the government agencies concerned are defined. Publicity and social supervision are also strengthened.

In terms of GBV, Dengfeng City takes extensive measures to protect female workers' lawful rights. The Special Regulations on the Labor Protection of Female Workers of Henan Province, an employer shall not impose restrictions on the lawful rights of female workers in labor contracts, and shall not reduce salaries and benefits, restrict their promotion opportunities, or dismiss them on the ground of marriage, pregnancy, etc., and shall take effective measures to prevent female workers from sexual harassment at the workplace.

### 5.7.3 Measures and Suggestions

The contractors should meet the following requirements:

- 1) Employ project workers equally and fairly without discriminating women, disabled persons and migrant workers.
- 2) Take appropriate protective and supporting measures for certain groups.
- 3) Allow workers to establish and join worker organizations, and protect their collective bargaining right.
- 4) Set up toilets for women on construction sites, develop regulations against sexual harassment, and offer relevant training.
- 5) Establish a GRM and a labor protection supervision mechanism for workers.

## 5.8 Current Situation of Poverty

### 5.8.1 Current Situation of Local Poverty

Through poverty alleviation efforts, all 25,973 registered poor residents in 57 poor villages in Dengfeng City were lifted out of poverty in 2019. However, poverty may still exist. The poor population mentioned here is equivalent to the low-income population, mostly lifted out of poverty in 2019<sup>4</sup>.

The affected population includes a poor population of 2,598.

There is a large poor population in the subproject area, and the July 20 flood has affected their income growth to some extent.

Table 5-13 Poor Population Lifted out of Poverty in the Subproject Area

Item Township	Local poor households	Local poor population	Proportion of agricultural population (%)
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<sup>4</sup>Poor population: At the end of 2021, there was no poor village in the subproject area. However, poverty may still exist.

<b>Gaocheng Town</b>	44	176	0.39
<b>Donghua Town</b>	161	642	1.12
<b>Dajindian Town</b>	234	935	1.6
<b>Shidao Xiang</b>	212	845	2
<b>Total</b>	651	2598	5.11

### 5.8.2 Livelihoods of Poor Residents

The local poor population deals with self-sufficient small-scale farming, including:

1) Their income is from traditional farming mainly. For 70.52% of the poor respondents, the main income source of cultivation and stockbreeding. Their average proportion of agricultural income to household income is 63.5%, showing that they rely highly on traditional farming.

2) The poor population still deals mainly with the cultivation of traditional food crops, and less with the cultivation of commercial crops. 81.75% of the poor respondents deal with wheat cultivation, 80.28% with corn cultivation, and only 15.62% with the cultivation of vegetables and other crops. On the other than, the poor population is generally poorly educated and elderly (over 50 for males and over 45 for females), and lacks skills and knowledge.

Table 5-14 Crops Cultivated by Poor Population

<b>Crop</b>	<b>Households</b>	<b>Percent (%)</b>
<b>Wheat</b>	183	81.75
<b>Corn</b>	180	80.28
<b>Beans</b>	166	74.35
<b>Vegetables and other crops</b>	35	15.62
<b>Total</b>	224	100

### 5.8.3 Poverty Causes of Poor Residents

In the subproject area, the causes of poverty are as follows:

1) Due to historical and geographic factors, usable resources are limited, and some places do not have basic conditions for cultivation.

2) Difficulty of employment: Most poor residents are elderly, poorly educated and unskilled, and cannot adapt to modern life. They can just do unskilled jobs, and are often employed.

3) Some poor residents are disabled or sick, and unable to work. Some live on MLS subsidies, and some incur huge debts due to illness.

4) The July 20 flood has caused great property losses, further impoverishing poor residents.

5) Some poor residents rely highly on external assistance, and are not motivated to become rich.

### 5.8.4 Local Supporting Measures

In general, the local supporting measures include:

1) Strengthen industry development and develop the collective economy to offer jobs and promote poverty alleviation.

2) Promote employment, and develop public welfare jobs.

3) Strengthen post-disaster reconstruction to prevent re-impoverishment. In Dengfeng City, 50 agricultural post-disaster reconstruction projects have been implemented, and temporary subsidies totaling 41.49 million yuan distributed.

4) Grant subsidies. After the July 20 flood, subjects of support have been screened, especially those suffering from major diseases.

5) Strengthen infrastructure investment. 27 rural highway projects, rural power grid upgrading, and rural living environment improvement have been implemented, improving the rural environment greatly.

### 5.8.5 Needs of Poor Residents for the Subproject

Poor residents' special needs should be met, and their sound suggestions taken into account to reduce the Subproject's potential negative impacts on them. Their needs mainly include:

1) Priority in receiving jobs: Poor residents usually have difficulty in getting employed, so they need jobs suitable for them. The Subproject will generate some unskilled jobs, such as cleaning and cooking, which will be first made available to poor residents.

2) Compensation: Some poor residents have grown trees along the river. They expect such

trees be compensated for or disposed of by themselves to minimize losses.

### 5.8.6 Impacts of the Subproject on Poor Residents

Since the Subproject involves LAR, relatively poor communities and residents are disadvantaged in utilizing compensation, receiving subproject benefits and adapting to the new situation, thereby potentially aggravating relative poverty.

LAR under the Subproject will not affect poor residents and vulnerable groups. The Subproject will not aggravate local poverty or create additional poverty, and will ensure that poor residents will benefit equally, including:

1) Offering direct and indirect job opportunities to increase income: The Subproject will create temporary or permanent jobs directly during construction and operation, in which unskilled jobs like sand and stone handling, and cooking, will be first made available to local poor residents, women and other vulnerable groups to increase their income. The Subproject will improve the local environment and attract more visitors, thereby generating job opportunities indirectly, such as catering, accommodation, sightseeing and cleaning.

2) Improving local infrastructure and making traffic more convenient: Bridge restoration will alleviate traffic congestion and reduce traffic accidents to some extent, and protect the personal safety of local residents, including poor residents. The Subproject will also reduce traffic costs of poor residents.

3) Promoting social fairness: The Subproject will improve the infrastructure and public service level of the 4 affected townships practically, and provide poor residents with greater convenience and more development opportunities, such as nonagricultural employment.

4) Promoting local economic development and creating more development opportunities: The Subproject will improve the local investment environment, and attract more investment to promote local economic development and create more job opportunities for local residents. The Subproject will also promote the tourism development of the 4 affected townships, and the development of related industries, such as catering, accommodation and travel services, thereby increasing the income of local residents, including poor residents.

5) Reducing land occupation: Land is a very important income source for poor residents. The Subproject will not occupy farmland and not aggravate the poverty of poor residents. On the contrary, the Subproject will promote sustainable agricultural development by promoting water and soil conservation.

## 5.9 Social Gender Analysis

### 5.9.1 Local Women's Demographics

At the end of 2020, Dengfeng City had a registered population of 726,400, a year-on-year increase of 9,096, including 368,600 males, accounting for 50.37%; and 357,800 females, accounting for 49.26%, with a gender ratio of 103:100.

The 4 affected townships have a total population of 250,100, including 120,200 females, accounting for 48.22%, with a gender ratio of 107:100. Among the 4 affected townships, Gaocheng Town has the highest proportion of female population of 49.09%, and Donghua Town has the lowest proportion of 46.43%. Donghua Town has the highest gender ratio of 115, and Gaocheng Town has the lowest ratio of 103. See Table 5-15.

Table 5-15 Basic Information on Local Women

Division	Households (0,000)	Population (0,000)	Male (0,000)	Female (0,000)	Proportion of females	Gender ratio (female =100)
Dengfeng City	18.3	72.64	36.86	35.78	49.26%	103
Subproject area	6.25	25.01	12.95	12.06	48.22%	107
Gaocheng Town	1.88	7.5	3.81	3.68	49.09%	103
Donghua Town	1.65	6.5	3.48	3.02	46.43%	115
Dajindian Town	1.65	6.59	3.4	3.2	48.49%	106
Shidao Xiang	1.1	4.42	2.26	2.12	48.79%	106

Source: 2020 statistical yearbook of Dengfeng City, and social and economic development bulletins of townships

### 5.9.2 Local Women's Current Situation

To learn local women's current situation, the task force conducted a questionnaire survey and interviews with women. In the questionnaire survey, there are 142 female respondents, accounting for 35.5% of the sample.

#### 5.9.2.1 Age Structure

In the sample, those aged 35-44 years are the most, accounting for 29.3% (47% and 53% for males and females respectively). Among the female respondents, those aged 35-44 years are the most, followed by those aged 45-54 years, and those aged 65 years or above are the least. See Figure 5-8.

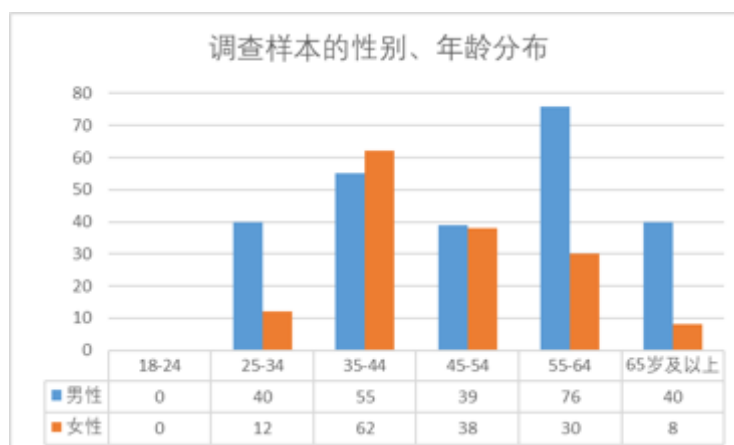


Figure 5-8 Gender and Age Distribution of the Sample

#### 5.9.2.2 Educational Levels

The respondents have mostly received senior high school / secondary technical school education (57.04% and 43.8% for males and females respectively). 10.56% of the female respondents have received junior college or above education, much lower than that of the males (24.03%). No respondent is illiterate.

It can be seen that men and women have little difference in educational level. See Table 5-16.

Table 5-16 Educational Levels of the Sample

Educational level	Male		Female		Total	
	N	Percent	N	Percent	N	Percent
Junior college or above	62	24.03%	15	10.56%	77	19.25%
Senior high school / secondary technical school	113	43.80%	81	57.04%	194	48.50%
Junior high school	72	27.91%	44	30.99%	116	29.00%
Primary school or below	11	4.26%	2	1.41%	13	3.25%
Illiterate	0	0.00%	0	0.00%	0	0.00%
Total	258	100.00%	142	100.00%	400	100.00%

#### 5.9.2.3 Occupations

The proportions of women in civil servants, enterprise employees and self-employers are lower than those of men, showing that women are disadvantaged in local employment.

Local women mostly stay at home and rarely work outside. There is a clear division of labor between the genders, where men are responsible mainly for external affairs and women mainly for internal affairs, such as farming and taking care of families. Therefore, men enjoy higher status, while women are mostly subordinate.

Table 5-17 Occupations of the Sample by Gender

Occupation	Male		Female		Total	
	N	Percent	N	Percent	N	Percent

Civil servant	4	1.55%	1	0.70%	5	1.25%
Public institution worker	0	0.00%	0	0.00%	0	0.00%
Enterprise employee	15	5.81%	2	1.41%	17	4.25%
Self-employer	11	4.26%	2	1.41%	13	3.25%
Freelancer	18	6.98%	21	14.79%	39	9.75%
Unemployed / laid-off	0	0.00%	0	0.00%	0	0.00%
Student	0	0.00%	0	0.00%	0	0.00%
Retiree	10	3.88%	3	2.11%	13	3.25%
Farmer	200	77.52%	113	79.58%	313	78.25%
Other	0	0.00%	0	0.00%	0	0.00%
Total	258	100.00%	142	100.00%	400	100.00%

#### 5.9.2.4 Women's Support for the Subproject and Social Status

1) In the question "Is the Subproject important for your family?", the proportion of the female respondents choosing "very important" (60.4%) is higher than that of the males (34.5%). Based on interviews, bridge restoration will bring great convenience to women in daily life, so they think the Subproject is more important for them. See Figure 5-9.

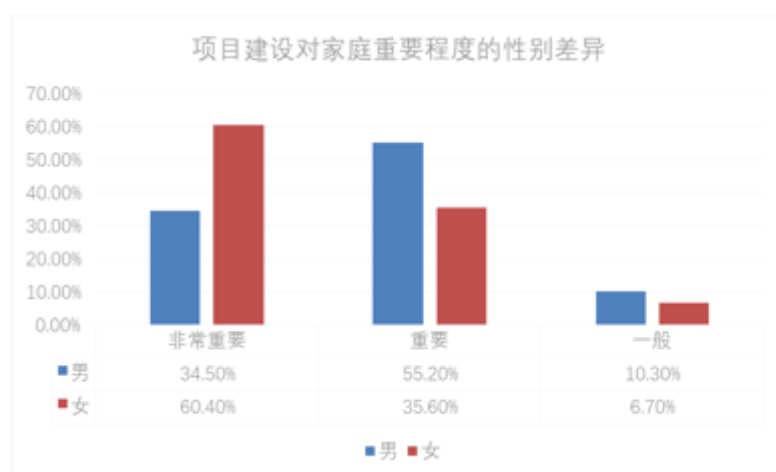


Figure 5-9 Gender Differences in Subproject Importance for Families

2) Local women have more opportunities to participate in public affairs, which will help promote gender equality.

In recent years, through active efforts of government agencies, women's federations and NPOs (or international organizations), local women have more opportunities to participate in public affairs, and greater access to public services and supporting policies.

More and more public activities oriented to or involving women will certainly improve their family and social status.

### 5.9.3 Women's Needs and Expectations

At the preparation stage, DCWRB, the township governments, design agency and task force collected local women's needs and suggestions by means of FGD and interview. Their needs for the Subproject are as follows:

#### 5.9.3.1 Relationship with Traffic

1) Women's trip modes

Women's main trip modes are electric bike (30.2%), walk (24.3%) and private car (20.7%). In daily life, local women travel by electric bike, walk and bicycle mainly. See Table 5-18.

Table 5-18 Trip Modes of the Sample by Gender

Indicator	Female			Male		
	Means of transport	Frequency	Percent	Means of transport	Frequency	Percent

No.1 trip mode	Electric bike	43	30.28%	Electric bike	86	33.33%
No.2 trip mode	Walk	34	23.94%	Private car	72	27.91%
No.3 trip mode	Private car	30	21.13%	Walk	64	24.81%

Note: The sample of the questionnaire survey includes 142 females and 258 males.

In the 4 affected townships, the existing road networks along the river are unsound. After bridge and road damage during the July 20 flood, the existing traffic infrastructure is far from meeting local women’s traffic demand, such as shopping, and taking children to and from school. Therefore, local women generally support the Subproject, and have raised expectations for safety signs, pavement and bridge quality, etc.

2) Women’s overall evaluation of traffic

The questionnaire survey shows that 67.74% of the female respondents think that the July 20 flood has caused inconvenience to their daily lives, and 45.16% think that there is traffic inconvenience along the Ying River.

In general, the main traffic problem perceived by local women is traffic inconvenience and risks arising from bridge and road damage.

**5.9.3.2 Greater Support for and Confidence in the Subproject**

In the question “Do you support the Subproject?”, 97.18% of the female respondents choose “strongly support”, much higher than that of the males (64.51%). Since bridge construction and river dredging will bring great convenience to them in shopping, taking children to and from school, and irrigation, their support level is much higher. See Figure 5-10.

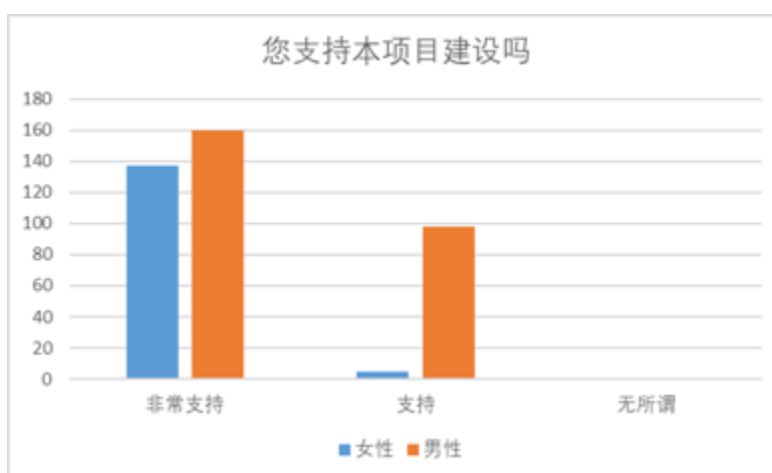


Figure 5-10 Support Level for the Subproject

**5.9.3.3 Expectation for More Job Opportunities**

The Subproject will generate some unskilled and service jobs, such as cleaning and catering. Local women expect to take such jobs to increase income.

**Interview 5-5: Dongjindian Village, Donghua Town, Ms Xu (39 years)**

“I would do farm work and take care of the family, and have some free time. I can do a cleaning or cooking job under the Subproject, even if for a short period of time.”

**5.9.3.4 Strong Demand for Public Participation**

With the development and progress of society, the role of women in families and society is recognized gradually, and their status has improved. Although the traditional division of labor still exists in the subproject area, women’s participation in certain activities is still inadequate, such as receiving LA compensation, major decisions, skills training and flood safety publicity. In the question “Have you been trained on flood control?”, nearly 1/3 of the female respondents have not. See Figure 5-11.

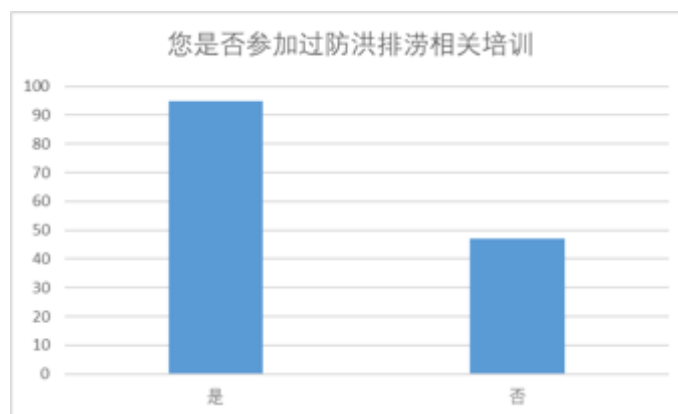


Figure 5-11 Have you been trained on flood control?

Local women are generally willing to participate in the above activities, and expect that particular attention should be paid to their needs and interests in future activities, especially middle-aged and elderly women.

**Interview 5-6: Nanzhai Village, Dajindian Town, Ms Chen (50 years)**

“I would take care of the family. I think that women can do something, such as skills training. I expect the government to pay more attention to us in the future.”

#### 5.9.4 Subproject Impacts on Women

##### 5.9.4.1 Positive Impacts

###### 1) Improving local traffic

In the subproject area, many young adult laborers (especially male ones) work outside, and those left behind are mostly old people and women. The Subproject will benefit those left behind in many ways. Since women’s main trip modes are walk and electric bike, bridge reconstruction will reduce their travel costs, times and burden.

###### 2) Creating a safer and more convenient traffic environment for women

After bridge restoration, women will enjoy safer, more convenient and more comfortable traffic. Their saved time can be used for production or leisure.

###### 3) Providing nonagricultural job opportunities to women to increase their income

The Subproject will generate some temporary jobs during construction, such as unskilled labor and cooking, which are available to local women and poor residents to increase their income. The Subproject will generate some unskilled jobs after completion, such as patrol and cleaning, which will be first made available to local women and poor residents.

###### 4) Encouraging women to participate to promote their development

AIB encourages women’s participation and pays attention to the protection of their rights. During implementation, women will be encouraged to participate in public affairs through village committees, and an incentive mechanism established. In addition, special flood control training will be offered to women to improve their participation awareness and overall literacy, and promote their long-term development. The survey shows that the female respondents are highly willing to participate in public activities, so women will be an important target group for community participation in the Subproject.

###### 5) Reducing floods to reduce financial losses

Floods often cause devastating damages. The Subproject will improve flood discharge and regulating capacity, and flood resistance, and create a favorable living environment. It will also reduce flood losses, and create a stable and safe production environment.

##### 5.9.4.2 Negative Impacts

The Subproject will benefit women. However, if there is a lack of gender sensitivity in the Subproject’s design, implementation and management, and women’s needs and suggestions are neglected, the Subproject’s benefits will be reduced, and women will be exposed to risks. The social

risks for women include:

1) Inequality in receiving compensation and getting employed

During LA compensation distribution, some women cannot sign for receipt because they are not household heads, so they are likely to be passive in making use of such compensation. During construction and operation, female workers are likely to be treated unfairly, such as remuneration and labor protection.

2) Reducing the land-based income of some women

LA may affect the living standard of women, because land-based income is likely to be reduced after LA. If land-expropriated women are not properly employed or resettled, their income will be reduced, thereby increasing the financial burden of their families.

3) Lack of flood safety awareness

Women and old people are relatively short of flood control knowledge. However, women have not received flood control training adequately, because the existing training mode is likely to neglect women, and women do not have time or effort to get trained due to their heavy housework burden.

The SMP has been developed through adequate consultation with the Dengfeng PMO, IA, local women's federations and agencies concerned. See Table 9-2 for details.



## 6 Option Selection

### 6.1 Option Selection

On July 19, 2021, the Mount Song area experienced an extraordinary rainstorm, with the precipitation breaking the single-day record in observation history of 385mm. This rainstorm was intensive and lasting, and triggered a torrential flood quickly, which not only destroyed the banks, but also overflowed and destroyed some structures. This flood damaged all rivers in Dengfeng City to varying degrees, especially the Ying River. The key to restoring the Ying River is river dredging, because it will increase the river's discharge and flood control capacity effectively.

River dredging will be conducted in the rural segment of the Ying River. 4 dredging machines have been proposed for comparison based on their characteristics, namely environment-friendly cutter suction dredger, high-concentration sludge pump, amphibious excavator and excavator.



Environment-friendly cutter suction dredger



High-concentration sludge pump



Amphibious excavator



Excavator

Figure 6-1 Dredging Machinery

① Environment-friendly cutter suction dredger

The environment-friendly cutter suction dredger is suitable for dredging in open waters, with a draught of 1.5m, featuring high precision, long-distance delivery, and enclosed and leakage-free pipeline. Dredged bottom mud is delivered to a designated area through the built-in high-power centrifugal sludge pump.

② High-concentration sludge pump

The high-concentration sludge pump is suitable for enclosed area construction with a depth of 0~0.5m, featuring high precision, high concentration, long-distance delivery, and enclosed and leakage-free pipeline. It is operated hydraulically to excavate, deliver and fill earth, and can be used with various types of amphibious excavators.

③ Amphibious excavator

The amphibious excavator is an efficient, multi-purpose excavator suitable for land, shallow and deep water. It sails on the water surface through its own draining track. Excavated mud will be delivered to a designated area by ship or vehicle.

④ General earthwork machinery

General earthwork machinery is suitable for dredging in areas with convenient drainage and traffic, and is universal and easy to operator, including excavators and bulldozers.

See Table 6-1.

Table 6-1 Comparison of Dredging Modes

No.	Dredging mode	Pros	Cons	Cost	Suitability
1	Environment-friendly cutter suction dredger	High precision, low secondary pollution	Complex process, requiring dewatering and residual water treatment	High	Comparison
2	Sludge pump	High precision	Low local efficiency, requiring dewatering and residual water treatment	Relatively high	Comparison
3	Amphibious excavator	Simple process, high precision, low cost	Likely to cause secondary pollution, unsuitable for open waters, requiring dewatering	Low	Comparison
4	Excavator	Simple process, high precision, low cost	Likely to cause secondary pollution, unsuitable for open waters, requiring dewatering	Low	Recommended

Since the river segment of the Subproject is broad, has a low discharge, and allows for dry excavation and dredging, stage-by-stage diversion, dry excavation and dredging will be applied.

## 7 Climate Change and Response

### 7.1 Climate Change

According to Interpretation of IPCC's latest report: China among the countries affected most by climate change (<https://baijiahao.baidu.com/s?id=1726075535229762317&wfi=spider&for=pc>): Since last year, extreme weather events like the Zhengzhou rainstorm have caused huge losses to China, and further losses may be incurred if no effective emission reduction measure is taken. China is one of the 10 countries suffering most from tropical cyclones and storm tides, and has annual losses from floods of up to \$13 billion. With the intensification of climate change, this situation may further deteriorate. The economic model shows that China is one of the countries affected most by climate change, and for each additional ton of carbon dioxide discharged in the world, China would lose \$24. In 2021, global carbon dioxide emissions amounted to 36.4 billion tons.

### 7.2 Response to Climate Change

The Subproject's response to climate change includes river safety, superstandard flood response, engineering measures, etc.

#### 7.2.1 River Safety

The Subproject will restore river functions, ensure flood safety and improve the city's emergency management capacity. The overall idea is to open up the flood gates in the segments of (0+000~0-750) and (2+000~4+000) in Gaocheng Town, (14+800~11+800) in Donghua Town, (22+000~24+000) in Dajindian Town, and Liyao and Shucun Villages in Shidao Xiang, dredge the river for flood discharge, and restore embankments. After completion, the Ying River's flood control capacity will improved greatly to resist floods that occur every 10-20 years.

#### 7.2.2 Analysis of Superstandard Floods

In recent years, extreme weather events have been increasingly frequent and intensive, such as the Rhine flood in Europe, the 48-hour rainstorm in Shizuoka, Japan, the dam failure in Hulunbuir City, Inner Mongolia, and the July 20 rainstorm in Zhengzhou. Both foreign and domestic experts point out that as the global warming trend continues, the situation will remain. Therefore, the possibility of extreme weather events should be considered in water resource project design.

According to analysis, when the Ying River encounters a rainstorm that occurs every 20 years, the overall water level in the segment from Haihewan Village, Dajindian Town (24+600) to Shidao Village, Shidao Xiang (36+838) will rise by 0.9m-1.6m, and river water will overflow in some parts; river water will not overflow in the segment from Jiangzhuang Village, Gaocheng Town (0-750) to Haihewan Village, Dajindian Town (24+600).

#### 7.2.3 Engineering Measures

##### 7.2.3.1 Emergency management measures

- 1) Establishing a superstandard flood forecast system

Establish a sound flood control responsibility system headed by the administrative chief. Assign water regimen teams during the flood period, and have someone on duty around the clock to forecast rain and flood conditions. The weather bureau should provide weather forecasts at any time. The flood control office should organize meteorological and hydrological experts to make forecasts. When a superstandard flood is predicted, the experts should give an early warning and propose a rescue plan.

- 2) Drafting an emergency evacuation plan for residents in the inundated area

When a superstandard flood occurs, residents in the flooded area should be transferred to safety. The flood control staff should be familiar with the local topographic and traffic conditions, and

design a rational evacuation route for planned and orderly evacuation. The evacuation route and resettlement site should be notified to local residents in advance.

3) Improving public flood control awareness

The Flood Control Law, Flood Control Regulations, River Management Regulations, etc. are the ultimate basis for flood dispatching and management. Publicity will be given by various means, including TV and consulting, to make the public aware of flood risks and mitigation measures.

4) Improving the post-disaster emergency rescue mechanism

First, define the duties to the authorities concerned to conduct post-disaster emergency rescue and reconstruction orderly. Local governments should grant relief funds timely to those who suffer severely, and help them rebuild homes and resume production. Second, make up consumed materials timely to ensure successful flood control. Third, restore flood control works damaged by the superstandard flood. Damaged communication cables, power lines, roads, hydrological monitoring stations and other infrastructure should be restored as soon as possible. Fourth, post-disaster reconstruction should be planned rationally in a unified manner, and newly built flood control works must comply with the national standard. Fifth, conduct disaster assessment by analyzing each aspect in flood control, sum up suggestions and experience, and find out issues.

#### 7.2.3.2 Operation management measures

To maintain river safety, naturalness and ecology, and protect water quality and bank slopes, it is necessary to strengthen wastewater discharge control, develop detailed rules for water system management, and assign dedicated staff. River facilities should be maintained regularly and properly.

### **7.3 Estimation of Incremental Costs**

In the Subproject, river safety and other works will be implemented to improve climate resilience. Such incremental costs are 165.39 million yuan, including building construction costs of 161.03 million yuan, temporary work costs of 4.36 million yuan. The Subproject's additional costs account for about 94% of the Subproject's total costs of 176.5 million yuan.

## 8 Public Participation and Information Disclosure

### 8.1 Stakeholder Identification

The Subproject's primary stakeholders have been identified, being direct beneficiaries and those negatively affected by the Subproject, including local residents, vulnerable groups, residents affected by LAR, etc. Secondary stakeholders include the owner, design agency, construction agency, supervising agency, government agencies concerned, etc.

#### 8.1.1 Primary Stakeholders

The Subproject's primary stakeholders include direct beneficiaries and those negatively affected by the Subproject.

**1) Beneficiaries:** The Subproject will benefit residents in 112 villages in the subproject, including 30 villages in Gaocheng Town, 23 villages in Donghua Town, 34 villages in Dajindian Town and 25 villages in Shidao Xiang, with a total population of 250,100, including 126,800 females, accounting for 50.7%. See Table 8-1.

**1) Local residents:** Local residents are the most direct beneficiaries of the Subproject: ①The Ying River is the most important flood control river in Dengfeng City, but silting and farmland occupation have affected its flood control capacity, and threatened the personal and property safety of nearby residents. The Subproject will restore the Ying River's flood control and discharge, irrigation, water supply and shipping functions, and reduce flood damages; ②Some bridges were damaged by the July 20 flood, making traffic inconvenient and unsafe. Bridge restoration will make traffic more convenient and safer, and meet local residents' daily needs; ③The restoration of the Ying River will be significant for supplying irrigation and domestic water to nearby residents; ④The Subproject will create a better living environment through ecological restoration.

**2) Vulnerable groups:** Local vulnerable groups including MLS households, five-guarantee households, the disabled, women-headed households, poor residents, etc. (There is no vulnerable group in the 35 households with 145 persons affected by LA for the Subproject.) The Subproject will undoubtedly generate more job opportunities and make traffic more convenient. The unskilled jobs generated by the Subproject will be first made available to local vulnerable groups, so that they can earn extra money while taking care of families. In addition, with the improvement of local traffic, it will be more convenient for local vulnerable groups to get employed elsewhere.

Table 8-1 Summary of Beneficiary Population

Township	Village	Beneficiary population (0,000)	Female beneficiary population (0,000)	Percent of female beneficiary population
Gaocheng Town	Gaocheng, Quhe, Shuangmiao, BEigou, Zhuyuan, Wudu, Jiagou, Chatinggou, Bafang, Fandian, Jietou, Wangcun, Yanggou, Baogou, Zhishang, Senzigou, Wangyao, Shuiyu, Miaozihuang, Jiangzhuang, Lyuzhuang, Yuanyao, Wujia, Gaojietou, Weiyuangou, Wangjiamen, Tianjiagou, Shiyangguan, Nanyanzhuang and Beiyanzhuang Villages	7.5	3.68	49.09%
Donghua Town	Dongjindian, Shaoyangzhai, Nandian, Rencun, Yuancun, Guocun, Masizhuang, Luotuoya, Tumenkou, Zhanglou, Zhouzhuang, Anyao, Kuzhuang, Beiyinpo, Shiqiao, Hemen, Zhaogou, Youlan, Yangsizhuang, Zhangsi, Liuzhuang, Wangcun and Quanmen Villages	6.5	3.02	46.43%
Dajindian Town	Jinxi, Jinzhong, Jindong, Yuanqiao, Youfangtou, Zhujiaping, Leicun, Gujiagou, Shutanggou, Nanzhai, Anmiao, Wangtang, Sanglou, Haihewan, Sanlizhuang, Dengcao, Haiyan, Lijiagou, Chenlou, Jiangou, Wangshang, Zhuangtou, Wencun, Meicun, Huangcun, Sanwangzhuang, Bijia, Cuiping, Duandong, Duanxi, Duannan, Taihoumiao, Longweigou and Duanzhong Villages	6.59	3.2	48.49
Shidao Xiang	Shidao, Xiyao, Zhaozhuang, Cuilou, Laozhuanggou, Chencun, Ruancun, Shangwo, Youwangzhuang, Zhanggou, Miaozihuang, Guogou, Haogou, Fanyao, Wanglou, Liyao, Shucun, Xuhan, Shaoyao, Fanzhuang, Yanpo, Houhe, Guanziling, Chenjiamen	4.42	2.12	48.79%

	and Hougou Villages			
Total	112	25.01	12.68	50.7%

Source: Feasibility Study Report, 2020 statistical yearbook of Dengfeng City, social and economic statistical reports of townships

**2) Those negatively affected by the Subproject:** including residents, enterprises and shops affected by LAR, and also including local vulnerable groups, such as poor residents and women

47.57 mu of collective land will be acquired permanently for the Subproject, affecting 35 households with 145 persons in 7 villages in 4 townships (Shidao Xiang, Dajindian Town, Donghua Town and Gaocheng Town) of Dengfeng City, including 38.54 mu of cultivated land (81.02%) (all being ordinary farmland, excluding basic farmland), 4.51 mu of garden land (9.5%) and 4.52 mu of other farmland (9.5%).

### 8.1.2 Secondary Stakeholders

Secondary stakeholders include the owner, design agency, construction agency, supervising agency, government agencies concerned, etc.

1) Dengfeng PMO: Since January 2022, the Dengfeng City Government has established agencies for the Subproject. The Dengfeng PMO is responsible for the organizational leadership, implementation and supervision of the Subproject, and liaison with AIIB. Subproject leading groups have been established in the 4 townships, responsible for subproject organization, coordination, management and implementation under the leadership of the Dengfeng PMO.

2) Owner: The owner DCWRB is responsible for coordinating relations of all parties concerned, and subproject construction, operation and maintenance.

3) Government agencies concerned: The government agencies concerned include DCNRPB, the ecology and environment bureau, emergency management bureau, statistics bureau, human resources and social security bureau, rural revitalization bureau, ethnic affairs commission, women's federation, civil affairs bureau, transport bureau, township governments, and village committees. The successful implementation of the Subproject relies on their support.

In addition, the Subproject's secondary stakeholders also include the design agency, contractors, etc.

## 8.2 Completed Public Participation and Information Disclosure Activities

Since the beginning of preparation in 2021, DCWRB has performed a series of information disclosure and social stability risk assessment tasks together with the agencies concerned. At the preparation stage, the feasibility study, SIA and EIA agencies disclosed subproject information, and conducted adequate informed consultation and public participation.

With the support of DCWRB, the township governments and village committees, the task force conducted fieldwork in the subproject area in February 2022. The SIA process is as follows:

### 8.2.1 Completed Public Participation and Information Disclosure Activities

1) Since November 2021, when the feasibility study was conducting fieldwork, the Dengfeng PMO began to communicate with local residents about the scope of construction, necessity and social benefits of the Subproject in the subproject area, and collected their attitudes and comments.

2) Since September 2021, under the direction of the technical assistance consultants, the Dengfeng City Government, DCWRB, township governments and design agency have conducted social stability risk assessment, a public willingness survey and public consultation (with about 30% of participants being women) by means of village congress, questionnaire survey, brochure, WeChat public account, etc.

3) In February 2022, the SIA agency visited the affected townships and villages, and learned local production and living conditions, economic and social conditions, traffic conditions, expectations for the Subproject, and potential impacts of the Subproject in detail, and notified local residents of the scope of construction, social benefits and impacts of the Subproject, compensation policies, restoration measures, etc. by means of questionnaire survey, FGD, organizational interview, in-depth interview, etc. Consultation results have been incorporated into the completed RAP.

Since November 2021, the Dengfeng City Government has set up a post-disaster reconstruction column on its website to release updates in real time. It has also disclosed the General River Chief Order of Henan Province (No.4), and the State Council's approval of the



post-disaster reconstruction plan of Zhengzhou Municipality, laying a good foundation for the implementation of the Subproject. See Figure 8-1.



Figure 8-1 Disclosed Subproject Information

### 8.2.2 Organizational Interview

Organizational interviews and FGDs have been held with the Dengfeng PMO, DCWRB, DCNRPB, development and reform commission, ecology and environment bureau, statistics bureau, human resources and social security bureau, rural revitalization bureau, women’s federation, ethnic and religious affairs bureau, township governments, etc. involved in the Subproject, and relevant data and literatures collected.



Figure 8-2 FGD with Government Agencies

### 8.2.3 Field Visit

The task force paid field visits to the 4 affected townships and damaged parts of the Ying River



to have a more objective understanding of the Subproject’s potential impacts on local residents, local residents’ production and living conditions, and their suggestions, concerns and expectations. See Table 8-2.



Figure 8-3 Field Visits by the Task Force(left: Gaocheng Town; right: damaged bridge in Donghua Town)

Table 8-2 Summary of Field Visits

City	Township	Village
Dengfeng	Gaocheng Town	Jiangzhuang Village
	Donghua Town	Dongjindian Village
	Dajindian Town	Jinxi, Duanzhong and Duanxi Villages
	Shidao Xiang	Shucun Village

#### 8.2.4 FGD

To further learn needs and suggestions of the APs (including women, poor residents, vulnerable groups, village officials, etc.), existing river infrastructure and problems, impacts of the July 20 flood, and education and training on post-disaster mental health and flood control, the task force held FGDs during the fieldwork.

The task force held 9 FGDs with 61 men-times, including 11 men-times of females, accounting for 18%; 6 old people, accounting for 9.8%; 5 vulnerable persons, accounting for 8.2%; and 39 village officials and villager representatives, accounting for 64%. See Table 8-3.





Figure 8-4 FGDs (Part)

(Upper left: Jiangzhuang Village, Gaocheng Town; upper right: Dongjindian Village, Donghua Town; lower left: Jinxi Village, Dajindian Town; lower right: Shucun Village, Shidao Xiang)

Table 8-3 Summary of FGDs and Participants

Location	FGD participants and numbers								Total	
	Women		Old people		Vulnerable groups		Village officials and villager representatives		Particip ants	Number of FGDs
	Parti cipants	Num ber of FGDs	Parti cipants	Number of FGDs	Particip ants	Num ber of FGDs	Particip ants	Number of FGDs	Particip ants	Number of FGDs
<b>Gaocheng Town</b>	2	1	1	1	1	1	6	1	10	2
<b>Donghua Town</b>	4	1	2	1	1	1	15	2	22	3
<b>Dajindian Town</b>	2	1	1	1	2	1	10	2	15	3
<b>Shidao Xiang</b>	3	1	2	1	1	1	8	1	14	1
<b>Total</b>	11	4	6	4	5	4	39	4	61	9

### 8.2.5 Key Informant Interview

The task force interviewed key informants of the affected townships and villages, and agencies concerned to further learn stakeholders’ attitudes to and suggestions on the Subproject, including heads of DCNRPB, the ecology and environment bureau, development and reform commission, transport bureau, statistics bureau, human resources and social security bureau, women’s federation, civil affairs bureau, rural revitalization bureau, and ethnic and religious affairs bureau at the city level, and village officials and villager representatives at the village level.

37 key informants were interviewed in total, including 11 from government agencies concerned, 7 in Gaocheng Town, 6 in Donghua Town, 5 in Dajindian Town and 8 in Shidao Xiang. See Table 8-4.





Figure 8-5 Key Informant Interviews

Table 8-4 Summary of Key Informant Interviews

Location	Heads of agencies	Village officials	Total
Gaocheng Town	1	6	7
Donghua Town	1	5	6
Dajindian Town	1	4	5
Shidao Xiang	1	7	8
DCNRPB and other agencies concerned	4	7	11
<b>Total</b>	<b>8</b>	<b>29</b>	<b>37</b>

### 8.2.6 Questionnaire Survey

The task force conducted a questionnaire survey in the affected townships and villages.

The sample size was 384 based on a confidence level of 95% and a maximum absolute error of 5% using the probability proportional to size (PPS) method. 400 copies of the questionnaire were completed.



Figure 8-6 Questionnaire Survey

See Table 8-5.

Table 8-5 Sample of the Questionnaire Survey

Location	Number of respondents	Percent (%)
Gaocheng Town	53	13.25%
Donghua Town	142	35.5%
Dajindian Town	103	25.75%
Shidao Xiang	102	25.5
<b>Total</b>	<b>400</b>	<b>100%</b>

The questionnaire database was established and analyzed using the IBM SPSS software. See Table 8-6.

Table 8-6 Basic Information on the Valid Sample

Indicator	Statistical data
<b>Gender</b>	Male: 64.5%; female: 35.5%
<b>Age</b>	18-24 years: 0%; 25-34 years: 13.1%; 35-44 years: 29.3%; 45-54 years: 19.35%; 55-64 years: 26.4%; 65 years or above: 11.9%
<b>Urban / rural</b>	Rural: 87.1%; urban: 12.9%
<b>Educational level</b>	Illiterate: 0%; primary school: 3.23%; junior high school: 29.03%; senior high school/secondary technical school: 48.39%; junior college or above: 19.35%
<b>Occupation</b>	Civil servant: 1.3%; worker of public institution: 0%; worker of enterprise: 4.23%; self-employer: 3.23%; freelancer: 9.68%; unemployed: 0%; student: 0%; retiree: 3.23%; farmer: 78.3%; other: 0%

See Table 8-7.

Table 8-7 Summary of Public Participation Activities

Type	Time	Venue	Description	Participants
<b>Information disclosure</b>	Sep. 2021	Affected villages	information disclosure	DCWRB, township officials, feasibility study agency, village officials, villagers
	Nov. 2021	Affected villages	Disclosing information disclosure, and collecting attitudes, comments and expectations	Dengfeng PMO, DCWRB, consultants, township governments, village officials, villagers
	Sep. 2021	Websites	Learning updates of post-disaster construction	DCWRB, township officials, local residents
<b>Field visit</b>	Feb. 14-24, 2022 Mar. 2022	Affected villages	Conducting the socioeconomic sampling survey	Village and township officials, DCWRB
	Feb. 14-24, 2022 Mar. 2022	Affected villages	Collecting local residents' comments and suggestions on the Subproject	Village and township officials, DCWRB, SIA agency
	Feb. 14-24, 2022 Mar. 2022	Construction sites	Visiting construction sites and villages to consult on preparation and collect suggestions on improving the subproject design	Village and township officials, DCWRB, SIA agency
<b>Questionnaire survey</b>	Feb. 14-24, 2022	Villages	Conducting a questionnaire survey on 400 respondents, including 258 males and 142 females	APs, SIA agency
<b>FGD</b>	Feb. 14-24, 2022 Mar. 2022	Agencies concerned, villages	Holding 9 FGDs with 61 men-times, including 11 men-times of females, accounting for 18%; 6 old people, accounting for 9.8%; 5 vulnerable persons, accounting for 8.2%; and 39 village officials and villager representatives, accounting for 64%	APs, village officials, villagers, SIA agency
<b>Key informant interview</b>	Feb. 14-24, 2022 Mar. 2022	Agencies concerned, townships, villages	Interviewing 37 key informants in total, including 11 from government agencies concerned, 7 in Gaocheng Town, 6 in Donghua Town, 5 in Dajindian Town and 8 in Shidao Xiang	Heads of agencies concerned, village officials, villagers, enterprise workers, SIA agency

## 8.3 Stakeholder Demand Analysis

### 8.3.1 Stakeholders' Needs for the Subproject

Stakeholders refer to individuals or groups that can affect or be affected by the realization of



the subproject objectives, including local residents, vulnerable groups, those affected by LAR, etc.

### 1) River restoration

The rivers in Dengfeng City mostly originate from mountains, and floods are very likely to cause great damages, and threaten local residents. As the most important flood control and discharge river of Dengfeng City, the Ying River is the most important factor of the whole city's personal and property safety. Since its embankments and riverbed were damaged by the July 20 flood, there is an urgent need for restoration.

#### ①Urgent demand for river dredging and improved flood discharge capacity

Currently, the Ying River is seriously silted, and some parts are narrow, reducing its flood discharge capacity. Local residents urgently expect to dredge and broaden the river.

#### **Interview 8-1: Jiangzhuang Village, Gaocheng Town, Mr. Li (48 years)**

"When the river is broadened, it will be easier to control floods in summer, so that floods will not cause damages to farmland and houses."

#### ②Urgent demand for embankment restoration

Some parts of the Ying River have unlined earth banks, which are likely to be destroyed. After the July 20 flood, the banks in Jiangzhuang and Quhe Villages, Gaocheng Town have been destroyed, and can no longer control floods. In some parts, earth banks have been weakened by the flood. The embankments are the first barrier to floods. Local residents are very dissatisfied with the current situation of the embankments, and urgently expect to improve their stability.

#### **Interview 8-2 Jinxi Village, Dajindian Town, Mr. Cheng (37 years)**

"The embankments have been damaged by the flood, and need to be repaired, so that we can grow crops without worry."

### 2) Bridge restoration

Bridges play a crucial role in local traffic across the Ying River. 3 bridges were destroyed by the July 20 flood, affecting local traffic seriously. Therefore, local residents expect to restore the bridges to ensure convenient traffic.

#### **Interview 8-3 Dongjindian Village, Donghua Town, Ms Bai (49 years)**

"After this bridge was destroyed by the flood, we have to cross the river via a temporary earth road, and vehicles cannot pass through it."

### 3) Retaining the water storage function to supply irrigation and domestic water

The Ying River is the "mother river" of Dengfeng City, supplying irrigation and domestic water to the whole city. It is also a water source of the downstream Baisha Reservoir. Local residents expect to restore its water storage and supply function, and improve the living environment.

#### **Interview 8-4 Jindong Village, Dajindian Town, Mr. Wang (37 years) Shucun Village, Shidao Xiang, Mr. Han (59 years)**

"We expect to build a retaining dam and a wetland to make the environment here better."  
"Water should be stored for farmland irrigation."

### 4) Reservation of small flood channels and river-going passages

Due to the necessity of flood discharge, local residents expect to reserve small flood channels to improve flood discharge capacity, and build river-going passages for the convenience of farmland irrigation.

**Interview 8-5 Duanxi Village, Dajindian Town, Mr. Gao (37 years)**

“Mountain floods are often intensive and extensive, so small flood channels should be reserved to protect farmland. River-going passages should also be built so that we can irrigate farmland conveniently.”

**5) Reduction of losses**

Since the issue of the General River Chief Order of Henan Province (No.4) in January 2022, ground attachments affecting flood discharge have been cleaned up throughout the province. There are some poplars planted by villagers along the Ying River. Villagers expect that their trees are compensated for during river restoration to reduce their losses.

**Interview 8-6: Shucun Village, Shidao Xiang, Mr. Shu (51 years)**

“There are many poplars planted by villagers along the river. Trees cleaned up during river restoration should be compensated for, or disposed of by ourselves.”

**8.3.2 High Enthusiasm and Willingness of Poor Residents**

Local poor residents generally support the Subproject. If possible, they are willing to get employed during construction and operation to increase income while taking care of families.

Most MLS subjects and poor residents are willing to participate in the Subproject, because it is a good opportunity to increase their income. They can do unskilled jobs generated by the Subproject directly, or work outside using convenient traffic conditions created by the Subproject.

**8.3.3 High Willingness of Women**

The questionnaire survey on 142 local women shows that all women support the Subproject. 100% of the female respondents are highly willing or willing to participate in the Subproject. See Table 8-8.

Table 8-8 Willingness of Local Women to Participate in the Subproject

Option	Indicator	Frequency	Percent	Valid percent	Cumulative percent
Valid	Highly willing	110	77.42	77.42	77.42
	Willing	32	22.58	22.58	22.58
	Unwilling	0	0	0	
	Total	142	100.0	100.0	

**8.3.4 High Subproject Awareness among Local Officials and Residents**

Through door-to-door publicity at the preparation stage, 90.32% of the respondents are aware of the Subproject. The main information sources are village committee notification (37%), TV, broadcast, newspaper or network (29.8%), and government notification (22%).

The awareness of the scope of construction of the Subproject among staff of government agencies concerned or local governments has increased to some extent. However, most local residents are still unclear about the scope of construction, so further publicity is needed.

**8.3.5 High Level of Support for the Subproject among Local Residents**

96.8% of the respondents think that the Subproject is important for their families.

Table 8-9 Support of Local Residents for the Subproject

Option	Indicator	Frequency	Percent (%)	Valid percent (%)	Cumulative percent (%)
Valid	Very important	206	51.61	51.61	51.61
	Important	181	45.16	45.16	45.16
	Neither, nor	13	3.23	3.23	100.0
	Total	400	100.0	100.0	

Local residents who have suffered from floods highly understand the importance of river dredging and bridge restoration, and support the Subproject.

**Interview 8-7: Nandian Village, Donghua Town, Ms Xu (33 years)**

“River management is a good thing supported by us, because it will provide more convenient traffic, and prevent future floods.”

#### 8.4 Public Participation and Information Disclosure Plan

Information disclosure and public participation will run through the whole lifecycle of the Subproject.

Before the start of construction, the ESIA Report and ESMP in Chinese and English will be disclosed on the websites of the Dengfeng PMO, DCWRB and AIIB. In addition, DCWRB will prepare hardcopies of the ESIA Report and ESMP for public reading.

A billboard will be set up at the entrance of each construction site, specifying the contractor, supervising agency, construction period, and contact information of the local competent authorities, in order that local residents forgive temporary construction impacts and report violations of contractors.

The contractors should attend public participation meetings held by the owner in the affected villages, explain construction activities, and environmental protection measures taken or to be taken, and respond to public E&S concerns.

On the basis of the questionnaire survey, FGDs, in-depth interviews and key informant interviews, the following public participation plan has been developed through participatory observation, as shown in Table 8-10.

Table 8-10 Public Participation Plan

Stage	Activity	Mode	Implemented by	Participants	Topic	Funding source
Preparation	<b>Subproject information disclosure</b>	TV, broadcast, poster, leaflet, village committee, internet	Dengfeng PMO, township governments, village committees	Residents, township officials, Dengfeng PMO	Disclosing basic information of the Subproject; Collecting comments and suggestions from residents; Answering questions of residents	Subproject budget
	<b>Willingness survey</b>	Village congress, questionnaire survey	Dengfeng PMO, consulting agency	Residents, Dengfeng PMO, consulting agency	Conducting a willingness survey on residents; The Subproject will be implemented only if over 80% of residents approve of it.	Subproject budget
	<b>Design consultation</b>	Interview, FGD, disclosure	Dengfeng PMO, design agency, consulting agency	Residents, Dengfeng PMO, design agency, consulting agency, village committees	Developing a public participation plan, including flood safety education and training, early warning and drilling, to improve local residents' flood control and safety awareness; Encouraging residents to give comments and suggestions on the subproject design; The PMO will disclose the preliminary design in the affected villages, and collect comments and suggestions.	Subproject budget
	<b>LA</b>	Consultation	Village committees, Dengfeng PMO	Residents, village committees, Dengfeng PMO, DCNRPB	Confirming land occupation; Determining the compensation mode through consultation; Signing compensation agreements	Subproject budget
	<b>Construction information disclosure</b>	Village congress, bulletin board, poster, broadcast, etc.	Dengfeng PMO, contractors, village committees	Residents, Dengfeng PMO, contractors, village committees	Disclosing the construction schedule; Construction site distribution; Construction impacts; Safety precautions for residents; Contractors' contacts and contact information	/
Implementation	<b>Reducing construction impacts</b>	Design optimization	Dengfeng PMO, contractors, village committees	Dengfeng PMO, contractors, transport bureau, traffic police, ecology and environment bureau, village committees, villager representatives	Leaving access roads to local residents during construction; Taking dust and noise control measures; Keeping stockyards away from living areas where possible; Minimizing temporary land occupation	Subproject budget
	<b>Participation in</b>	Village meeting, village	Dengfeng PMO,	Residents, Dengfeng	Determining the jobs to be generated by the Subproject;	Internal



Stage	Activity	Mode	Implemented by	Participants	Topic	Funding source
	<b>construction</b>	congress	contractors, village committees	PMO, contractors, village committees	Determining the selection criteria for construction workers, and making jobs first available to poor residents and women; Determining salaries, and skills and safety training for workers	budgets of contractors
	<b>Management of nonlocal workers</b>	Health and safety publicity, and worker education	Dengfeng PMO, contractors, health bureau, village committees, local residents	Dengfeng PMO, contractors, health bureau, health centers, village committees, nonlocal workers, local residents	Conducting education and publicity on public health, AIDS prevention and GBV, etc., and including it in contracts; Conducting physical checkups for construction workers; Strengthening education on local customs for nonlocal workers	Subproject budget
<b>Operation</b>	<b>Flood and water safety education</b>	Workshop	Dengfeng PMO, village committees	Residents, village committees	Strengthening flood safety education to improve residents' safety awareness; Organizing a workshop on flood control and safety, and conducting early warning and drilling to improve residents' flood safety awareness; Offering diversified disaster training (earthquake, flood control, etc.); Increasing the proportions of women, old people and children in flood control education and training; Strengthening the training of natural disaster officers; Creating a good atmosphere of river environment protection in residual communities.	Special budgets of authorities, collective finance
	<b>GRM disclosure</b>	TV, broadcast, poster, leaflet, village committee, internet	Dengfeng PMO, government agencies concerned, village committees	Dengfeng PMO, government agencies concerned, township governments, village committees	Disclosing the Subproject's supervision hotline at appropriate places; Accepting grievances by means of field appeal, letter, call, etc., and giving a reply on the spot or within 15 days; Collecting comments from women, poor residents and other vulnerable groups, and ensuring that the Subproject is implemented openly, fairly and transparently	/

## 9 Grievance Redress

### 9.1 Grievance Redress Procedure

During the preparation, construction and operation of the Subproject, the Dengfeng PMO and DCWRB will establish a project-level GRM to address the Subproject's potential issues, and ensure local residents' extensive participation.

All grievance records and dispositions will be reported to AIIB through quarterly / semiannual E&S monitoring reports.

The Subproject has two GRMs:

The first is the project-level GRM for APs, NGOs and business entities.

The second is the GRM for project workers, including direct and contracted workers.

#### 1) GRM for APs

Grievances may relate to flying dust and noise arising from construction, the improper disposal of construction waste, traffic inconvenience, etc. Contractor workers may also report OHS concerns through this GRM. The Dengfeng PMO, DCWRB, DCNRPB, township governments, village committees, and other government agencies concerned established agencies for social actions the Subproject in November 2021, where DCWRB is responsible for managing the GRM. If DCWRB receives a grievance, it will first check if such grievance relates to the Subproject. If yes, it will redress such grievance through coordination. If no, it will forward such grievance to the competent authority for the griever. All grievances will be recorded, and the whole grievance redress process notified to relevant staff. The basic procedure and timeframe of the GRM are as follows:

- Stage 1 (5 days): If any problem occurs at the construction or operation stage, an AP may file a written or oral grievance to the contractor. The contractor will: 1) stop the relevant activity (e.g., construction with noise impact on nearby residents) immediately; 2) not restore such activity before the grievance is closed; 3) notify DCWRB of the grievance received and the proposed solution; 4) give a definite reply to the AP within two days; and 5) close the grievance within 5 days after receipt where possible.
- Stage 2 (5 days): If the contractor cannot find a solution, or the AP is dissatisfied with the proposed solution, DCWRB will hold a meeting with the main stakeholders (including the contractor and AP) to develop a solution accepted by all, including key steps. The contractor should implement such solution immediately, and close the grievance within 15 days. All measures and results should be recorded.
- Stage 3 (15 days): If DCWRB cannot find a solution, or the AP is dissatisfied with the proposed solution, DCWRB will hold a stakeholder consultation meeting within 7 days (including the griever, contractor, local ecology and environment bureau, human resources and social security bureau, urban administration bureau, etc.) to develop a solution accepted by all, including key steps. The contractor should implement such solution immediately, and close the grievance within 15 days. All measures and results should be recorded. At the end of Stage 3, the IA will notify the outcome to AIIB.
- Stage 4: If the griever is still dissatisfied with the disposition of Stage 3, he/she may apply for arbitration with the competent authority in accordance with the Administrative Procedure Law of the PRC.
- Stage 5: If the griever is still dissatisfied with the arbitration award, he/she may file a suit in a civil court in accordance with the Civil Procedure Law.

#### 2) GRM for workers

With the support of the IA, the contractors will establish a separate grievance redress center for construction workers to handle grievances about salaries and payment, overtime pay, accommodation safety, health, medical care, etc.

In addition, in GBV management, dedicated staff for protecting women's rights will be appointed, and effective measures taken to protect female workers from sexual harassment at the workplace, and allow them to file grievances. Such grievances should be handled timely, and victim privacy protected.

In addition, the PPM was established by AIIB to provide an opportunity for an independent and impartial review of submissions from Project-affected people who believe they have been or are likely to be adversely affected by AIIB's failure to implement its Environmental and Social Policy (ESP) when their concerns cannot be addressed satisfactorily through Project-level grievance redress mechanisms or AIIB Management's processes. For more information, visit:

<https://www.aiib.org/en/policies-strategies/operational-policies/policy-on-the-project-affected-mechanism.html>.

## 9.2 Recording and Feedback of Grievances and Appeals

During the implementation of the ESMP, the relevant agencies should register and manage appeal and handling information, and submit such information to DCWRB monthly, which will inspect the registration of appeal and handling information regularly.

To record grievances and their handlings, the Dengfeng PMO and DCWRB have prepared a registration form, as shown in Table 9-1.

Table 9-1 Grievance Registration Form

Appellant	Time	Location	Feedback of accepting agency	Dengfeng PMO's advice	External M&E agency's advice	Progress	AIIB's opinion
Appeal							
Expected solution							
Proposed solution							
Actual handling							
Person responsible (signature)							
Notes: 1. The recorder should record the appeal and request of the appellant factually. 2. The appeal process should not be interfered with or hindered whatsoever. 3. The proposed solution should be notified to the appellant within the specified time.							

## 9.3 Contact Information for Grievance Redress

The IA will assign dedicated staff members to collect and accept grievances and appeals from the APs. See Table 9-2.

Table 9-2 Contact Information for Grievance Redress

Agency	Contact	Address	Tel
Dengfeng PMO	Jing Dongxu	No.277 Songshan Road	15838232636
DCWRB	Yi Zhiqiang	No.277 Songshan Road	17603882022
Gaocheng Town Government	Gao Hongtao	Gaocheng Town Government	13703995251
Donghua Town Government	Rong Hao	Donghua Town Government	13803891122
Dajindian Town Government	Mr. Kang	Dajindian Town Government	18569903787
Shidao Xiang Government	Wen Yaxu	Shidao Xiang Government	17337132825
Jiangzhuang Village Committee	Feng Guoyun	Jiangzhuang Village	15136260666
Jiangzhuang Village Committee	Xu Jianzhong	Jiangzhuang Village	13592433665
Jiangzhuang Village Committee	Li Haibo	Jiangzhuang Village	13603995906
Dongjindian Village Committee	Li Wei	Dongjindian Village	15537191363
Dongjindian Village Committee	Liu Lianmin	Dongjindian Village	15039067888
Dongjindian Village Committee	Li Jieshi	Dongjindian Village	15138651309
Duanxi Village Committee	Gao Yanlong	Duanxi Village	18037510600
Jinxi Village Committee	Li Shengwei	Jinxi Village	13526415333
Jinxi Village Committee	Cheng Guangqing	Jinxi Village	13014529567
Nanzhai Village Committee	Chen Junbao	Nanzhai Village	18236769088
Shucun Village Committee	Zheng Huaqian	Shucun Village	13592468189
Shucun Village Committee	Shu Wanshun	Shucun Village	17719888360
Shucun Village Committee	Zhang Zhixia	Shucun Village	18037893528

## 10 ESMP

### 10.1 Organizational Responsibilities for ESMP Implementation

The Zhengzhou Municipal Government has established a project leading group headed by the deputy mayor, and composed of officials from the municipal finance bureau, development and reform commission, transport bureau, urban and rural construction bureau, water resources bureau, natural resources and planning bureau, ecology and environment bureau, etc.

The Zhengzhou PMO under the Project Leading Group has been established at the municipal finance bureau. Its members are from the municipal finance bureau, transport bureau, urban and rural construction bureau, water resources bureau, etc. The Zhengzhou PMO has 5 teams, responsible for overall coordination, bidding and procurement, financial auditing, E&S support and project implementation supervision, etc.

The Zhengzhou PMO is main responsible for the Project's overall coordination, bidding and procurement, financial statistics, project implementation supervision, etc. to ensure the successful implementation of the Project. The sectoral authorities have also established their own PMOs, responsible for conducting routine project management, and directing IAs to conduct project preparation, implementation and evaluation, covering planning, finance, procurement, training, monitoring and file management.

DCWRB is the IA of the Subproject, responsible for: 1) appointing an E&S coordinator to coordinate ESMP implementation; 2) including the ESMP, monitoring plan and mitigation measures in the bidding documents and contracts; 3) running the GRMs; 4) handling unforeseeable adverse impacts and reporting to AIIB timely; and 5) appointing qualified E&S external monitoring agencies.

Contractors: 1) ensuring that sufficient financial and human resources are available to implement the mitigation measures in the ESMP; and 2) running the GRM during construction.

Supervising agency: 1) ensuring that sufficient financial and human resources are available to supervise and direct the contractors to act on the ESMP; 2) supervising construction progress and quality; 3) appointing qualified OHS staff to supervising the contractors on site regularly; 4) supervising the contractors' ESMP performance. See Figure 10-1.

### 10.2 Expected E&S Impacts and Mitigation Measures

Mitigation measures have been developed based on the identified E&S impacts (Tables 10-1 and 10-2). The design agency and contractors will include such measures into the design and bidding documents, contracts, and operation management. The effectiveness of such measures will be monitored and evaluated for adjustment and improvement.

#### 10.2.1 Reducing LAR risks

a) Develop a detailed RAP; b) Pay particular attention to how vulnerable groups (if any) will use compensation for income restoration in the RAP.

#### 10.2.2 Restoring riverside infrastructure to meet flood control and safety needs

The infrastructure needed most by local residents includes: a) embankments; b) drainage facilities and flood channels; and c) traffic safety signs.

#### 10.2.3 Implementing publicity and training on flood control knowledge

Past flood control training is inadequate. The task force thinks it very necessary to strengthen flood control and safety training. In addition, since the river environment needs to be maintained by all residents, it is also necessary to offer training on embankment maintenance and waste cleanup to realize sustainable river management.

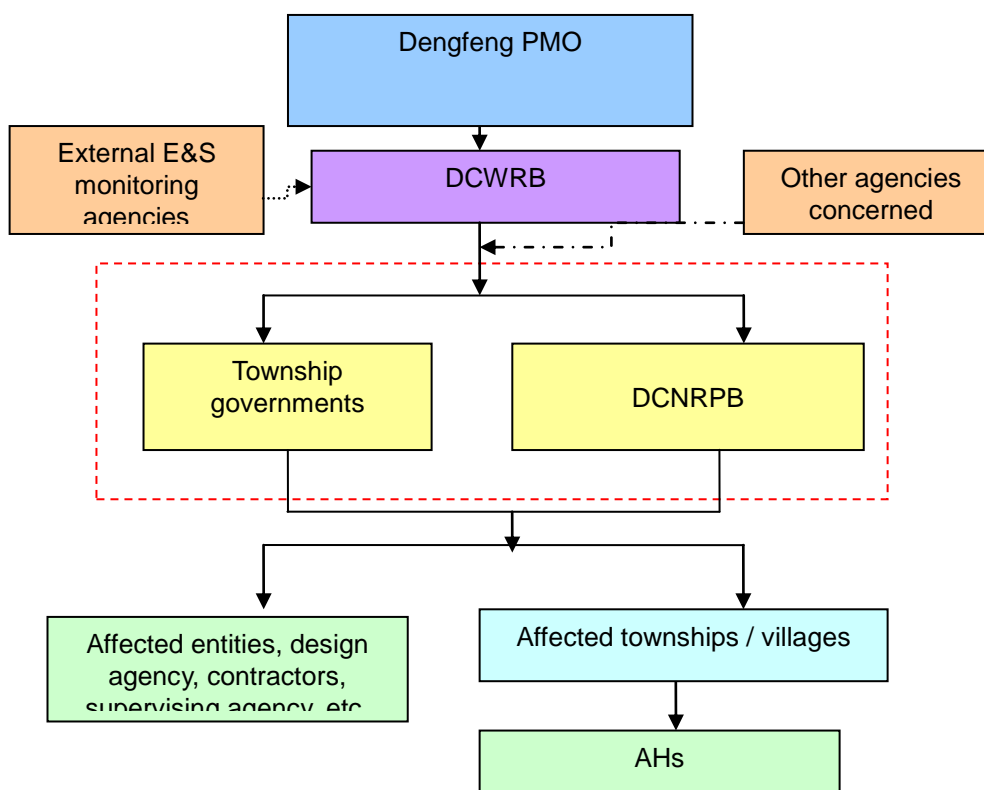


Figure 10-1 Organizational Chart for E&S Management

#### 10.2.4 Making jobs available to local women and preventing sexual harassment

a) Pay more attention to the employment free female labor during construction, especially those aged above 50 years; b) The contractors should recruit some women to involve more women in the Subproject, and should ensure equal pay for equal work; c) Strengthen the protection of female workers' rights, and offer relevant training to prevent GBV; d) Strengthen the supervision of construction sites, and establish a clear GRM to avoid GBV, sexual exploitation, sexual harassment, etc.); e) Establish a construction site grievance redress team, which includes at least two female members, and protect the safety of the team members.

#### 10.2.5 Strengthening the management of external workers to prevent AIDS, COVID-19 and other social risks

During construction, nonlocal workers will be recruited, and may pose social and health risks. Thus, it is necessary to strengthen safety and health publicity, and worker management to prevent such risks.

- Conduct public health and AIDS prevention education and publicity in the subproject area, covering epidemics (including AIDS, COVID-19, influenza, etc.), and include these in contracts to ensure effective implementation;
- Conduct education and publicity on AIDS and other infectious diseases, social interactions and communications, etc. for construction workers;
- Conduct physical checkups for nonlocal workers, set up temporary infirmaries if necessary, and ensure that only healthy workers can participate in construction;
- Conduct diversified publicity on AIDS prevention by means of brochure, poster, etc.;
- Strengthen publicity and education on local customs for nonlocal workers to make them respect local customs.

In addition, to involve beneficiaries in the Subproject extensively, and promote good communications between local residents and contractors, local workers (including women) will be recruited.

- Not less than 25% of construction workers should be women, including certain proportions of women and poor residents;
- Make unskilled jobs first available to vulnerable groups, including women;
- Offer labor remuneration not less than the local minimum salary standard, and offer subsidies for environmental supervision;
- Offer employment training to local workers recruited.

#### **10.2.6 Applying appropriate construction methods to reduce impacts on local residents**

a) Schedule construction rationally and set up fences to protect the personal safety of nearby residents; b) Identify underground power, water and gas pipes before excavation; c) Give publicity in advance, and conduct construction in stages to minimize impacts on nearby enterprises and shops; d) Take measures to control construction and traffic noise, select low-noise equipment where possible, and use high-noise equipment in the daytime; e) Sprinkle access roads regularly to reduce flying dust; f) Set up no-horning signs near communities, and design sludge transport routes rationally; g) Evade social sensitive sites, and avoid overnight construction where possible; h) Educate and train construction workers regularly, and avoid gathering in the noon break and at night; i) Post construction and contact information on fences and near sensitive sites, and assign dedicated staff to handle grievances; j) Take strict COVID-19 prevention and control measures, and conduct health screening regularly to minimize community health and safety impacts.

#### **10.2.7 Improving the capacity of local townships and communities to participate in river management**

a) Improve the river chief systems and stabilize the river chief team; b) Strengthen the civil supervision of river management; c) Strengthen the river management requirements, such as river tidiness (no waste, no illegal building, no direct wastewater discharge, no illegal occupation, etc.); d) Strengthen education and publicity on river management and flood control, and promote public participation in this aspect; e) Establish a social supervision mechanism and a river management information release platform, and set up river chief billboards along the river for public supervision.

#### **10.2.8 Improving labor and working conditions to protect lawful rights and interests of workers**

a) Employ workers equally and fairly without discrimination; b) Provide appropriate protection and assistance measures to certain worker groups, such as women, the disabled, migrant workers and underage workers; c) Allow workers to establish and join worker organizations, and protect their collective bargaining right.

#### **10.2.9 Protecting interests of persons affected by ground attachments**

There are scattered crops and trees along the river, which were planted by local villagers before the July 20 flood. Such land is not contracted land, and is no longer suitable for cultivation.

For such crops and trees: a) Allow villagers to dispose of their crops and trees themselves to reduce their losses; b) Compensate for crops and trees according to the rates specified in the RAP; c) Strengthen public consultation through village congresses, and disclose relevant measures and policies to avoid conflicts.

A feasible SMP has been developed through consultation with the Dengfeng PMO, owner, IA, agencies concerned and local residents. See Table 10-2.

Table 10-1 Environmental Impact Mitigation Measures Implemented by the Construction Agency

Type	Item	Environmental protection measures	Supervised by	Investment (0,000 yuan)
Water environment protection	Construction stage	1) Recycling vehicle and equipment washing wastewater through treatment. 2) Discharge domestic wastewater into septic tanks for irrigation.	Environmental protection authority	Vehicle washing budget
	Operation stage	Ensure river water quality through strict control measures.	Environmental protection authority	Environmental management budget
Ecological environment protection	Water and soil conservation	Take engineering, planting and temporary measures for integrated management.	Water resources authority	Water and soil conservation budget
	Ecological protection	1) Optimize the construction scheme, and conduct ecological restoration as soon as possible after construction. 2) Record the vegetation of the construction camps and temporary stockyards before construction as a basis for vegetation restoration. 3) Transfer and centrally store 0~30cm topsoil, and set up temporary barriers and drain ditches around before construction. 4) After construction, clean up construction waste timely, and backfill topsoil as designed. 5) Make up the damaged vegetation with appropriate species to avoid alien species invasion. 6) Optimize the construction scheme to control water pollution and noise from the source. 7) Conduct ecological compensation with common local aquatic organisms after construction.	Environmental protection authority	60
Ambient air protection	Construction stage	Ensure that approvals, registration, supporting measures, monitoring and staff are in place before construction, the construction site is fenced, all materials are covered, all vehicles are enclosed and washed, all pavements are hardened, and all construction activities are monitored in real time. The following measures will be taken to control flying dust during construction: 1) Flying dust control education Offer flying dust control training to all workers before construction. 2) Flying dust control responsibility system Urge the contractors to conduct flying dust management properly, and appoint the supervising agency for supervision. Include relevant provisions in contracts, and prepare a sound flying dust control scheme. 3) Earth and stone excavation and backfilling Take sprinkling and coverage measures timely, shorten excavation and backfilling timely, and store and cover earth and stone centrally. Clean pavements by manual sprinkling or a high-pressure flushing vehicle. 4) Construction site flying dust control Harden main roads at the construction site to avoid flying dust. Cover exposed grounds with dust screens, or take planting or fixation measures to control flying dust. Establish a sprinkling and cleaning system on the construction site.	Environmental protection authority	100

		<p>5) Vehicle washing Set up a vehicle washing device at vehicle entrances and exits, or use mobile flushing devices in special cases. Ensure that vehicles are free from dirt and mud. The flushing pressure should not be less than 0.3MPa, and the flushing time should not be less than 3min.</p> <p>6) Flying dust control during spoil transport Vehicles for spoil transport must be registered and enclosed, and drive along specified routes.</p> <p>7) Monitoring system Install a video monitoring system on the construction site. When the 3h average PM2.5 concentration on the construction site is equal to or greater than 78<math>\mu\text{g}/\text{m}^3</math> or the 3h average PM10 concentration is equal to or greater than 115<math>\mu\text{g}/\text{m}^3</math>, sprinkling and other emergency measures should be taken.</p> <p>8) Water and soil conservation Unplanted grounds should be covered with dust screens and kept wet. Disturbed grounds should be restored timely after construction.</p> <p>9) Non-road machinery control Assign a safety officer to manage non-road machinery, and ensure that it is properly maintained and meets the applicable regulations.</p> <p>10) Bottom mud odor control Accelerate dredging, set up fences, and apply deodorants.</p> <p>11) Canteen fume control Ensure that fume purification equipment operates normally.</p>		
		<p>12) Traffic impact mitigation measures Set up traffic signs around the construction site, and assign staff for traffic guidance when necessary.</p>	<b>Transport authority</b>	
Sound environment protection	Construction stage	<p>1) Design and set up construction sites in strict conformity with the design.</p> <p>2) Strengthen construction management and schedule construction rationally.</p> <p>3) Minimize noise during construction through effective management.</p> <p>4) Select construction machinery and trucks conforming to the relevant national standards, use low-noise construction machinery and processes where possible, and strengthen the maintenance of construction machinery to noise intensity ultimately.</p> <p>5) Set up fences around sensitive sites to reduce noise impacts.</p> <p>6) Schedule construction rationally near villages, and avoid construction at night (22:00~6:00) and during noon breaks.</p>	<b>Environmental protection authority</b>	20
Solid waste disposal	Construction stage	<p>1) Set up trash bins in the construction and living areas.</p> <p>2) Use the dredged material and spoil for embankment restoration where possible, and transfer the unusable material to the spoil ground.</p>	<b>Environmental protection authority</b>	110
<b>Processing plant management</b>		<p>Environment: The processing plant should establish environmental sanitation management regulations. Only simple repair and part replacement can be conducted on the construction site, and machinery overhaul is conducted at an existing repair factory in Dengfeng City.</p> <p>OHS: The Dengfeng PMO should ensure that project workers are treated fairly, and have a safe and healthy working environment. In this regard, a sound labor rights protection and regulation mechanism</p>	<b>Environmental protection and labor authorities</b>	10



	has been established in Dengfeng City. First, an employer must have a lawful license, and recruit workers by lawful means. Second, all labor contracts and relationships should be registered. Third, regular and special inspections are conducted to see if an employer uses no child labor, protects female and underage workers, observes the working time and salary provisions, etc. Fourth, a signboard is set up at the workplace, notifying workers of their lawful rights and means of rights protection.		
<b>Cultural heritage management</b>	If any cultural heritage is identified during construction, the following measures will be taken pursuant to the Cultural Relic Protection Law of the PRC: 1) Stop construction immediately; 2) Protect the site; 3) Report the local cultural relic authority immediately; 4) Adjust the construction scheme as advised; 5) Resume construction until the cultural relic authority has visited the site and taken appropriate measures.	<b>Cultural relic authority</b>	/
Other	Environmental management and monitoring, etc.	<b>Environmental protection authority</b>	26.71
Total			326.71

Table 10-2 SMP

<b>Risks</b>	<b>Measures or actions</b>	<b>Actors</b>	<b>Time</b>	<b>Funding source</b>	<b>Monitoring indicators</b>
<b>1. LAR risks</b>	a) Develop a detailed RAP; b) Pay particular attention to how vulnerable groups (if any) will use compensation for income restoration in the RAP; c) Provide temporary housing to the APs during the transition period.	DCWRB, RAP preparation agency, external M&E agency	Preparation and construction stages	Subproject budget	a. RAP; b. Payment of compensation; c. Livelihood restoration; d. Consultation on and disclosure of resettlement programs
<b>2. River infrastructure</b>	a) Embankments; b) Drainage facilities and flood channels; and c) Traffic safety signs	DCWRB, design agency, contractors, human resources and social security bureau, DCNRPB, transport bureau	Construction and operation stages	Subproject budget; public finance	a) Restored banks; b) Number of drainage facilities and flood channels; c) Number of traffic safety signs
<b>3. River management</b>	Relevant training activities: a) Organize a workshop on flood control and safety, and conducting early warning and drilling to improve residents' flood safety awareness; b) Offer diversified disaster training (earthquake, flood control, etc.); c) Increase the proportions of women, old people and children in flood control education and training; d) Strengthen the training of natural disaster officers River chief system: a) Improve the river chief systems and stabilize the river chief team; b) Strengthen the civil supervision of river	DCWRB, emergency management bureau, township governments, village committees	Preparation, construction and operation stages	Subproject budget; public finance	a. Frequency of training on flood control, number of trainees, proportion of women; b. Scope of training; c. Effectiveness of training; d. Material and fund use management process; e. Relevant process; f. Frequency of publicity and education

Risks	Measures or actions	Actors	Time	Funding source	Monitoring indicators
	management; c) Strengthen the river management requirements; d) Strengthen education and publicity on river management and flood control, and promote public participation in this aspect; e) Establish a social supervision mechanism.				on river management g. Social supervision
<b>4. Employment of vulnerable groups</b>	a) Recruit female workers to Dengfeng PMOs at different levels for the convenience of women-related work; b) Offer training to recruited female workers; c) Make unskilled jobs first available to vulnerable groups, including women; d) Offer labor remuneration not less than the local minimum salary standard, and offer subsidies for environmental supervision.	DCWRB, contractors, human resources and social security bureau, township governments, village committees, local women	Construction stage	Contractor budget	a) Numbers and proportions of women and poor residents doing unskilled jobs; b) Numbers of women and poor residents doing public welfare jobs; c) Venue, scope and frequency of training for female workers
<b>5. Women's participation and GBV prevention</b>	a) Not less than 50% of participants in public participation activities at the preparation stage are women. b) The time, venue and form of publicity should be suited to women's needs, educational level and daily activities. c) Strengthen the protection of female workers' rights, and offer relevant training to prevent GBV; d) Offer relevant training to female workers; e) Strengthen the supervision of construction sites, and establish a clear GRM to avoid GBV, sexual exploitation, sexual harassment, etc.); f) Establish a construction site grievance redress team, which includes at least two female members, and protect the safety of the team members	Design agency, contractors, owner, Dengfeng PMO, urban and rural construction bureau, civil affairs bureau, women's federation, transport bureau, township governments, village committees, local women, poor residents	Construction and operation stages	Subproject budget; public finance	a) Number of FGDs, number of female participants, and minutes; b) Time, venue and mode of training; c) Gender ratio of contracted workers; d) Frequency of training for women; e) Measures taken by the contractors to prevent GBV; f) Measures taken by the contractors to prevent sexual harassment, staffing of the grievance redress team, operation of the GRM
<b>6. Social risks</b>	a) Conduct public health and AIDS prevention education and publicity in the subproject area, covering epidemics, and include these in contracts b) Conduct education and publicity on AIDS and other infectious diseases, social interactions and communications, etc. for construction workers; c) Conduct physical checkups for nonlocal workers, set up temporary infirmaries if necessary; d) Conduct diversified publicity on AIDS prevention by means of brochure, poster, etc.; e) Strengthen publicity and education on local customs for nonlocal workers to make them respect local customs; f) Sign labor contracts with temporary workers.	Contractors, health bureau, DCWRB, enterprises, women's federation, township governments, village committees	Construction and operation stages	Subproject budget, health bureau budget	a) Contract provisions; b) Frequency of training and number of trainees; c) Number of health centers; d) Frequency of publicity on AIDS prevention; e) Frequency of training on local customs

Risks	Measures or actions	Actors	Time	Funding source	Monitoring indicators
<b>7. Construction risks</b>	a) Schedule construction rationally and set up fences to protect the personal safety of nearby residents; b) Identify underground power, water and gas pipes before excavation; c) Give publicity in advance, and conduct construction in stages to minimize impacts on nearby enterprises and shops; d) Take measures to control construction and traffic noise, select low-noise equipment where possible, and use high-noise equipment in the daytime; e) Sprinkle access roads regularly to reduce flying dust; f) Set up no-horning signs near communities, and design sludge transport routes rationally; g) Evade social sensitive sites, and avoid overnight construction where possible; h) Educate and train construction workers regularly, and avoid gathering in the noon break and at night; i) Post construction and contact information on fences and near sensitive sites, and assign dedicated staff to handle grievances; j) Take strict COVID-19 prevention and control measures, and conduct health screening regularly to minimize community health and safety impacts.	DCWRB, contractors	Preparation and construction stages	EMP budget	a) Number of traffic signs; b) Daily number of visitors to scenic zones during construction; c) Number of complaints about environmental pollution during construction, and handling; d) Inclusion of safety management in contracts, and publicity and education for workers; e) Number of notices and warning signs, and number of public facilities repaired
<b>8, Improving labor and working conditions to protect lawful rights and interests of workers</b>	a) Employ workers equally and fairly without discrimination; b) Provide appropriate protection and assistance measures to certain worker groups, such as women, the disabled, migrant workers and underage workers; c) Allow workers to establish and join worker organizations, and protect their collective bargaining right; d) Establish a labor protection supervision mechanism, and protect the privacy of reporters.	DCWRB, contractors	Preparation and construction stages	EMP budget	a) Proportion of women, the disabled and other special groups in recruited workers; b) Protective measures taken; c) Frequency of training and education; d) Frequency of collective bargaining; e) Labor protection supervision mechanism, number and proportion of female workers, feedback and suggestions
<b>9. Proprietors of ground attachments</b>	a) Allow villagers to dispose of their crops and trees themselves to reduce their losses; b) Compensate for crops and trees according to the rates specified in the RAP; c) Strengthen public consultation through village congresses, and disclose relevant measures and policies to avoid conflicts.	DCWRB, township governments, village committees	Preparation stage	Subproject budget; public finance	a. Disposal of crops and trees b. Compensation; c. Frequency and scope of village congresses

### 10.3 Institutional Strengthening and Capacity Building

DCWRB has no experience in implement an AIIB-financed subproject, and there is no EIA requirement for domestic projects of this type. Therefore, implementing the ESMP is a new task for the IA. The Zhengzhou PMO will assign an external specialist to provide preliminary training on ESMP implementation to the IA's E&S specialist, contractors and supervising agency, including AIIB's ESP, good construction practices, monitoring and reporting, GRM, etc.

### 10.4 Monitoring and Reporting

#### 10.4.1 Environmental Monitoring

Environmental monitoring will be conducted by a qualified third party.

##### 1) Water environment monitoring

Monitoring sites: a monitoring cross section 50m downstream the starting point, 50m upstream the end point, and at the entry point of the Ying River into the Baisha Reservoir

Monitoring factors: pH, COD, BOD<sub>5</sub>, ammonia nitrogen, SS, dissolved oxygen, total nitrogen, total phosphorus, petroleum

Monitoring frequency: **once before construction**, and quarterly during construction and operation, for 3 consecutive days per time

Monitoring method: as per the Environmental Quality Standard for Surface Water (GB3838-2002)

##### 2) Ambient air monitoring

Monitoring sites: at each downwind residual community close to the construction site

Monitoring factors: TSP, PM<sub>10</sub>, PM<sub>2.5</sub>;

Monitoring frequency: **once before construction**, and quarterly during construction, for 7 consecutive days per time

Monitoring method: as per the Ambient Air Quality Standard (GB3095-2012), and the Ambient Air Quality Monitoring Standard (Trial)

##### 3) Sound environment monitoring

Monitoring sites: sensitive sites within 50m around the construction site

Monitoring factors: equivalent continuous sound level A

Monitoring frequency: once before construction, and quarterly during construction, for 3 consecutive days per time, once in the daytime and at night each

Monitoring method: as per the Environmental Quality Standard for Noise (GB3096-2008)

##### 4) Bottom mud monitoring

Monitoring sites: within the dredged river segment

Monitoring factors: moisture content, grain size and grading, density, pH, pollutants, etc.

Monitoring frequency: once before construction, and once during construction and operation each

#### 10.4.2 Social Monitoring

Monitoring and evaluation is an important means to ensure that the Subproject is implemented according to its objectives, and also an important error correction and participation mechanism of the Subproject. Therefore, a monitoring and evaluation mechanism has been established, including internal supervision, and external monitoring and evaluation.

Internal supervision will be conducted by DCWRB on the implementation of the Subproject and the SMP, information disclosure, public participation, fund use, etc.

External monitoring and evaluation will be conducted by an independent agency accepted by AIIB, and with over 10 years of experience in social and resettlement monitoring and evaluation in

projects financed by AIIB, ADB, World Bank, etc. Such agency will conduct monitoring and evaluation, and submit reports to AIIB regularly (usually semiannually).

#### **10.4.3 Reporting**

The Zhengzhou PMO will report the implementation of the ESMPF, and submit a report quarterly in the first year and semiannually afterwards.

E&S monitoring reports will be submitted semiannually.

#### **10.5 Cost Estimate**

Implementation and management costs of E&S mitigation measures are estimated to be 5.161 million yuan, including: 1) costs of measures during construction, including fences, sprinklers, covering materials, drain ditches, acoustic barriers, traffic signs, totaling 3.261 million yuan, borne by the contractors (as part of the construction contracts); 2) E&S monitoring costs of 1.6 million yuan; 3) capacity building and training costs of 100,000 yuan; 3) training, public participation and grievance redress costs of 200,000 yuan.

## Appendix 1: Waste Soil, Sludge and Construction Waste Absorption Agreement

### 关于登封市颍河水毁修复重建工程弃土消纳的证明。

根据设计核算，亚投行紧急优惠贷款支持河南郑州等地特大暴雨洪涝灾害灾后恢复重建项目-郑州子项目 登封市颍河水毁修复重建工程建设过程中，清淤污泥、建筑垃圾及弃方等总产生量约 29.3 万 m<sup>3</sup>。根据市政府统一规划，上述清淤污泥、建筑垃圾及弃方均送往登封市西城区工程弃土消纳场综合处置。

登封市西城区工程弃土消纳场位于大金店镇三王庄村南秦沟处两处废弃沙坑，占地面积 200 余亩，消纳类型为建筑垃圾和工程弃土等，设计容量为 200 万 m<sup>3</sup>，目前已使用约 5 万 m<sup>3</sup>，近期计划消纳约 65 万 m<sup>3</sup>，剩余容量约 130 万 m<sup>3</sup>。本次工程清淤污泥、建筑垃圾及弃方产生总量约 29.3 万 m<sup>3</sup>，该弃土消纳场完全可以消纳。

特此证明。

登封市住房和城乡建设管理局。

2022 年 4 月 11 日。

## Appendix 2: List of FGDs with Local Residents

Date	Township	Village	Details / number of participants	Remarks
February 14	Gaocheng Town	Jiangzhuang Village	1) FGD with women:2 2) FGD with old people:1 (female) 3) FGD with vulnerable groups:1 (MLS) 4) Other village committee and villager representatives:6	
February 15	Donghua Town	Dongjindian Village	1) FGD with women:4, including 3 middle-aged (30-55 years) and 1 old (>55 years) 2) FGD with old people:2 (1 male, 1 female) 3) FGD with vulnerable groups:1 (poor) 4) Other village committee and villager representatives:15	
February 16	Dajindian Town	Jinxi Village	1) FGD with women: 2 2) FGD with old people:1(male) 3) FGD with vulnerable groups:2 (MLS) 4) Other village committee and villager representatives:10	
February 16	Dajindian Town	Duanxi Village	1) FGD with women:2 2) FGD with old people:1(male) 3) FGD with vulnerable groups:2 (MLS) 4) Other village committee and villager representatives:10	
February 17	Shidao Xiang	Shucun Village	1) FGD with women:3 2) FGD with old people:2 (1 male, 1 female) 3) FGD with vulnerable groups:1 (MLS) 4) Other village committee and villager representatives:8	

## Appendix 3: List of Interviewees

Chapter	Interviewee
5	Interview 5-1: Jiangzhuang Village, Gaocheng Town, Mr. Feng (53 years)
	Interview 5-2: Yangsizhuang Village, Donghua Town, Ms Wang (48 years)
	Interview 5-3: Shucun Village, Shidao Xiang, Mr. Han (56 years)
	Interview 5-4: Jiangzhuang Village, Gaocheng Town, Mr. Liu (58 years)
	Interview 5-5: Dongjindian Village, Donghua Town, Ms Xu (39 years)
	Interview 5-6: Nanzhai Village, Dajindian Town, Ms Chen (50 years)
8	Interview 8-1: Jiangzhuang Village, Gaocheng Town, Mr. Li (48 years)
	Interview 8-2: Jinxi Village, Dajindian Town, Mr. Cheng (37 years)
	Interview 8-3: Dongjindian Village, Donghua Town, Ms Bai (49 years)
	Interview 8-4: Jindong Village, Dajindian Town, Mr. Wang (37 years); Shucun Village, Shidao Xiang, Mr. Han (59 years)
	Interview 8-5: Duanxi Village, Dajindian Town, Mr. Gao (37 years)
	Interview 8-6: Shucun Village, Shidao Xiang, Mr. Shu (51 years)
	Interview 8-7: Nandian Village, Donghua Town, Ms Xu (33 years)