P.R.CHINA

JINGDEZHEN WUXIKOU HYDRO-COMPLEX PROJECT IMPLEMENTATION CO., JIANGXI

SUPPLEMENTARY ENVIRONMENT IMPACT ASSESSMENT REPORT

JIANGXI WUXIKOU INTEGRATED FLOOD MANAGEMENT PROJECT

SUPPLEMENTARY ENVIRONMENTAL IMPACT ASSESSMENT REPORT

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1. INTRODUCTION

1.1. INTRODUCTION OF PREVIOUS ENVIRONMENT IMPACT ASSESSMENT WORK

The proposal of Wuxikou Hydro-Complex Project was made in 1998 and approved in December 2002. In December 2008, the Feasibility Study Report of Wuxikou Hydro-Complex Project in Jiangxi Province was developed by Jiangxi Provincial Hydraulic Planning and Design Institute. Following the "Law of Environment Assessment, the People's Republic of China" and "Environment Protection Management Act of Construction Project", Jingdezhen DRC entrusted, Yangtze Yangtze River Water Resource and Protection Research Institute (refer to "EIA institute") to prepare the "Environment Impact Assessment Report of Wuxikou Hydro-Complex Project". With the work done for environment base line survey, project engineering assessment, environment impact assessment, the draft EIA reportwas completed in January 2009, which was pre-reviewed by theHydraulics and Hydropower Planning and Design Institute and the revised version was finally approved at the national level by the Ministry of Environmental Protection in January 2010.

1.2. OBJECTIVES OF SUPPLEMENTARY EIA

In the second half of 2009, this Wuxikou Hydro-Complex Project started to apply for a World Bank loan. Since the project has potential significant impacts at the local and regional level, according to the WB Environmental Assessment policy, the project Category A and will require a full EIA and Environmental & Social Management Plan. The project will also trigger other safeguard policies such as Natural habitats, Pest Management, Physical Cultural Resources, Safety of Dams, and Involuntary Resettlement.

As the first engagement of the World Bank with the Jiangxi Province in flood protection and hydropower, the JWIFMP will be prepared as a good practice example that can be emulated in future hydropower projects in China. To that end the PMO and the World Bank have agreed to work together to finalize the Environmental Assessment for the project adopting good practices from projects in China and in other countries.

As a first step the Bank received the EIA report prepared by Yangtzi River Water Resources and Protection Institute dated July 2009[1]. A quick review indicates that it addresses most issues associated with the environmental impacts of flood protection/hydroelectric projects. Based on additional screening and scoping, complemented by field visits by the Bank team, the PMO and the World Bank have identified several areas where there are important opportunities to enhance the quality of EA analysis and mitigation measures. These additional studies will constitute a "Supplementary EIA report" that together with the EIA report already prepared will be sent to the Bank officially before the appraisal mission.

Additional data collection and analysis and desk review will be needed to complement the issues identified in the WB missions. In this context, the PMO contracted Artelia Consultants (simplified as "the consultants" below) for the preparation of additional EIA documentations required in accordance with the WB policy, which mainly cover:

- A more thorough analysis of Cumulative Impacts for the cascade reservoir development planned for the Changjiang River, including the management of water releases from the

[1] Environmental Impact assessment of the Jiangxi Wuxikou Integrated Flood Management Project, 2009.

reservoir, impacts on fish and fisheries, water quality, associated with the formation of the reservoir and operation of the hydropower plan.

- Preparing a more detailed Environmental & Social Management Plan, including engineering and non-engineering issues, the management of camp and work force , health and safety issues, air and noise, resource extraction (borrow pits and quarries), and cultural artifacts including chance findings during construction, and compensatory measures for natural habitats, fish and fisheries, among many others.
- The management of environmental and social impacts stemming from Complementary Infrastructure such as the access road, transmission lines and re-routing of railway inundated by the project.
- A comprehensive assessment of Physical Cultural Resources in the areas affected by the project, not limited to officially designated sites, but identifying buildings, bridges and other assets that are considered of unique characteristics by the community.
- The assessment of Social Impacts stemming from the formation of the reservoir, the resettlement of over 10,000 people, the construction activities, and the flooding of rural infrastructure and the environmental impact of the resettlement sites.

Therefore, according to Aid Memoire of WB Project Identification Mission (November 2011), the EA safeguards documents package for this project will include the original domestic EIA, a Supplemental EIA, a stand-alone ESMP for the entire project, and an Executive Summary. The cumulative impact assessment will also be undertaken as part of the supplementary EIA.

In Feb. 2012, the first draft of SEIA report and ESMP has been completed by the consultants, and submitted to the project owner and WB for review during the 1st Preparation Mission. This is the 5th version based on the comments of WB Pre-appraisal mission.

1.3. WB ENVIRONMENTAL SAFEGUARD POLICIES

According to the latest project data, the project has in total triggered five environmental safeguard policies of the World Bank, respectively :

- OP/BP 4.01 Environmental Assessment
- OP/BP 4.04 Natural Habitat
- OP 4.09 Pest Management
- OP/BP 4.11 Physical Cultural Resource, OP/BP 4.37 Dam Safety
- Environmental, Health, and Safety (EHS) Guidelines, by International Finance Corporation (IFC) and World Bank Group

2.PROJECT DESCRIPTION

2.1. PROJECT BACKGROUND

2.1.1. CHANGJIANG RIVERBASIN

As a major tributary of the Yangtze River basin, the Poyang Lake catchment covers most of Jiangxi Province territorially. Also, it is the largest freshwater lake in China.

Figure 1: Poyang Lake Catchment in Yangtze River Basin

Rao is one of the five major rivers in the Poyang Lake water system, comprised of Changjiang Riverand another big one. At Yaogong Ferry of Boyang County, the confluence of Le'an River and Changjiang Riveris called Rao River. Originating within the territory of Qimen County, Anhui Province, the Changjiang Riverflows from northeast to southwest, until entering the territory of Fuliang County pertaining to Jiangxi Province, at Daohu on the border of Anhui-Jiangxi Provinice, from which on the river is called Rao. Going through the middle of the Jingdezhen City from north to south, the Changjiang Riverincorporates into Yaogong Ferry of Poyang County. The mainstream of the Changjiang Riveris 219.28km from Qimen County of Anhui Province, to Yaogong Ferry of Poyang County in Jiangxi Province, with a gap of 100.43m and total basin area of 6260km^2, of which 1894km^2 is in Anhui Province, 3274Km^2 is Jingdezhen administrative district, 1092Km^2 is the Shangrao administrative district.

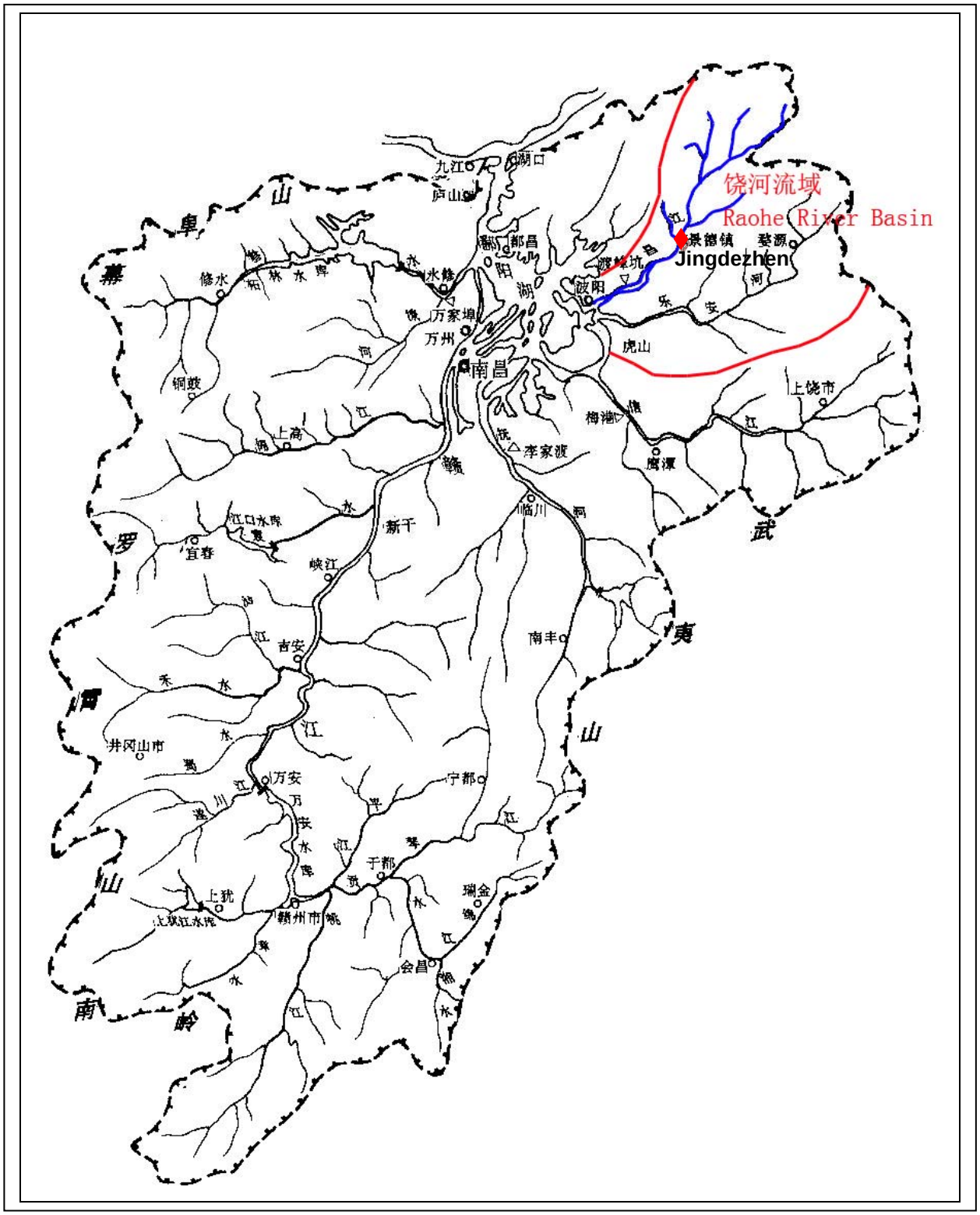


Figure 2: Poyang Lake Catchment and Main Rivers

The fluvial networks are developed in the Changjiang Riverbasin, where there are 12 tributaries with catchment area of over 100 Km^2; and there are 4 tributaries with catchment area of 500 Km^2 such as Dabeishui River, Yangchun River, Donghe River and Nanhe River as detailed below. In the

tributaries, the Yangchun River is the first one with the largest catchment, followed by the Donghe River.

Table 1: Major Tributaries of Changjiang River

Name of Tributary	Confluence on right/left bank	Location of confluence	Catchment area (km^2)	Length (km)	Locations	Remarks
Beihe river	Right	Daohu	522.63	60	Qimen County	
Yangchun river	Right	Yangcun	846.03	58	Jingdezhen	Also called Yangcun River
Donghe river	Left	Jiucheng	591.85	68.2	Jingdezhen	Also called Boyuanshui River
Xihe river	Right	Jingdezhen	487.51	55	Jingdezhen	Also called Hongyuanshui River
Nanhe river	Left	Dufengkeng	518.10	55	JIngdezhen	

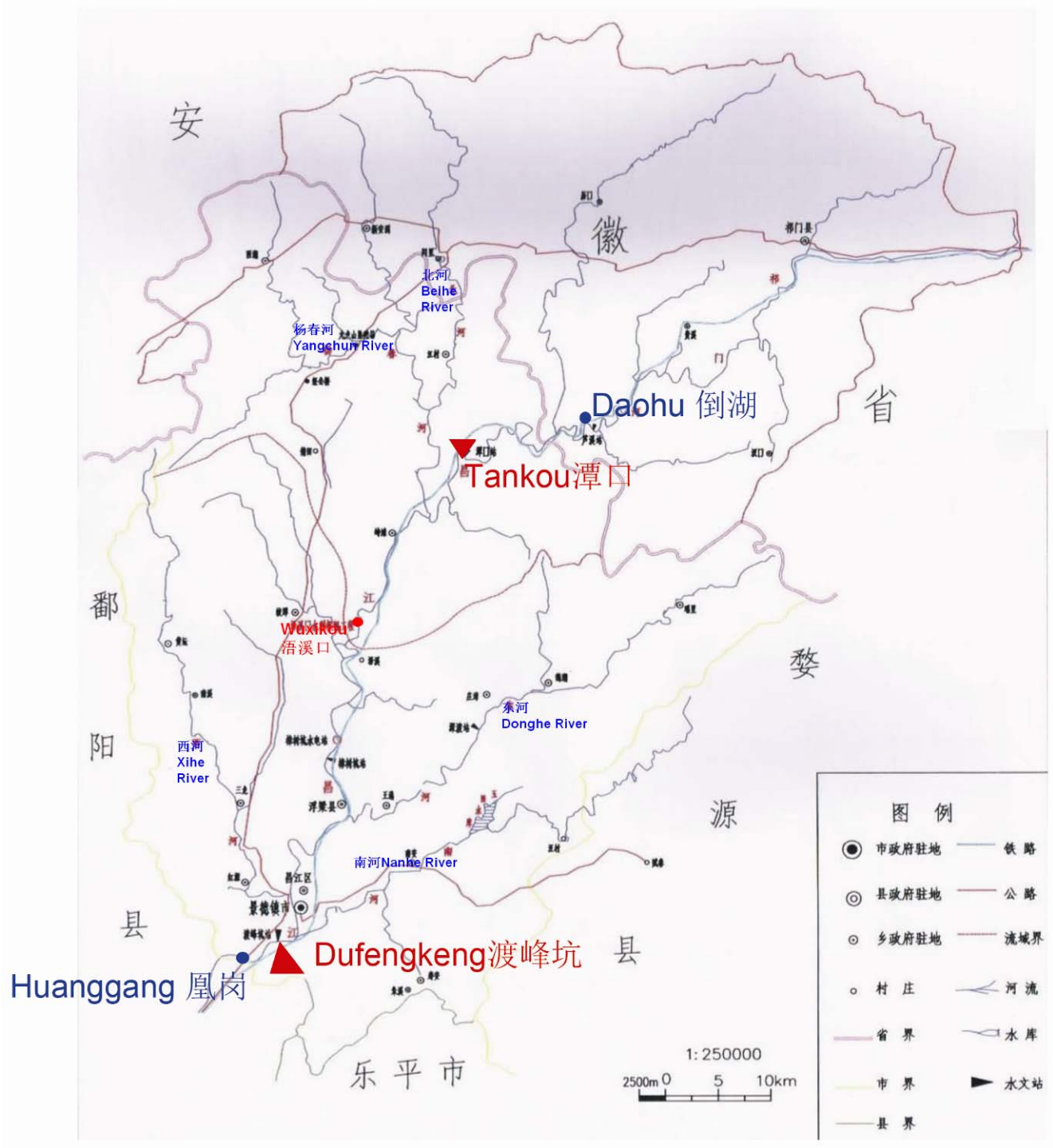


Figure 3: Changjiang River and Tributaries

2.1.2. WATER RESOURCES OF CHANGJIANG RIVER

The upstream of the Changjiang Riveris considered one of the storm centres in the northeast of Jiangxi Province. The flood in the catchment is attributed to storm, and flooding season is consistent with the wet season. The flood occurs essentially in April - June, particularly the peak flood takes places in June. After July, typhoon often brings about flood with a short duration. According to the Dufengkeng Hydrological Station (see Figure 3), the statistics show that the

largest flood per annum takes place usually in April – August, intensively in May – July. Of which June is the maximum month accounting for 44.6%. April-June as the main flooding season accounts for 73.2%, while the post-flooding season after 1st July accounts for 25.0%.

In the shape of a fan slightly, the Changjiang RiverBasin is mostly hilly with the Huangshan mountain ridge extending from northeast to southwest, showing the topography of the higher northeast than southwest. The upstream area is surrounded on the east, west and north by lower hills, of which there are Baishita and Wuhuajian etc as the main peaks with an elevation of over 1000m on average, while the watershed is recognized as the Changjiang Rivervalley in the middle and the southwest. In the downstream of Huanggang, see figure 3, there is a low-lying area, on the both banks of which alluvial plains spread out mostly. When entering the Poyang County, the River shows an open water surface called Lakeside fluvial networks area. Apart from plain and canyon, plateaus are distributed asymmetrically over the both sides of the main stream.

In the upstream of Daohu, see figure 3, the reaches are shallow with torrent, plenty of rocky and acute beach; while in the downstream of Daohu up to Jingdezhen City, the river depth ranges 1-2m with bedrock outcropping from time to time. In the section from Jingdezhen to Huanggang, hills stretch with wide valley, where asymmetric terraces and mountainous plains are distributed. In the downstream of Huanggang, the rivers crisscross with lake, designated as the Lakeside fluvial networks area, within which the plateau is particularly developed with eroded hills dispersed.

In the upstream of Dufengkeng Hydrological Station, see Figure 3, the average precipitation over years reaches 1800mm, while the runoff depth in the basin is 920-980mm annually with the average runoff amount of 4.81billion m^3 over years. The mainstream of the Changjiang Riveris 0.45‰ in gradient. In the upstream of Tankou Hydrological Station, see figure 3, defined as the Changjiang RiverUpstream located in the territory of Anhui Province mostly, where the catchment area is 1760km^2, the gradient is 0.91‰. The reaches between Tankou and Dufengkeng Hydrological Station are defined as the midstream with the gradient of 0.32 ‰ where the catchment area is 5013km^2. In the downstream of the Station up to Yaogong Ferry, viz the estuary is defined as the downstream with the gradient of 0.073‰. The theoretical reserves of hydropower resources in the Changjiang Riverbasin reach 146.9MW, of which the exploitable one is 94.73MW in the domain of Jiangxi Province (the same below) with an annual capacity of 3.78×10^8kWh in power generation.

The hydraulic resources of the Changjiang Riverare distributed in Jiangxi Province as shown below.

Table 2: Distribution of Hydraulic Resources of Changjiang Riverin Jiangxi Province

Rivers name	Catchment area (km^2)	Length of mainstream (km)	Drop (m)	Annual runoff amount (100 million m^3)	Theoretical reserves (MW)	Exploitable (MW)	Annual capacity (100 million kwh)	Remarks
Mainstream of chanjiang river	6222	175.8	50.9	57.17	40.70	71.89	2.97	Reaches between Daohu and Yaogongdu
Yangchun river	846	53.6	314.4	7.41	25.60	5.01	0.19	
Donghe river	591.9	68	616.5	6.03	17.2	6.61	0.20	
Xihe river	487.5	71.5	298.4	4.58	6.70	1.87	0.07	
Nanhe river	518.1	72.5	550	5.28	10.3	9.35	0.35	
Total					100.5	94.73	3.78	

According to the surface water (environmental) functional zoning of Jiangxi Province and the Chinese surface water quality standard (GB3838-2002), Changjiang River is divided into the following sections in view of their different functions:

a. Anhui-Jiangxi Buffer Zone: from the entry point of Changjiang River into Jiangxi Province to Chengmen section of Xingtian Township, 6.5km long near the boundary between Anhui and Jiangxi provinces), defined as Class III for landscaping purpose;

b. Fuliang Reserved Zone: from Chengmen of Xingtian Township to Chaotianmen, 60km long, with the water quality target of Class III for landscaping purpose;

c. Jingdezhen Development and Utilization Zone: from Chaotianmen of Fuliang County to Nianyushan Ship Lock of Nianyushan Town, which is a 36km long involving the urban area, with the water quality target of Class II~III for various purposes of drinking water source (upstream of Jingdezhen urban area), industrial water use (downstream of Jingdezhen urban area) and landscape (the sub-section further downstream of Jingdezhen urban area).

The detailed functional zoning for the main stream of Changjiang River within Jiangxi Province is indicated in the following Figure 4.

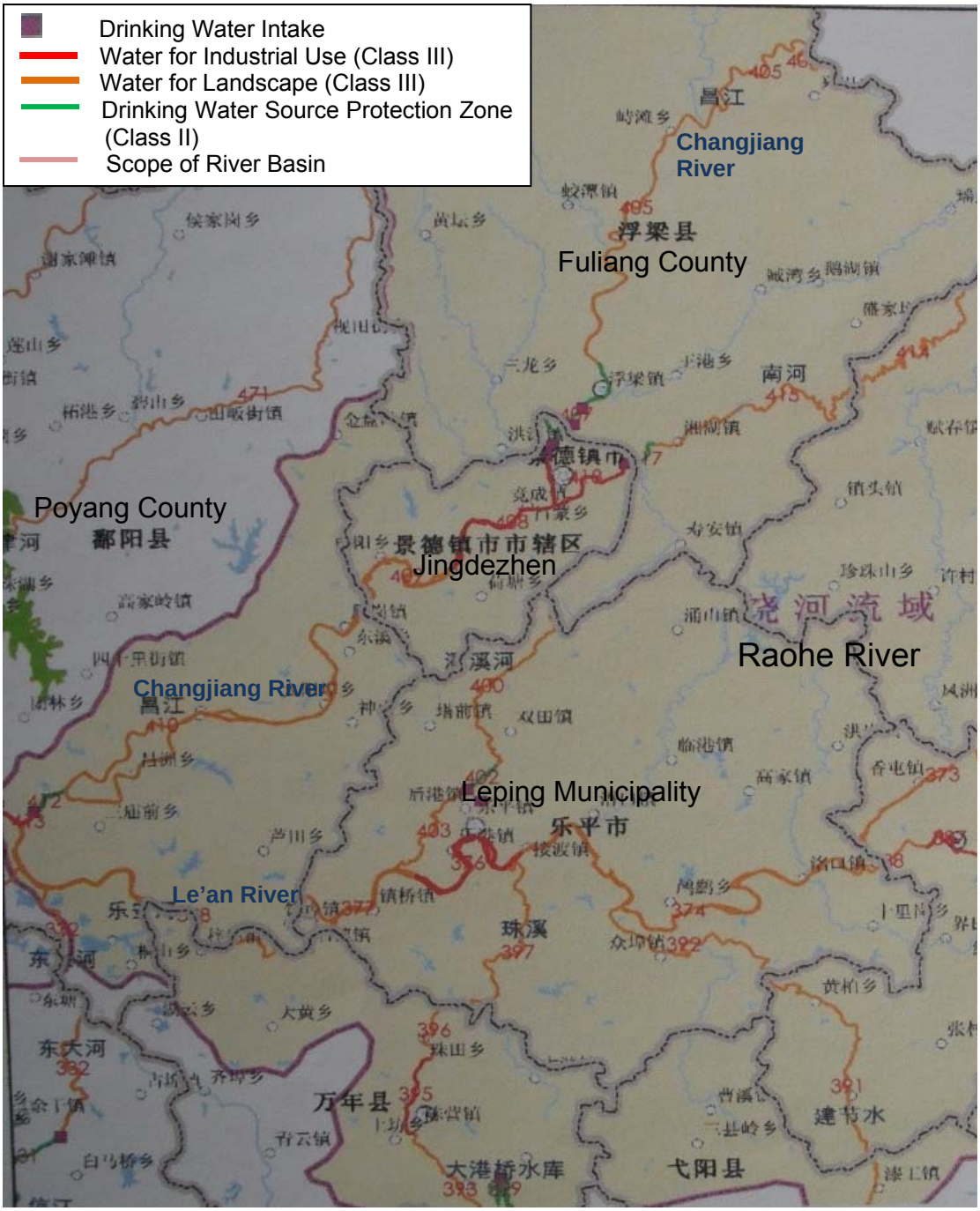


Figure 4: Water Quality Functional Zoning of Changjiang River

According to the recent monitoring data, the water quality of Changjiang River is generally good, Class II for most river reaches and even Class I for some sections defined as drinking water source protection zone. The middle and lower reaches are more vulnerable to non-point source pollution from agricultural activities and to the pollution from urban sewage discharge along the river. Therefore the reaches near the urban area of Qimen County and downstream of Jingdezhen urban area show the tendency of water quality deterioration in recent years.

2.1.3. PROJECT BACKGROUND

The Wuxikou hydro-complex project was initially proposed in the early 1990s with a Rao River Watershed Planning Report of Jiangxi Province prepared by the provincial Water Resources Planning and Design Institute. The plan put forward the 5-step development program of the mainstream of the Changjiang River, viz. Wuxikou – Zhangshukeng – Jingdezhen – Nianyushan - Huanggang. The plan focused on discussing the purpose of hydro-development.

Along with preparation of Jiangxi Province Jingdezhen Urban Development Master Plan, afterwards, the provincial design institute prepared Jingdezhen Urban Flood Control Planning Report and Jingdezhen Urban Flood Control Project Proposal in December of 1996 and May of 1998 respectively. In which, the principles are identified including embankment in conjunction with wall, embankment and wall prior to reservoir, and implementation in phases to constitute flood control strategy for the City. In other words, the urban area of Jingdezhen has to be protected from flooding with development of the Wuxikou hydro project, in consistency with the 1 in 50-year standard.

2.2. PROJECT OBJECTIVES

With the development of China's economy, Jingdezhen has also experienced a great change in the last over ten years. The development conception is being changed from simply economic development into livelihood-based development with promotion of sustainable development. Under the guidance of the conception, the hydro project aims at the following purposes:

2.2.1. FLOOD CONTROL

As stated above, the upstream of the Changjiang Riveris considered as one of the storm centres in the northeast of the Province with frequent occurrence of storm in the basin. The reaches in the upstream are mountainous with greater gradient and quicker convergence, resulting in rapid fluctuation of flood. The reaches in the middle and downstream slope gently to bring about longer duration of flood and extremeness in peak and volume, usually threatening Jingdezhen located in the middle stream with flood. In terms of the concerned information, the land elevation of urban area ranges 28-40m in Jingdezhen, the railway elevation 35.08 ~ 36.69m, the original flood control capacity of only 4 to 10 year return period flood from China's standard of urban flood control, Jingdezhen city flood The standard should be 50 to 100 years, there is a big gap.

According to the Jingdezhen city planning, urban flood control planning, flood mitigation strategy in Jingdezhen: dike (wall) combined with the library after the first levees (walls), the progressive implementation. The specific practices: Jingdezhen City flood control system of flood control standard construction standards in 20 years, until after the completion of the the Wu Sikou Reservoir, through the joint scheduling and the Wu Sikou Reservoir used to achieve the minimum security standards in 50 years.

Jingdezhen City in 2000, almost no flood control facilities, only in the urban lower watermelon Island levee, the crows Beach Fair, and three rivers and dykes and the Changjiang urban segment has a short bank protection works, these three small levee flood protection standard protective range is limited to local low places, the fundamental solution can not be the city's protective issues. In 2000,the relevant departments of Jingdezhen the dike construction projects Jingdezhen Municipal People's Government of King House word[1998] No. 139 on the responses of referrals by the Department of Water Resources of Jiangxi Province Jiangxi water anti-word (1998)024 No. of flood control standards, Jingdezhen City dike project construction to resist the Changjiang 20-year flood, Jingdezhen City dike projects are being implemented.

Jingdezhen city flood control system, the most important part, Wuxikou water control project, it must as soon as possible construction to ensure that the Jingdezhen city to reach the 50-year flood protection standard.

2.2.2. WATER SUPPLY

Currently, the maximum daily water demand of Jingdezhen is 485,000m^3/day (5.61m^3/d, including residential and industrial use). According to the original EIA, it is expected that in 2020 the maximumu daily water demand will reach 556,000m^3/day (6.44m^3/s). All of the water will come from Changjiang River and its tributaries. In addition, a minimum ecological flow for Changjiang River needs to be maintained to guarantee the sustainability of local aquatic habitat. However, the historical records of Dufengkeng Hydrologic Station show that the minimum water flow of Changjiang River was detected on July 28,1978 at a rate of 1.28m^3/s; and when P = 95%, the average daily water flow at the station is 6.56m^3/s. Obviously, only water taking from Changjiang River cannot meet the water demand for urban development. Therefore, it is necessary to find new water, to promote adjustment capacity and to increase hydro power generation during dry season.

With completion of construction of the project, the water level of Wuxikou Reservoir will increase to 56.00m with total water storage capacity of 0.427 billion m^3 and flood control water capacity of 0.296 billion m^3. Through promoting the water adjustment capacity, the water supply of Jingdezhen during dry season can be guaranteed.

2.2.3. POWER GENERATION

Jingdezhen is known as the world famous Porcelain Capital. It is located in the middle reaches of Changjiang River. The urban area of Jingdezhen is located in terrace and low mountain hilly area at both sides of Changjiang and its tributaries Nanhe River and Xihe River. According to the statistical data, in 2004, Jingdezhen urban area is 46km2 with a population of 432,000 and GDP16.51billion Yuan. According to the Jingdezhen City Master Plan, by 2010, Jingdezhen urban area will increase to 49.0km2 with a population of 530,000; and by 2020, the urban area will increase to 89.0km2 with a population of 564,000.

At present, the installed capacity of hydropower is 11.02MW with an annual power generation of 26.5 million kWh. Jingdezhen Power Grid has a coal-fired power plant with a capacity of 400 MW. In 2007, Jingdezhen Power Grid supplied 12.55 x 108 kWh of power. According to the Jingdezhen Urban Development Planning, by the year of 2020, the whole city power consumption will reach to 22.3 x 10^8 kWh.

In Jingdezhen, both power generation and supply are far from enough. Moreover, poor water adjustment capacity of hydropower stations causes big hydropower generation disparity between dry season and rainy season. During dry season, power use has to be limited due to power shortage thus seriously affected the industrial and agricultural production and restricts the economic development. The design installed capacity of Wuxikou hydraulic project is 30 MW. With the construction of the project, the Wuxikou hydropower station becomes the key one in Jingdezhen Power Grid. The average annual power generation is 0.8127 x 108 kWh. It somehow assists in relieving tensions of the local power supply, especially during dry season, its high adjustment capacity become tremendous significance.

2.3. PROJECT COMPOSITION

The proposed Wuxikou Integrated Flood Management Project will mainly consist of the following components presented in the table below, all of which will be covered by this supplementary EIA. In this sections, the key components of proposed Wuxikou Hydro-complex Project, including main works, project resettlement, associated power transmission line and re-routing of Anhui-Jiangxi Railway will be presented in details. The project layout are shown in Figure 7.

Table 3 : Composition of Wuxikou Integrated Flood Management Project

No.	Name of Component	Component Description	Project Investment (10000yuan)
1	Main Works of Wuxikou Hydro-complex	A Large(II)-type[2] reservoir, using gravity dam, with the normal water level of 56.0m and the total capacity of 427million m^3. Its installed capacity is 32MW with the annual power generation of 81GWh.	318,596.74
2	Borrow Areas for the Dam	One borrow area, namely Luoxi Borrow Area (2.13ha). One weathered material field (0.67ha)	Included in the project cost of Component 1
3	Spoil Sites	Two spoil sites in total, respectively covering the area of 8.67ha and 3.33ha.	Included in the project cost of Component 1
4	Access Roads and Bridges	18.6 km in total, including 9.5km permanent roads and 9.1km temporary roads.	Included in the project cost of Component 1
5	Work camps	With the maximum number of workers as 816, totally 9792m^2 is planned together with office building on site.	Included in the project cost of Component 1
6	Reservoir bottom clearance	Before reservoir impoundment, the reservoir bottom will be cleared to remove all the existing buildings and structures below the flooding line.	Included in the project cost of Component 1
7	Project Resettlement	A total rural population of 8483 people will be resettled in 60 resettlement sites (26 relocated and 34 near the existing locations). Zhitan Town will be relocated with a urban population of 1481 people by 2015 and the land use about 21.02ha.	Included in the project cost of Component 1
8	Roads for the reconstructed resettlement sites	39.9km in total according to the RAP.	Included in the project cost of Component 1
9	Associated Power Transmission Line	About 20km 110kV power transmission line to supply the urban area of Jingdezhen and other areas in its service area.	Tbd
10	Re-routing of Anhui-Jiangxi Railway	19.51km of existing Anhui-Jiangxi Railway needs to be re-routed. The re-routed railway will be 22.5km long.	79,800

[2] With the storage capacity between 100million m^3 and 1billion m^3.

2.3.1. MAIN WORKS OF WUXIKOU HYDRO-COMPLEX

In as early as 1991, Jiangxi Hydrologic Planning and Design Institute completed the Jiangxi Raohe River Catchment Planning Report, in which included five cascades hydropower exploitation: Wuxikou – Zhangshukeng – Jingdezhen – Zhanyushan – Huanggang. Based on the Urban Master Plan, the design institute completed the Jingdezhen Municipal Flood Control Plan in October 1996, and Jingdezhen Flood Control Project proposal in May 1998. The project proposal defined the basic flood control principle: integrated dam and reservoir construction, dam first and reservoir later, step by step. The provincial water resource department approved to increase flood control from 1 in 20 years standards before the Wuxikou Reservoir construction to 1 in 50 years standard after the project construction.

Located in Jiaotanzhen Town, 40km away from Jingdezhen, the proposed Wuxikou Hydro-complex Project is mainly designed for flood control integrated with the functions of water supply and power generation in the middle reaches of Changjiang River. Based on the findings of Jiangxi Province Raohe River Basin Deveopment Plan and project feasibility study report, the reservoir is designed for the 1:50 years return flow as a large (2) type reservoir with normal water level of 56.00m and the total storage capacity of 427 million m3, flood control capacity of 296 million m3. With the completion of the project construction, the flood control will increase from 1 in 20 years to 1 in 50 years standard, thus effectively protecting the Jingdezhen city and the life and properties of residents living along the river, supporting the regional economy sustainable development. The characteristics and main contents of the project are detailed in the table below. The totalproject cost is estimated as 3.19 billion Yuan. The total construction period is 42 months starting construction from 2012 and putting into operation in 2016.

Table 4: Key Features of Wuxikou Hydro-complex

Item		Unit	Quantities
Features of Reservoir	Dead Water Level	m	45
	Flood Control Limited Level	m	50
	Normal Water Level	m	56
	Design Flood Level	m	62.30
	Total Storage Capacity (when checking flood level)	100 million m^3	4.75
	Storage Capacity at Normal Level	100 million m^3	1.73
	Surface of Reservoir at Normal Level	km^2	25.07
	Backwater Length at Normal Level	km	22.85
	Type of regulation		Seasonal Regulation
Benefits	Installed Capacity	MW	32
	Firm Output	kW	2234
	Annual Power Generation	100GW·h	0.81
Project Features	Type of Dam		Concrete gravity dam
	Crest Elevation	M	64.60
	Maximum Dam Height	M	46.80
	Length of Dam Crest	M	498.13

2.3.2. CONSTRUCTION OF ASSOCIATED POWER TRANSMISSION LINES

In light of the need of power transforming from Wuxikou to power grid, about 20km of 110kV transmission line construction is incorporated into the project. According to the WuXikou Hydropower Station Power Access System Report, considering maximal transmission 30MW to power grid, it is suggested to adopt 110kV voltage level, and build 110kV power transmission line to connect Wuxikou hydropower station with Jingdezhen power grid through 220kV Fuliang Transformer Substation for providing electricity to Jingdezhen city and other areas. The power transmission line project will be implemented by local grid company. Since the domestic EIA work has not yet been started, this report will provide preliminary analysis of environmental and social impacts in the context of local environmental baseline in order to provide the guidance for the future implementation of project EIA.

2.3.3. RE-ROUTING OF ANHUI-JIANGXI RAILWAY

Implementation of the project will inundate 19.51km of Anhui to Jiangxi railway from K350+500 to K370+700 thus the affected railway needs to be re-routed. According to the feasibility study report[3] of Anhui-Jiangxi Railway Electrification Project, the railway will be re-routed from K349+900, then goes along the edge of the planned reservoir located at west side of Changjiang River, construct new Xinyingli railway station at CK352+100 and Xinzhitan station at CK363+500, then farther south to cross Changjiang Riverat Xiaoxin harbor, thereafter traverse the mountain areas and connect with existing lines at K372+400. The distance between the bridge crossing Changjiang Riverand the planned reservoir dam site is about 4km. The length of the deviated line is 22.5km. The estimated cost is 798 million Yuan. The project location map is shown below.

[3] Prepared by China Railway Engineering Design Institute (Shanghai), April 2010, updated version for review

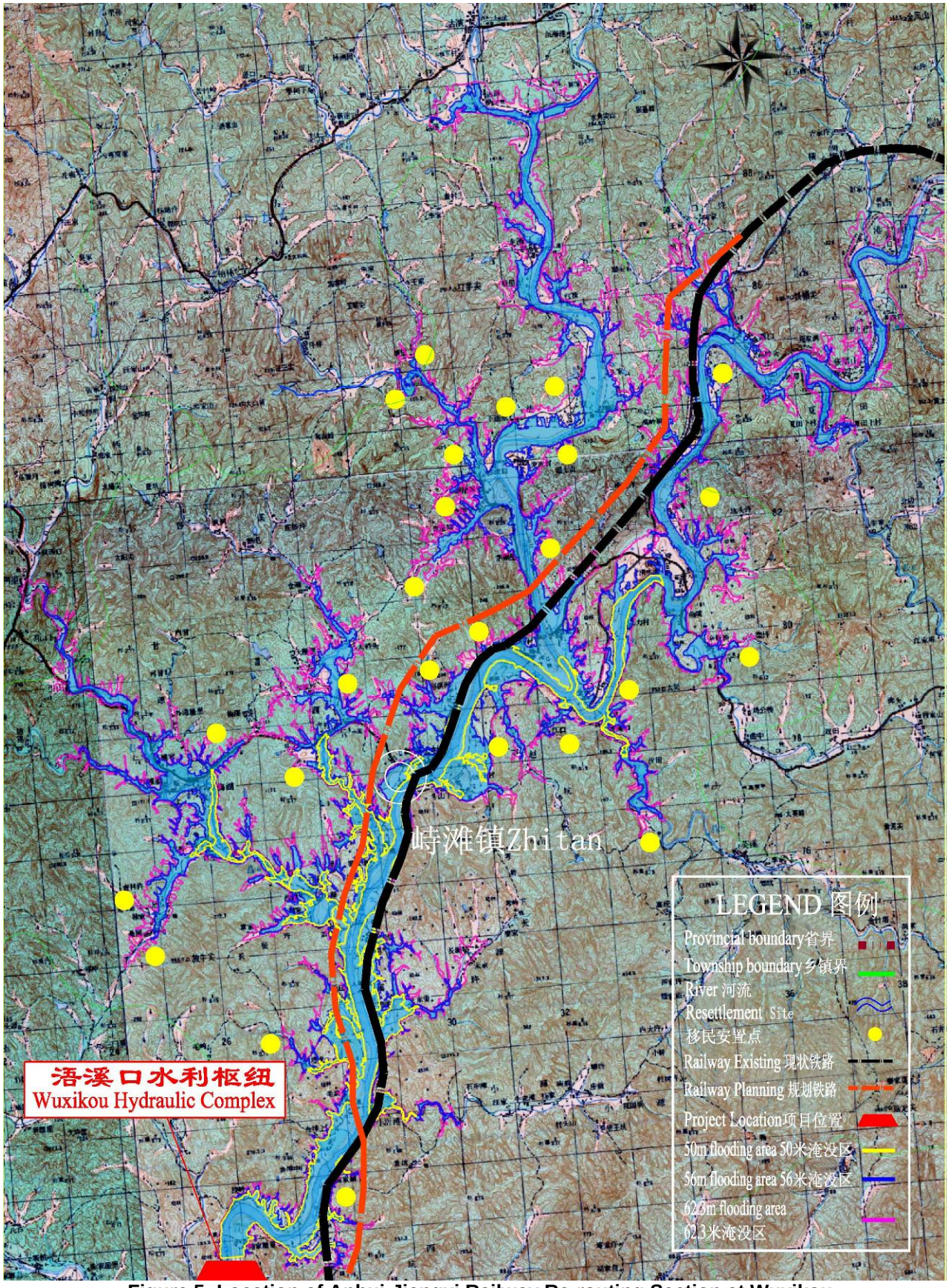


Figure 5: Location of Anhui-Jiangxi Railway Re-routing Section at Wuxikou

2.3.4. RELOACTION OF ZHITAN TOWNSHIP AND CONSTRUCTION OF RESETTLEMENT SITES

Based on the Resettlement Action Plan (May 2012) of Wuxikou Hydro-Complex Project, the total population to be affected by the project is estimated as 16104, among whom there are 6300 people only affected by land acquisition, 2049 people only affected by resettlement and 7395 people affected by both land acquisition and resettlement. Accordingly, 60 centralized resettlement sites (including 26 relocated sites and 34 backward sites) are planned for the project together with the relocation of Zhitan Township.A total investment of 2.44billion yuan is estimated for the project land acquisition and resettlement. Details of the planned resettlement sites and Zhitan Township relocation are shown below and in Figure 7.

Table 5: Basic Information of Centralized (Relocated) Resettlement Sites

No.	Location of Resettlement Sites			Resettled Population in 2015	Area (mu)							
	Administraive Division		Name		Sub-total	Paddy Field	Dry Land	Garden	Forest for Timber	Economic Forest	Shrub	Wasteland
	Town	Village										
1	Fuliang	Xinping	Diwuli	240	27.0				25.1			1.9
2	Fuliang	Chapei	Chengjiawu	130	15.6				15.6			
3	Fuliang	Chapei	Chengjiaxia	134	15.4				15.0			0.4
4	Fuliang	Jinzhu	Hong Keng	222	25.8				25.8			
5	Fuliang	Hanyuan	Fanjiazui	253	30.7	4.4				5.4	20.9	
6	Fuliang	Chada	Simuli	111	13.9	2.1			9.4			2.4
7	Fuliang	Chada	Zhangjiawu	99	11.2	4.5						6.7
8	Fuliang	Chada	Duijialing	542	65.7	37.0	4.1		24.0			0.6
9	Sanlong	Sanlong	Guojiawu	87	9.9				9.9			
10	Sanlong	Yangcun	Shamaoqiao	141	16.1				8.2	7.9		
11	Hongyuan	Dalong	Chatingxia	170	20.8				18.9	1.0		0.9
12	Hongyuan	Lijia	Qianjiawu	180	21.9		3.9	9.9		8.1		
13	Hongyuan	Xima	Tongluo	131	15.8		6.4	9.4				
14	Zhuangwan	Hanxi	Youchasha	108	13.6	1.8	1.9				6.9	3.0
15	Jiaotan	Waijiang	Xingxiqiao	149	17.5	3.9	7.0			1.4	5.0	0.2
16	Jiaotan	Jiaotan	Xiawu	143	16.3		2.0		10.7	3.6		
17	Xianghu	Lingan	Changtian	107	13.3	11.5			0.9			0.9
18	Xianghu	Dongan	Huangtugang	183	21.2			7.6	13.6			
19	Xianghu	Dongan	Xinwuban	264	29.7	1.3	12.0	10.9	2.6		2.9	
20	Xianghu	Lantian	Wengtianwu	208	23.3	0.5	11.3		8.7			2.8
21	Wanggang	Dunkou	Zhangshubao	148	17.8						17.8	

No.	Location of Resettlement Sites			Resettled Population in 2015	Area (mu)							
	Administraive Division		Name		Sub-total	Paddy Field	Dry Land	Garden	Forest for Timber	Economic Forest	Shrub	Wasteland
	Town	Village										
22	EHu	Qiaoxi	Jinmaosheijian	150	17.5						17.5	
23	EHu	Jietian	Liangxin	82	8.3				8.3			
24	EHu	Chuangye	Garden	302	34.5				2.2	32.3		
25	EHu	Chuangye	Yanglianwu	66	7.7				7.7			
26	EHu	Ehucun	Maojiashan	182	21.8				21.8			
	Total			4532	532.3	67.0	48.6	37.8	228.4	59.7	71.0	19.8

Table 6: Basic Information of Centralized (Nearby) Resettlement Sites

No.	Town	Village	Group	Resettled Population in 2015	Location of Resettlement Site			Moving Distance (km)	Area (mu)								
					Name	Village	Group		**Sub-total**	Paddy Field	Dry Land	Garden	Forest for Timber	Economic Forest	Shrub	Wasteland	Land for Houses
1	Zhitan	Liukou	Liukou	111	Zhuangqian	Liukou	Liukou	1	**14.0**				14.0				
2			Liukou	110	Mujiangao		Liukou	0.7	**28.6**				28.6				
3			Zhongtian	43	Jijiaduan		Zhongtian	1	**4.8**				4.84				
4			Batian	272	Damaoshan		Batian	0.8	**33.0**				33.0				
5			Yuejin/Xintang	247	Caoxinjiang		Yuejin	1.2	**30.4**		0.2		30.2				
6			Yujing	36	Yangjiawu		Yujing	0.6	**4.0**				4.05				
7			Shangfajing	78	Datouling		Shangfajing	0.5	**8.8**				8.77				
8			Hujia	109	Hujiawu		Hujia	0.4	**13.2**		3.8		0.4	8.1			0.9
9		Longtan	Hongqi	57	Hongqicunhou	Longtan	Hongqi	0.5	**6.4**				6.41				
10			Hongwang	12	Shewushan		Hongwang	0.3	**1.3**				1.35				
11			Longtan	108	Siguli		Longtan	0.3	**13.2**		0.3		11.1	1.8			
12		Meihu	Yejia/Shiqiao	85	Chuancangwu	Meihu	Yejia	1	9.6		0.96		8.61				
13			Yinshan	120	Tuwuli		Yinshan	0.8	14.5	5.1	0.1		9.3				
14			Yueshan	97	Zhangcun		Yueshan	0.8	11.1		10.9					0.2	

No.	Town	Village	Group	Resettled Population in 2015	Location of Resettlement Site			Moving Distance (km)	Area (mu)								
					Name	Village	Group		**Sub-total**	Paddy Field	Dry Land	Garden	Forest for Timber	Economic Forest	Shrub	Wasteland	Land for Houses
			Sangyuan/qingnian	96	Jinniuling		Sangyuan	0.5	10.8				10.8				
15			Neigan/ Waigan	145	Qikengkou		Neigan	1.3	17.1						17.1		
16		Qingxi	Jiangfeng	190	Tuqiangli	Qingxi	Jiangfeng	1.5	21.4				21.4				
17			Hujia/ Jinjia	97	Jingwuli		Jinjia	0.9	10.9				10.9				
18			Quxi	98	Xiaqian		Quxi	0.5	11.0				11.0				
19			Licun	143	Xiaan		Quxi	2.3	16.2				16.2				
20		Qingxi	Qingxi	85	Qingxi	Qingxi	Qingxi	0.8	9.6		4.78		4.78				
21		Zhitan	Zuoyuan	91	Zuojiawu	Zhitan	Zuoyuan	0.5	10.2				5.12	5.12			
22			Gangkou/ Zhaokeng	64	Laowuchang		Zhaokeng	1	7.2				7.20				
23			Wangcun	132	Shangcuncha ng		Wangcun	2	15.0						15.0		
24			Yangcun/ Chachang	226	Zhiwuli		Yangcun	0.8	24.0				24.0				
25			Zhaohong	70	Zhaohongpo		Zhaohong	0.6	7.9				7.87				
26		Daheli	Dongyuan	137	Dongyuan	Zhitan	Xucun	3.5	15.7				15.7				
27	Zhitan	Maowu	Maowu/Peilong	185	Zhujialing	Maowu	Maowu	3.5	22.9	2.0			20.9				
28		Yingxi	Shatian	97	Xumuchang	Yingxi	Shatian	2	10.9				10.9				
29	Jiaotan	Shebu	Chenjia	66	Dalingxia	Shebu	Chenjia	1.5	7.4						7.42		

No.	Town	Village	Group	Resettled Population in 2015	Location of Resettlement Site			Moving Distance (km)	Area (mu)								
					Name	Village	Group		**Sub-total**	Paddy Field	Dry Land	Garden	Forest for Timber	Economic Forest	Shrub	Wasteland	Land for Houses
30		Luoxi	Raoling	190	Raolingxincun	Luoxi	Raoling	5.5	21.4			11.1	10.3				
31	Xingtian	Tankou	Tankou	255	Tankouhou	Tankou	Tankou	1.7	27.8		6.9			20.9			
32			Yingli	43	Wanli	Tankou	Yingli	0.8	4.8						0.48	4.35	
33		Zhujia	Xiacun	114	Laocundi	Zhujia	Zhujia	2.8	13.1		3.0	1.4	8.7				
34			Shangcun/ Xiacun	103	Tanli	Zhujia	Xiacun	0.8	12.6	0.2	5.4		7.0				
Total				4112					**491**	7.3	36.3	12.5	353.4	35.9	40.0	4.6	0.9

Additionally, Zhitan Town is located 50 km to the northeast of Fuliang County as the location of Zhitan Village Government. The ground elevation in the town is 54~56m. With the inundation of the reservoir, the whole town will be resettled. According to the adjustment plan for the inundation area of Fuliang County Government that the market town will be relocted to other area. By 2015, it is projected that the population relocated is 2338 with the area of 21.02hm^2. The new loacation is near the original market town of Haoshan and in the low hills, east to the Zuoyuan Group of Zhitan Village of Fuliang County. Based on the need of market town's function division, residential building area (40.18%), public construction area (32.06%), road and square area (9.09%), public facilities area (7.27%) and the green area(4.57%) are planned with the total investment of CNY18.21 million for the market town infrastructure reconstruction.

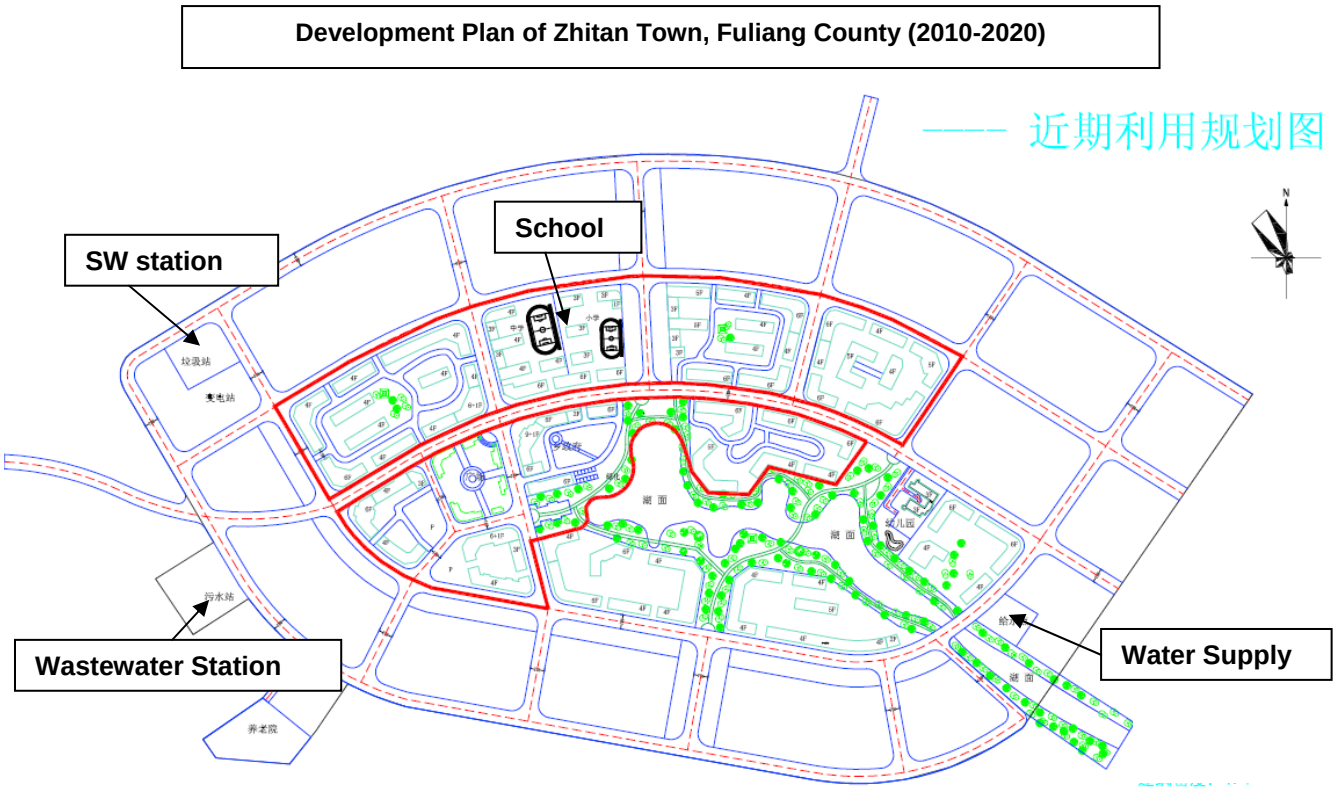


Figure 6: Development Plan of Zhitan Town, Fuliang County

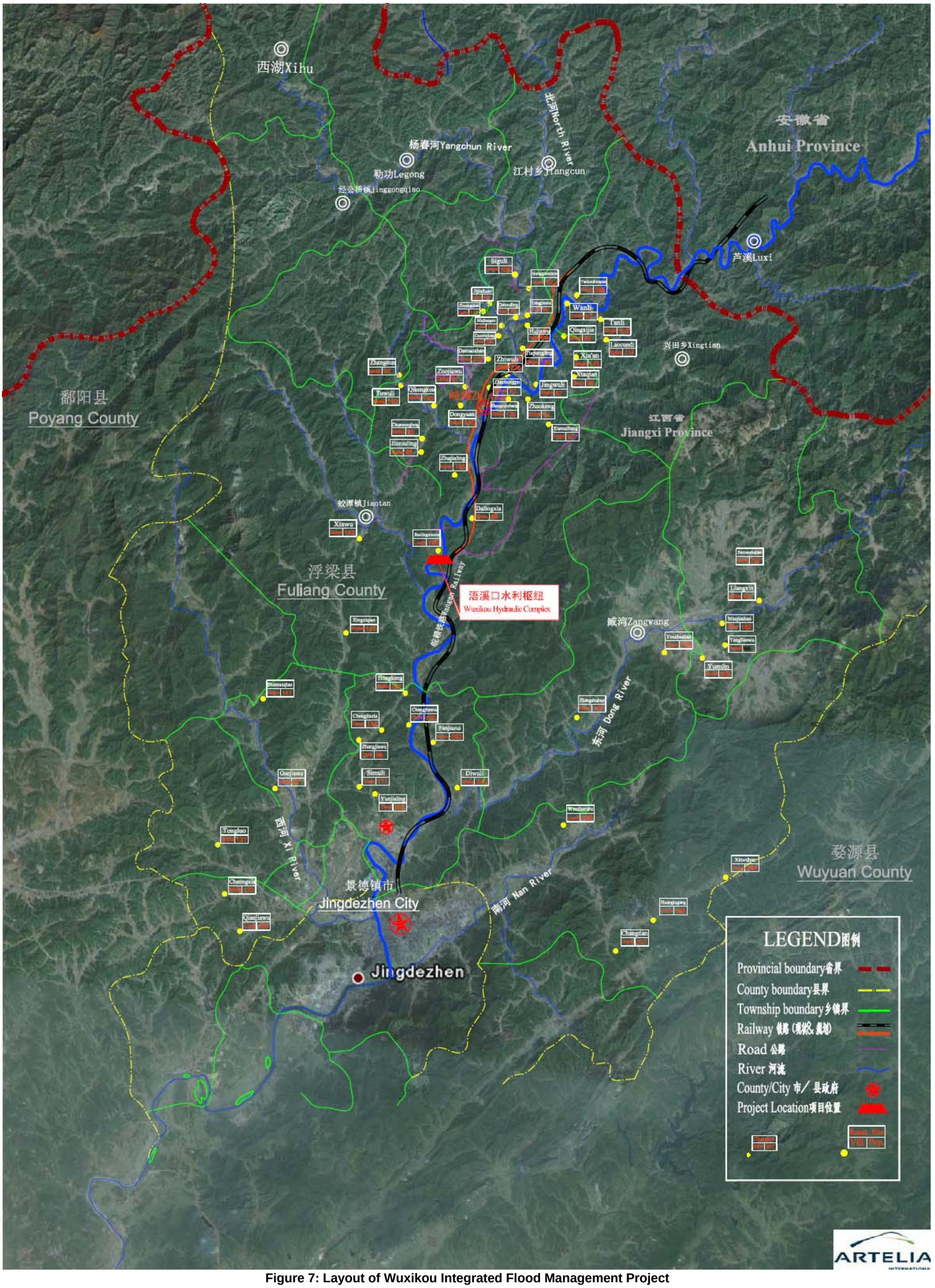


Figure 7: Layout of Wuxikou Integrated Flood Management Project

3.SCOPE OF STUDY AREA

Based on the findings of domestic project EIA outcome, the study scope of this complementary EIA will cover the areas directly and indirectly affected by the project-related activities, including dam site, borrow area, spoil pits, access road, work camps, reservoir bottom clearance, project resettlement areas and associated road project, Anhui-Jiangxi railway realignment, 100KV power transfer project, and also the ongoing city dyke project for Jingdezhen, as listed below:

Table 7: List of Studied Project Components for Supplementary EIA

No.	Project Component	Description
1	Main Works of Wuxikou Hydro-complex	A Large(II)-type[4] reservoir, using gravity dam, with the normal water level of 56.0m and the total capacity of 427million m^3. Its installed capacity is 32MW with the annual power generation of 81GWh.
2	Borrow Areas for the Dam	One borrow area, namely Luoxi Borrow Area (2.13ha). One weathered material field (0.67ha)
3	Spoil Sites	Two spoil sites in total, respectively covering the area of 8.67ha and 3.33ha.
4	Access Roads and Bridges	18.6 km in total, including 9.5km permanent roads and 9.1km temporary roads.
5	Work camps	With the maximum number of workers as 816, totally 9792m^2 is planned together with office building on site.
6	Reservoir bottom clearance	Before reservoir impoundment, the reservoir bottom will be cleared to remove all the existing buildings and structures below the flooding line.
7	Project Resettlement	A total rural population of 8483 people will be resettled in 60 resettlement sites (26 relocated and 34 near the existing locations). Zhitan Town will be relocated with a urban population of 1481 people by 2015 and the land use about 21.02ha.
8	Roads for the reconstructed resettlement sites	39.9km in total according to the RAP.
9	Associated Power Transmission Line	About 20km 110kV power transmission line to supply the urban area of Jingdezhen and other areas in its service area.
10	Re-routing of Anhui-Jiangxi Railway	19.51km of existing Anhui-Jiangxi Railway needs to be re-routed. The re-routed railway will be 22.5km long.

[4] With the storage capacity between 100million m^3 and 1billion m^3.

No.	Project Component	Description
11	Jingdezhen City Dyke Project	Implemented since 2000 at the level against 1-in-20-years floods. The current progress is: 8.54km completed, 2.53km to be completed by 2012 and 9.12km remaining to be implemented in the near future.

Additionally, the analysis will consider potential project impacts on the zone of reservoir inundation (flooding line: 56m), downstream area of the reservoir, nearby nature reserves and existing ecological resources.

This chapter will present the reason of why incorporates all of the above-mentioned areas into research, and also illuminate the type of potential environment impact. The research scope is the area along mainstream of Changjiang Riverstarting from Qimen County of Anwei Province, flowing into Yaogongdu in Poyang County of Jiangxi Province, then joining with Raohe River and finally entering into Poyang Lake. The key point for consideration is the five-stage including Daohu Lake (also called "Aoxi"), Wuxikou, Zhangshukeng, Nianyushan Mountain, Huanggang, with total length of 259km; meanwhile, backwater scope of main tributaries (Yangshun River and Meihu River) converging into reservoir is also included which is 2898.8km^2, covering the entire of Fuliang County and urban area of Jingdezhen Town.

3.1. HYDRO-COMPLEX ZONE

The proposed Wuxikou Hydro-complex project is located in Jingdezhen city Fuliang County and the dam is located in Luoxi village Jiaotan town Fuliang County. The construction area is composed of dam area, access road and construction area including borrow areas, spoil sites and workers' camp. The layout can be found in Figure 8. The whole construction area will affect Luoxi village, Shebu village, Jiaotan village and forest farm with permanent land acquisition of 909.99 mu and temporary land acquisition of 190 mu. The number of affected person is 236.

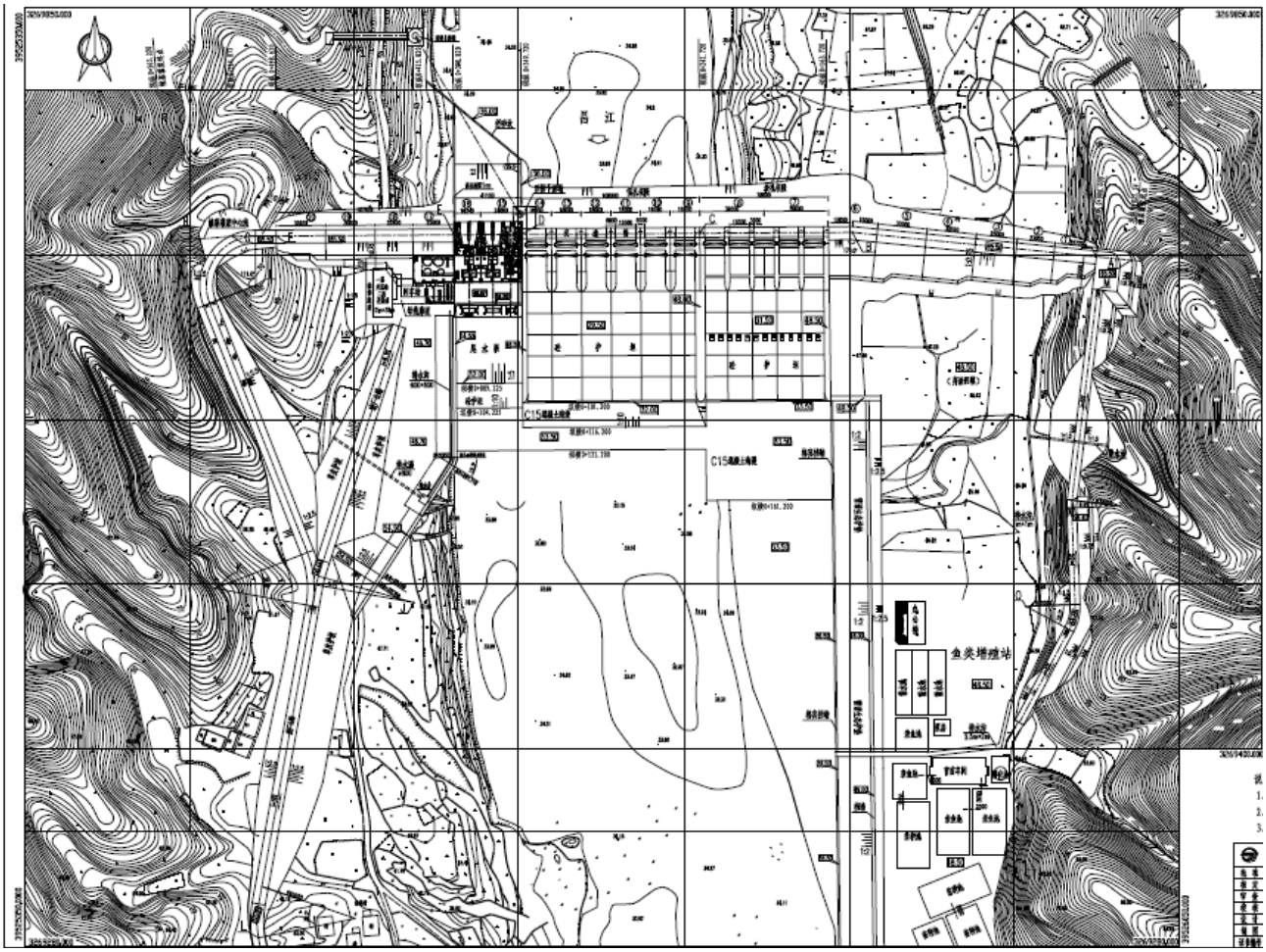


Figure 8: Layout of Wuxikou Hydro-complex

In addition, as shown in Figure 9, according to the double-check results of earthwork balance during preliminary design phase, two borrow areas will be developed for the project, respectively: (1) Luoxi Borrow Area, located at the area between Luoxi Village and Jinjia Village on the right bank downstream of the dam site, with the exploitation surface of 2.13hm^2; and (2) a weathered material field on the ridge upstream of the dam site with the land use of 0.67hm^2. There will be totally 2 spoil disposal sites for the project with the total land use of 12hm^2, respectively: (1) 1# spoil disposal site: at Baojia terrace about 0.5km upstream of the dam site on the left bank, with the area of 8.67hm^2 ; (2) 2# spoil disposal site: on the primary terrace about 2km upstream of the dam site on the right bank, with the area of 3.33hm^2.

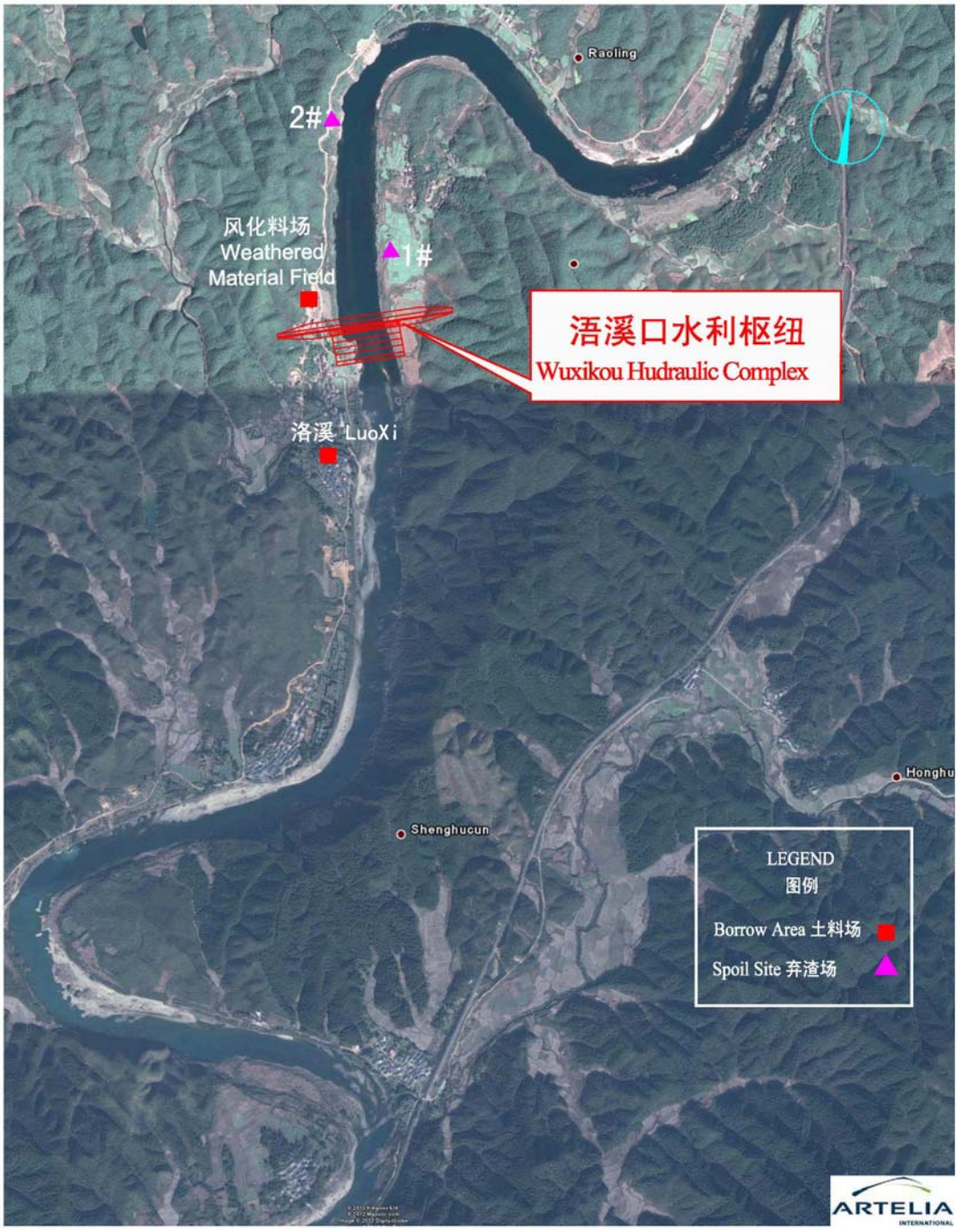


Figure 9: Locations of Borrow Areas and Spoil Disposal Sites for Wuxikou Hydro-complex Project

The activities considered for this area also including the totally 18.6km permanent and temporary access roads and bridges, the work camps for 816 workers at maximum and the reservoir bottom clearance project before reservoir impoundment.

The potential impacts on local ecology, water quality, air quality and acoustic environment during project construction and operation will be the study focus for this area, and the soil erosion impacts resulting from the operation of identified borrow areas and spoil disposal areas and their mitigation measures are also one of the key concerns in the EIA.

3.2. RESERVOIR INUNDATION ZONE

In correspondence with water level variation during the operation of Wuxikou Reservoir, the changes of inundation zone are persented in the table and figure below.

Table 8: Descroption of Reservoir Inundation Zones

No.	Type of Water Level	Water Level (m)	Length of Shoreline (km)	Area of Inundation Zone (ha)	Area of Exposed Bottom (ha)
1	Flood Control Limited Level	50	110	783	3683 (against design flood level) 1724 (against normal water level)
2	Normal Water Level	56	381	2507	1959
3	Design Flood Level	62.30	484	4466	/

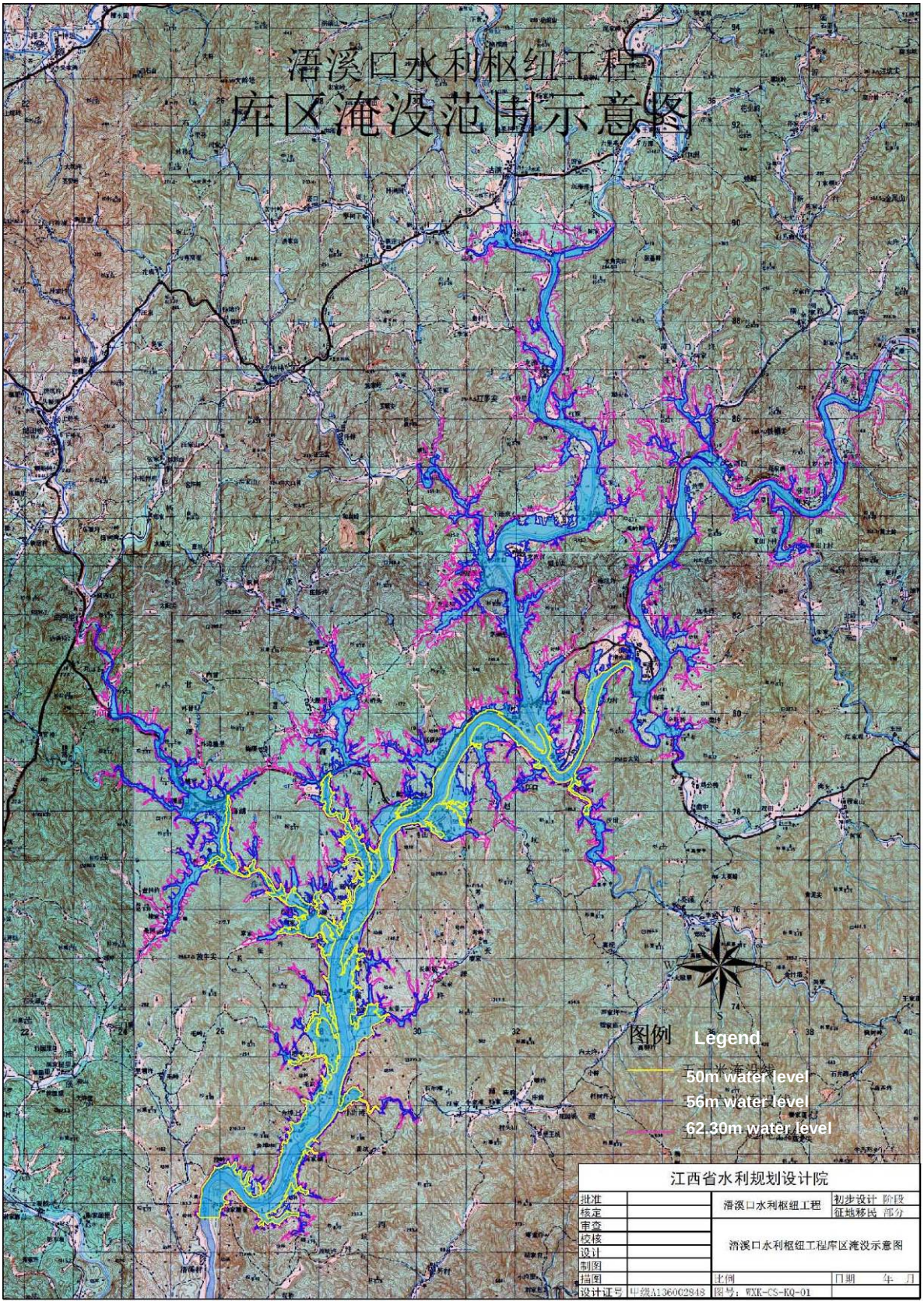


Figure 10: Scope of Inundation for Wuxikou Hydro-complex Project

At the normal water level of 56m (considered as the main affected area in the RAP), the inundation area is 25.07 km^2 covering the land area of 17.12 km^2 and water area of 7.95 km^2. The backwater

length is 22.85km. Within the inundation area, the main impact includes inundation of land and attached facilities, change of water quality and ecological environment, and impacts on living conditions of local residents. As indicated in the latest RAP, with farmland-lifting plans implemented for the shallowly inundated areas, 18 villages in 5 township/towns of Fuliang County, namely, Zhitan Township, Jiaotan Town, Xingtian Township, Jiangcun Township and Jinggongqiao town, will be affected by reservoir inundation. The detailed mitigation measures have been developed in the project RAP.

3.3. RESETTLEMENT AREAS

Based on the local conditions and in consideration of the livelihood recovery and resettlement willingness, concentrated and scattered resettlement will be applied to this project. A small part of the migrants will be resettled in a scattered way with backward resettlement. At the same time, 60 centralized resettlement sites are planned as shown in Table 5, Table 6 and Figure 7 together with the relocation of Zhitan town. The total resettlement area is 91.97 hm2 including the town area of 23.52 hm2 and concentrated resettlement area of 68.45 hm2. Besides, following the RAP, farmland protection plan has been developed using the standard of 5 years flood return period including 17 farmland elevation with 192.27 hm2 farmland protected and 99.80 hm2 earth borrow area. Environment carrying capacity analysis has been addressed during the RAP preparation. And the domestic EIA has evaluated the potential impact on the ambient ecological environment caused by resettlement area. While it should be noted that during the preliminary design period, 3 resettlement sites have been changed because of the Black Moschus chinensis protection zone which is located in Fuliang County. This EIA has made full analysis and evaluation of potential environmental and social impact caused by the currently confirmed 60 resettlement sites, township relocation and supporting facilities, as summarized below:

Table 9: Summary of Potential Environmental and Social Impacts Related to Resettlement Areas

Aspects	Expected Environmental and Social Impacts
I. Construction Period	
Land acquisition	The construction of resettlement sites for the proposed project will lead to the acquisition of farmland, forests, garden plot, etc.
Soil erosion	The construction of resettlement sites will increase local soil erosion due to the construction activities such as soil excavation and filling.
Ecology	The construction of resettlement sites may result in the damage of local vegetation, affect the growth of nearby ancient trees, and bring nuisance to the habitats of local terrestrial animals and nearby natural reserves.
Air Quality	The dust from construction and transportation activities may deteriorate the air quality around the construction sites or along the traffic routes.
Noise	The noise from construction activities such as excavation and piling and the increased traffic noise will bring nuisance to the areas around the construction sites or along the traffic routes.
Water quality	The wastewater from construction activities may deterirorate the water quality of local river if discharged without proper treatment.
Solid waste	The solid waste from construction activities may deterirorate the local environmental quality without proper treatment and disposal.
Cultural heritage	There might be cultural heritage discovered during construction and construction activities may cause damages to those newly discovered cultural heritage sites or artifacts on site.

Aspects		Expected Environmental and Social Impacts
Social impact	Traffic safety	The risk of traffic accident will increase with the local traffic increase due to the construction of resettlement sites.
	Vulnerable group	Some peoplegroupfic accident will increase with the local traffic increase due to the construction of resettlement sites.raffic routes.trial animals and nearby natural reserves. the soil erosion
	Women	Women might be less involved in training and working; the real needs of women might be ignoredbe such as: house appearance and house arrangements; female might even bear more debt pressure. Female dominated family might be more vulnerable during the resettlement.
	Indigenous residents	With resettlement, the average per-capita land possession will decrease; the pressure on public infrastructure and service will increase; there will also be problems about the allocation of public resources.
II. Operation Period		
Water quality		Centralized resettlement sites will generated domestic wastewater, which will deteriorate the water quality of local river if discharged without proper treatment.
Solid waste		Centralized resettlement sites will generated domestic solid waste, which will deteriorate the local environment without proper treatment.
Ecology		The daily activitivities of resettled people may bring nuisance to nearby habitats of local wildlife and nearby natural reserves.
Pest Management		For livelihood recovery of resettled migrants, the plantation of Radix Pseudostellariae (276.5mu) and oil tea trees (1671.9mu) has been planned. During the plantation, pesticides may be used for pest management. Improper pest management may increase the environmental pollution.
Hazardous Materials		Rodenticide will be used for rat killing in the resettlement areas, whose storage and use may threaten human life and health.
Social impact	Life quality	The project resettlement will generally have no impact on life style and livelihood of affected persons; however, their living environment and traffic conditions will be significantly improved.
	Public health	Reservoir impoundment will generate the waste from the removal of lavatories, livestock pen and tombs, which will cause water pollution if without proper treatment and disposal; the dramatic increase of water surface will increase the density of mosquitoes and rats around the reservoir and consequently the incidence of infectious diseaces.
	Community organization	The resettlement may affect the village integrity and change the organization of local communities; resettled people may face a series of problems when adapting to the new community.
	Traditional culture	The traditional family relationship may be affected after resettlement.

3.4. UPSTREAM AND DOWNSTREAM OF DAM SITE

Once Wuxikou Reservoir is built up, the flood control capacity of downstream area of Jingdezhen City will improved from at a 20 one-year return period to a 50 one-year return period which will effectively protect downstream peoples' lives and properties, reduce economic loss of Jingdezhen Town and villages downstream on both river sides, provide sufficient power for city development as well as water use guarantee, and bring a good social and environmental benefit. The beneficiary will amount to 600,000. Besides the above-mentioned positive benefit, based on the existing cascade developments (upstream Daohu hydropower station, downstream Zhangshukeng hydropower station, Nianyushan ship lock and Huanggang ship lock), the development of Wuxikou hydro-complex

project may have a further impact on Changjiang Riverhydrology, water and soil erosion of river bank, water quality, land utilization, ecological environment of river, fishery, the relative analysis will be incorporated into the cumulative impact assessment report.

3.5. NATURE RESERVE AND ECOLOGICAL RESOURCES

As decentralizing resettlement within the county is adopted by the project, the activities of reservoir inundation, land acquisition for dam site and resettlement resulting form the project almost involves the entire county, the study scope for terrestrial plant ecology is the whole Fuliang County with total assessment area of 2850.84km^2, focusing on construction site, reservoir inundation area. The study scope for aquatic biology covers the area from the boundary between Anhui and Jiangxi provinces in the north to Huanggang cascade in the downstream of Changjiang River, including the tributaries of Yangchun River, Meihu River and Donghe River.

The domestic EIA shows the land in the areas affected by reservoir inundation and resettlement is mainly used as woodland. 6 ancient trees will be flooded and the activities of residents in the newly constructed resettlement area might have impacts on the existing ancient trees. According to the domestic EIA, except one in poor growth conditions, the other affected ancient trees will be transplanted. According to the investigation, the forestry bureaus in Jiangxi Province has rich experience on the transplantation of ancient trees. For example, for the construction of Shihutang Hydro-complex in Taihe County, 725 ancient trees were transplanted in January 2011; a 1000-year-old Lagerstroemia was successfully transplanted in Duchang, Jiangxi in June 2011; the forestry bureau of Xiuwen County has successfully transplanted a 300-year-old Chinese yew in August 2012; and so on. It is believed the local forestry bureau will be competent for such transplantation activities.

For the terrestrial wildlife, there is 1 provincial nature reserve and 6 county-level nature reserves within the project area (see Figure 11). During the process on selecting of relocated resettlement sites, 3 resettlement sites of Wanggang Town have been relocated during the preliminary design to avoid being located within the experimental zone of Fuliang Huangzihao county level muntiacus crinifrons nature reserve. Currently there is only one resettlement site located near the Huangzihao nature reserve at the shortest distance of around 5km from its experimental zone and at the shortest distance of around 8.5km from its core zone. The potential impacts of resettlers' daily activities on terrestrial wildlife and corresponding mitigation measures have been considered and included as part of the ESMP.

In terms of aquatic habitats, based on the domestic EIA, the spawning sites for fishes in Changjiang River are scattered with small size, mainly at the river sections of Wuxi, Shebu, Changzhen Village and Yingxi (see Figure 11). The typically overwintering ground is the area with the water depth over 20m deep, such as Mitun, Jiantantun, and Zhangshuikeng Reservoir downstream of the proposed dam.

According to the recent observations, there is limited presence of otters in the project-affected area, which is listed as Class II national protective animals; however, the expected impacts on their living will limit to the temporary impacts of construction activities to a limited extent. The workers may also hunt otters if without proper management. With reservoir impoundment, the water surface will significantly increase which will change the original habitat of otters, and lead to their migration. However, it will also increase the suitable habitat for otters, which means the project will generally bring positive impacts for otters.

In May 2008, a provincial protection zone has been established in Changjiang River for the restoration of Spinibarbus sinensis, a kind of characteristic local economic fish species and other economic fishes in Changjiang River such as various carps. In July 2009, the protection zone was adjusted. Currently, as shown in the figure below, the core zone of the protection zone is on the tributary of Changjiang River, Donghe River, which joins Changjiang River from the left bank

downstream Zhangshukeng Reservoir and is 55.12km long covering the area of 275.8hm^2; its experimental zone is located on the main stream of Changjiang River, from Zhushan Bridge to Fugang Bridge, with the length of 33.7km and the area of 539hm^2. After the adjustments, the core zone is about 25km downstream of the proposed Wuxikou dam site. Both the reservoir construction and operation will not affect the hydrological and water quality conditions within the core zone, which means the project implementation will not have any significant impacts on the core zone. The experimental zone is located downstream of the proposed Wuxikou dam and upstream of the existing Nianyushan Ship Lock. With the stabilization of local aquatic habitats, the project operation is expected to have no adverse impact on the spawning sites downstream of the dam and to have positive impacts on the existing aquatic habitat, feeding grounds and wintering grounds.

This report will cover the analysis of impacts on exisitng ecological resources in the above-mentioned nature reserves and Changjiang Riverduring project construction and operation periods, and also present corresponding mitigation measures.

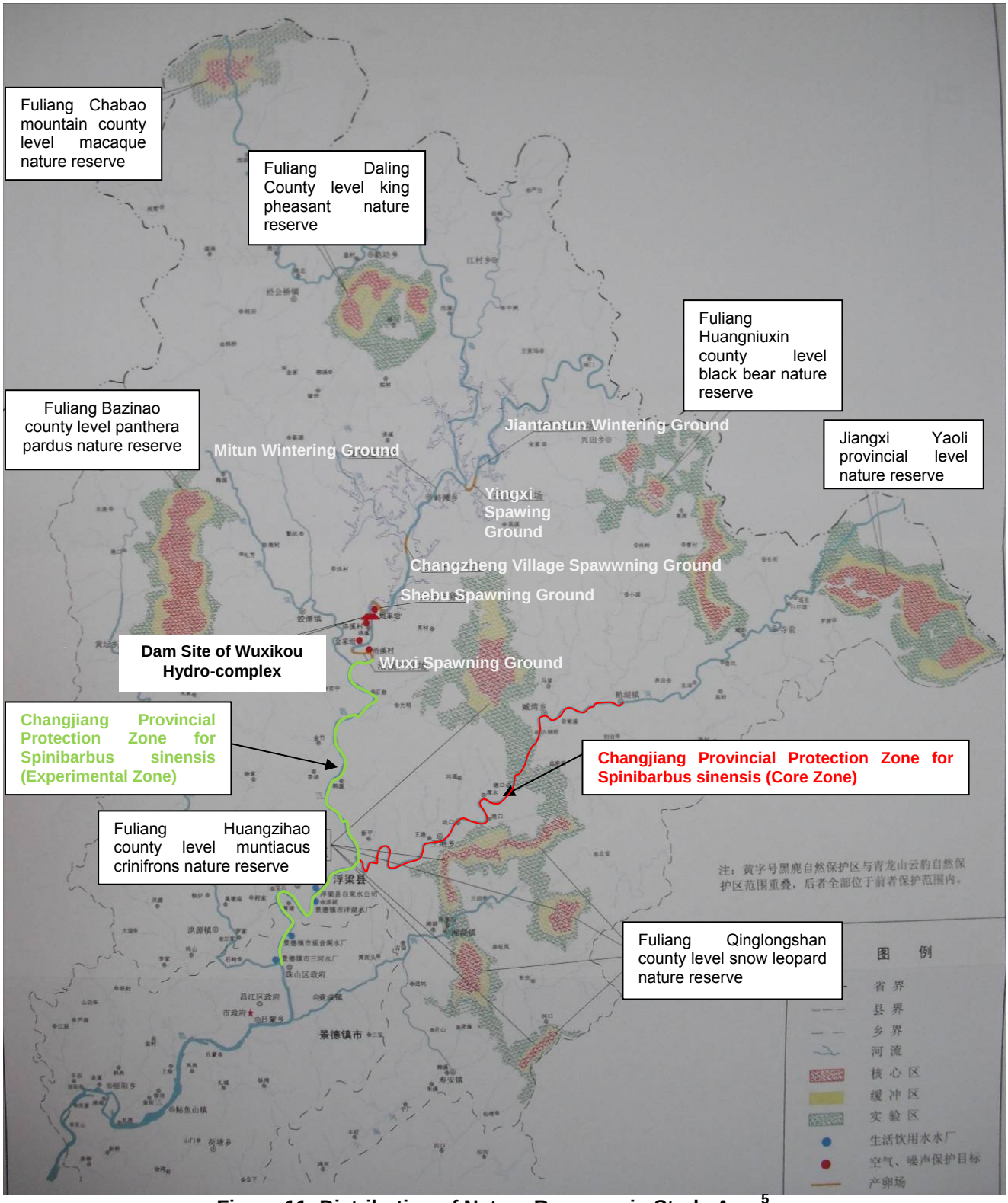


Figure 11: Distribution of Nature Reserves in Study Area[5]

[5] Domestic EIA Report for Jiangxi Province Wuxikou Hydro-complex Project (Final Version), December 2009.

3.6. RE-ROUTING OF ANHUI-JIANGXI RAILWAY

Since part (with 19.51km long, K350+500～K370+700) of Anhui-Jiangxi Railway will be flooded due to the implementation of the project, the railway needs to be re-aligned in part which is 22.04km long, bordering planned reservoir on the west site of Changjiang River, heading south to Xiaoyi Harbor, crossing Changjiang River, going through within the mountain and across existing line and finally connecting with the existing line. The bridge crossing Changjiang Riveris 4km away from the location of planned reservoir. In the EIA prepared in 2011 by China Railway Siyuan Survey & Design Group Co, Ltd. for the integrated electrification renovation of Anhui-Jiangxi Railway, the corresponding environmental mitigation measures for the realignment due to the implementation of Wuxikou Hydrological project was proposed. This report will conduct analysis of potential environmental and social impacts during the construction and operation of Anhui-Jiangxi Railway Re-routing Project covering the following aspects.

Table 10: Summary of Potential Environmental and Social Impacts Related to Auhui-Jiangxi Railway Re-routing Project

Aspect	Potential Impacts
I. Construction period	
Land acquisition and resettlement	The project construction will lead to land acquisition (farmland, forests and so on) and resettlement.
Soil Erosion	The project construction will increase local soil erosion due to the construction activities such as soil excavation and filling.
Ecology	The project construction may result in the damage of local vegetation and bring nuisance to the habitats of local terrestrial animals.
Air quality	The dust from construction and transportation activities may deteriorate the air quality around the construction sites or along the traffic routes.
Noise	The noise from construction activities such as excavation and the increased traffic noise will bring nuisance to the areas around the construction sites or along the traffic routes.
Water quality	The wastewater from construction activities may deterirorate the water quality of local river if discharged without proper treatment.
Solid waste	The solid waste from construction activities and workers' camp may deterirorate the local environmental quality without proper treatment and disposal.
Vibration	There is no large vibration source. It is believed that there is limited impact on the areas near new railway.
Cultural heritage	There might be cultural heritage discovered during construction and construction activities may cause damages to those newly discovered cultural heritage sites or artifacts on site.
Traffic safety	The transportation of construction materials and temporary construction along the railway will have impact on local transportation.
II. Operation period	
Air quality	There will be no new added boilers generating air pollutants. The railway electrification is expected to reduce the generation of boiler flue gas.
Noise	The railway operation will have noise impact on nearby residents.
Vibration	The railway operation will cause vibration impacts on nearby residents.

Aspect	Potential Impacts
Water quality	There will be wastewater generated from railway station and from train maitanence, which will pollute the local environment if discharged without proper treatment
Solid waste	The generation of solid waste is expected along the operating railway.
Magnetic radiation	The railway operation will increase magnetic pollution, which may have certain impacts on the health and daily life of nearby residents.

3.7. 100KV POWER TRANSMISSION LINE

For the transmission of power from Wuxikou hydro-complex project, the 110kv power transmission has generally identified the alignment through Fuliang Transformer Substation. The project will be organized and implemented by local power departments. As the preparation of its domestic EIA have not been officially started yet, this report will carry out preliminary analysis of the project-related environmental and social impacts based on the identified environment baseline; also this report will be served as a directive guidance for the upcoming domestic EIA study. The expected potential environmental and social impacts related to the 100kV power transmission line project are as follows.

Table 11: Summary of Potential Environmental and Social Impacts Related to 100kV Power Transmission Line Project

Aspect	Potential Impacts
I. Construction period	
Land acquisition and resettlement	The project construction will lead to land acquisition (farmland, forests and so on) and resettlement.
Soil erosion	The project construction will increase local soil erosion due to the construction activities such as soil excavation and filling.
Ecology	The project construction may result in the damage of local vegetation and bring nuisance to the habitats of local terrestrial animals.
Air quality	The dust from construction and transportation activities may deteriorate the air quality around the construction sites or along the traffic routes.
Noise	The noise from construction activities such as excavation and the increased traffic noise will bring nuisance to the areas around the construction sites or along the traffic routes.
Water quality	The wastewater from construction activities may deterirorate the water quality of local river if discharged without proper treatment.
Solid waste	The solid waste from construction activities and workers' camp may deterirorate the local environmental quality without proper treatment and disposal.
Construction safety	During construction, there is safety risk when spanning transmissionline, which may cause power failure and affect normal operation of local power grid.
Cultural heritage	There might be cultural heritage being discovered during the construction period. And there might be damage to the discovered cultural heritage or artifacts
II. Operation Period	
Ecology	During the maintanence period to power line, the maintanence crews might damage the local ecosystem.

Aspect	Potential Impacts
Noise	During the power line operational period, in a bad weather, there will be noticeable noise generated from corona
Solid waste	During the maintanence period, crews might generated waste, and leave it on site.
Magnetic radiation	Magnetic radiation will be generated from Power frequency electric field and magnetic field, when the electricity being transferred or voltage being changed in this power line project. Magnetic radiation will have impact on local environment and residents, having impact on wireless signals, local communication, and impact on functions of IT equipment and medical equipments
Public health and safety	If power cable not being well installed, there might be fire or lighting during the operational stage. This would bring risk to public assets and safety

3.8. ASSOCIATED ROAD AND BRIDGE DEVELOPMENTS

The length of access road for the project totals 18.6km, covering 24.69hm^2, mainly farmlandand forestland. Among others, the 9.1km is construction road for temporary use, with an area of 6.73hm^2 as farmland, forestlandand wasteland; while the rest 9.5km is permanent road involving an area of 17.96hm^2. In addition, 260m-and 50m-width bridges have been involved in this project. For the resettlement sites, totally 39.9km of rural roads have been planned. For road and bridge projects, the expected environmental and social impacts are mainly expected during construction period, as summarized below:

Table 12: Summary of Potential Environmental and Social Impacts Related to Road and Bridge Developments

Aspect	Potential Impacts
I. Construction period	
Land acquisition and resettlement	The project construction will lead to permanent and temporary land acquisition and resettlement.
Air Quality	Exhaust emissions and dust caused by construction activities will affected ambient air quality.
Noise	Traffice noise from access roads might affect the daily life of nearby villagers.
Water quality	The wastewater from construction activities may deterirorate the water quality of local river if discharged without proper treatment.
Solid Waste	The solid waste from construction activities and workers' camp may deterirorate the local environmental quality without proper treatment and disposal.
Soil Water Conservation	The project construction will increase local soil erosion due to the construction activities such as soil excavation and filling, soil borrowing and spoil disposal.
Ecology	The project construction may result in the damage of local vegetation and bring nuisance to the habitats of local terrestrial animals.
Cultural heritage	There might be cultural heritage being discovered during the construction period. And there might be damage to the discovered cultural heritage or artifacts
II. Operation Period	

Aspect	Potential Impacts
Noise	Noise generated by transportation along the permanent roads might have environmental impacts on surroundings.
Air	The emission from transportation on permanent roads might cause some air pollution on its surroundings.

4.SUMMARY OF DOMESTIC EIA REPORT

The «Environmental Impact Assessment Report for Changjiang RiverWuxikou Hydro-complex Project (Final Version)» was developed by the Yangtze River Water Resource Protection Science Research Institute in December 2009 and finally approved by the Ministry of Environmental Protection in 2012 (HuanShen[2010] No.98). Based on the investigation of environmental baseline and project analysis, the report assessed the potential environmental impacts for Wuxikou Hydro-complex Project during construction and operation and proposed corresponding mitigation measures. The total environmental protection cost of the project is 70.209 million yuan of which environmental protection investment is of 59.264 million yuan, soil and water conservation investment is of 10.745 million yuan. The environmental protection investment includes: environmental protection measures 34.587 million yuan, environmental monitoring measures 3.53 million yuan, environmental protection equipment and installation 3.85 million yuan, the Environmental Protection interim measures cost 5.2 million yuan, the independent cost of 6.891 million yuan. According to the report, the potential environmental impacts of the project and the proposed mitigation measures are summarized as follows.

Table 13: Summary of Original EIA Report (Final Version, December 2009) for Wuxikou Hydro-complex Project

Elements		Environmental baseline situation	Project Phase	Potential environmental impacts	Proposed mitigation measures
Water Environment	Water supply	Now the total quantity of water taking from the Changjiang Riveris 177 million m^3, approximately 5.61m³/s. The natural runoff of the Changjiang Rivercan not meet the urban water supply demand in dry periods. Under the Master Planning, the water shortage of Jingdezhen's total water demand in 2020 will be 26 million cubic meters. [5.6 (1)]	Opeara ction	With reservoir completion, by utilizing the regulated flow of 16.4m³/s (P = 95%), Wuxikou Reservoir will greatly alleviate the water shortages pressure of Jingdezhen City during dry season. With the joint operation of Wuxikou Hydro-complex and Zhangshukeng Hydropower Station, the downstream demand of water supply could be secured. [5.6 & 5.3.1.3 (2)]	Positive impact, and do not need to take mitigation measures.
	Hydrological regime	Changjiang River is one of the two main tributaries of Raohe River, and the floods in the basin are mainly formed by the rainstorm. At Wuxikou dam site the annual average flow is 88.0 m³/s, and the mean annual runoff is 2.78 billion m^3. The annual	Constru ction	With joint operation of Wuxikou Hydro-complex and the Zhangshukeng Hydropower station, the downstream river course won't dry up and will not affect the downstream water. [5.3.1.1]	With the construction of open diversion channel and joint operation with the downstream Zhangshukeng Hydropower Station, at least 15 m³/s discharge flow can be ensured. Even when Zhangshukeng hydropower station is operated at the dead water level, the minimum flow rate of 15m³/s can be ensured for 3 consecutive days, which satisfies both the downstream ecological, domestic and industrial water demand. [5.3.1.1]

Elements		Environmental baseline situation	Project Phase	Potential environmental impacts	Proposed mitigation measures
		runoff is unevenly distributed all year round : 53.8% in the flood season (Apr. to Jun.), while12.9% in the dry season from October to next February. [3.2.1 (4)]	Opeara tion	During the impoundment, the diversion channel will be closed. It is estimated there will be 4 hours' discontinuous flow for the downstream river section. With project operation, the discharge flow will significantly change in particular before the flood season (before March) and after the flood season (after July). The change will not exceed 20% of the natural flow at the dam site. [5.3.1.2 & 5.3.1.3]	During the early stage of impoundment, the discharge flow is controlled by the bottom outlets. Depending on the water level in the reservoir, one to six bottom outlets will be accordingly opened to provide as the flow rate of 15 m³/s downstream. During the four hours' discontinuous flow, Zhangshukeng reservoir will be used to ensure the downstream discharge flow and to avoid river cutting-off. During operation, the joint operation with the downstream Zhangshukeng Hydropower Station, at least 15 m³/s discharge flow can be ensured. [5.3.1.2 & 5.3.1.3]
	Water temperature	For the main stream of Changjiang River, only Dufengkeng hydrology station provides baseline data on water temperature varying between 8.5℃ and 30.1℃ in a year. [5.3.2.1]	Opeara tion	The temperature of the downstream water will be affected by the reservoir, but the temperature will recover quickly and obviously by weather conditions. By tributaries flowing into, the water temperature at the downstream JingDeZhen power plant has less floating than natural conditions. The project will not affect the normal working of the thermal power plant. [5.3.2]	To further verify the project impact to the water temperature of the reservoir and the downstream river, the water temperature tracking and monitoring shall be strengthened after the completion of the reservoir. [5.3.2]
	Surface water	The water quality of Changjiang Riveris mainly Class II, at some sources the water quanlity could be up to Class I. The water quality is generally good. But water quality of Changjiang River at Qimen county and Jingdezhen urban area shows the tendency of deterioriation in recent years. While according to monitoring results, water quanlity of these parts still meet local standards for water functional area. [3.2.4 (1)]	Construc tion	**Washing wastewater from concrete batching plant:** 100 m³ / d, the pH (9 to 11), SS (3000-10000mg / L) [5.3.3.3]	After regulating, neutralizing and precipitating, reuse it for aggregate washing and dust reduction on site. [7.3.2]
				Wastewater from concrete maintenance: less water, pH (9-11), SS (5000mg / L) [5.3.3.3]	After neutralizing and precipitating, discharge in compliance with standards. [7.3.2]
				Drainage of foundation pit: Composing by rainfall, water leakage and construction water, pH (9-11), SS (2000mg / L) [5.3.3.3]	Recycle it when meeting standards after settling treatment. [7.3.2]
				Domestic wastewater: 98 m³/d on peak season, including BOD_5 (200mg / L), COD (400mg / L), SS, etc. [5.3.3.3]	Discharge after proper treatment to meet the standard requirements. [7.3.2]
				Oily wastewater from mechanical service station: 50 m³/d (20 m³/d on left bank, 30 m³/d on right bank), oil (100mg / L) [5.3.3.3]	Use for dust control for construction site after oil removal. [7.3.2]

Elements		Environmental baseline situation	Project Phase	Potential environmental impacts	Proposed mitigation measures
			Opeara tion	**Impoundment period :** water quality will be impacted by the surrounding agricultural pollution, domestic pollution of residential area, and uncollected debris (plants and animals), domestic garbage and waste (humans and animals) at the flooding area. [5.3.3.4]	Before impoundment, clean the bottom of the reservoir as per environmental requirements. [7.3.3]
				Water quality during operation: Around reservoir, there is no industrial sources of pollution, showing dicreasing trend of importing pollution source. According to the model prediction, the concentration of COD and NH3-N will reach Class II by 2015. The average annual TN concentration is 0.20mg / L, the average annual TP concentration is.01mg / L, as the nutritional status. The entire reservoir is unlikely to be eutrophicated, but nutritional level could be affected by nutritional level of Meihu River tributary. [5.3.3.4]	During operation, the development activities around the reservoir should be controlled. Relevant pollution prevention plans and regulations should be developed and enforced; a strict permission system needs to be set up for industrial enterprises in order to protect the water environment of Wuxikou reservoir. Pollutant discharge need to be controlled around the reservoir, reservoir water environmental monitoring system should be set up, the online monitoring of the ecological flow needs to be implemented. [7.3.3]
				Water quanlity of downstream river section: With the completion of the reservoir, in dry season the environmental capacity of downstream water could be increased by10%. In wet season and normal season, the environmental capacity of Changjiang Riveris bigger, therefore the egulation of the reservoir won't impact the water quality. It is to be predicted that the water quality in the Jingdezhen drinking water source protection zones could meet the standard. [5.3.3.4]	Monitoring water quality of downstream water intakes to optimize the use of water resources and to reduce the total amount of water. [7.3.3]
	wastewater from resettlement area	Now most domestic wastewater of the residential area near the reservoir is discharged directly into the river without treatments. [5.3.3.1 (1)]	Operati on	The relocated Zhitan Township involved in the project is predicted to generate 162 m³/d wastewater. And 800 m³/d wastewater from centralized resettlement sites. The long term discharge of domestic wastewater without proper treatment will deteriorate local water environment . [5.4.3.2]	Build wastewater septic tanks for rural resettlement households, the treated water will be discharged In compliance with the standard requirements. Domestic wastewater from Zhitan Township will be treated by the process of biological oxidation, and the treated water will be discharged in compliance with national standard requirements. [7.3.3]
	Groundwater	Groundwater types are pore-space water in loosening rocks and bedrock fissure water. [5.3.3.4 (1) 4)]	Opeara tion	Topography and geology of the reservoir is in good conditions,it is less possible to happen permanent leakage for the reservoir. Cause there are connections between the pore water of the dam area and the river water, the reservoir water may leak out, so anti-seepage must be taken. [5.3.3.4 (1) 4)]	Take engineering measures in the design to prevent water leakage. [5.3.3.4 (1) 4)]

Elements		Environmental baseline situation	Project Phase	Potential environmental impacts	Proposed mitigation measures
	Poyang Lake	Poyang Lake is located in the north of Jiangxi Province, and at the south bank of the middle reaches of the Yangtze River, receives water from five rivers i.e Ganjiang River, Fu river, XinJiang river, Rao river, and Xiu River, at the end runs into the Yangtze River at Hukou. It is a water-carrying, in-out and seasonal lake, and also largest freshwater lake in China. Its water level is impacted by both of above five Rivers and the Yangtze River, so water level and volume change a lot between flood and dry season. Its mean annual runoff is 143.6 billion cubic meters, mainly distributed during April to September which accounts for 69% of the full-year runoff. [5.3.4]	Opeara tion	In terms of hydraulic regime for Changjiang , the main impact of the project is to change the runoff process, and does not involve the diversion of water and projects with large water consumption, does not change the annual water amount from Changjiang Riverinto Poyang Lake. By regulations of the reservoir,in the dry season water volume increases from Changjiang Riverinto Poyang Lake. Because the annual runoff of WuXikou dam site only accounts for 2% of Poyang Lake's runoff, the regulation of the project does not change much for the water volume of Poyang Lake during dry season. [5.3.4]	Almost no negative impact, and do not need to take mitigation measures. [5.3.4]
Air		According to monitoring results, the air quality of the project area is higher than Class II in <Environmental Air Quality Standard> (GB3095-96). [3.2.4 (2)]	Constru ction	**Construction activities :** The project has much engineering work, there is big volume of flying dust, the earthworks dust, aggregate processing dust, concrete mixing floor dust and blasting dust on the environmental air quality with major pollutants of TSP. But cause the population density is not big in the project area, the impact from the increase of atmospheric concentrations of pollutants in the construction area is relatively small. In project area, Baojia Group and Luoxi village will be affected by dust and waste from the soil material site's excavation. [5.7]	Preferred consideration shall be given to the blasting methods like presplit blasting, smooth blasting, cushion blasting, deephole millisecond compression blasting to reduce dust generation. Set precipitators for the concrete mixing station, and to strengthen the maintenance of the precipitator. In the construction period, use treatments like Emission reduction, dust prevention and dust suppression taken. Prevent dust blowing of wind and strengthen environmental supervision by sprinkling,install enclosure and tarpaulin covers. [7.4]

Elements		Environmental baseline situation	Project Phase	Potential environmental impacts	Proposed mitigation measures
			Construction	**Construction machines and vehicles :** On construction site, smoke- dust and exhaust of trucks and heavy machinery and flying dust by trucks driving will increase concentrations of TSP, SO2 and NO2 in the air arround the project area, especially Luoxi Village, Jinjia Group, Wuxi Village will be greatly impacted by surrounding road traffic emissions. [5.7]	Follow laws and regulations of construction equipment operation and truck transportation. Reduce the impact of road dust on the surrounding environment by limiting transpoting load and speed, sprinkling on road, covering the transport of materials and strengthening themaintenance of machinery and equipment. [7.4]
Noise		The current noise in construction area comes mainly from life noise of village residents, no other industrial noise sources. It meets the Class 2 standard of the <Environmental Quality Standard for Noise> (GB3096-2008). [3.2.4 (3)]	Construction	Wu Village and Luoxi Village, Jinjia Group will be mainly affected by both banksof road traffic noise; settlements site will be impacted by blasting noise, but only short time, impact is not too much. Baojia Group and Luoxi village will be affected by noise from the operation of soil borrow areas. [5.8]	Control vehicles speed near concentrated settlements. when vehicles pass Luoxi Village, Jinjia Group and Wuxi Village, low the speed and prohibite the loudspeakers. Set up traffic signs of warning and speed limit along the access road to the construction zone. [7.5]
Solid waste	Spoil	/	Construction	Total spoil from the project is 249700m³, including 164300 m³ spoil from excavation of central construction, 30400 m³ spoil from earth material field, and 55000 m³ from settlement area. [6.2.3]	The project has identified three Spoil fields, located at: left bank of the river gully 0.3km downstream of the dam site (29 600 m³), the diversion open channel (35 200 m³) and the gulch near right bank of the dam site (99500 m³). Need to strictly follow the relevant regulation stated in the soil and water conservation plan during construction period. [6.7]
	Construction camps	/	Construction	According to the analysis, construction camps will produce the garbage of 0.4t per day during peak period, primarily from Luoxi Village construction management and living area. The random disposal may pollute the environment and affect the health of persons. [5.9]	The waste of construction area is to be cleaned and transported by Fuliang County Environmental Sanitation Management Bureau based on the signed agreement. [7.6.1]
	Resettlement Area	/	Operation	The annual waste generation of rural migrants and town residents are 3992.0t and 590.9t. If not properly treated, it will pollute rivers and other water bodies, harm the environment and human health. [5.4.3.6]	The domestic solid waste from relocated township and centralized settlement sites wii be sent for landfilling. The landfill sites with the total capacity of 29000m^3 have been proposed in the original EIA for the new Zhitan Township and centralized resettlement sites. [7.6.2]

Elements		Environmental baseline situation	Project Phase	Potential environmental impacts	Proposed mitigation measures
Local climate		The project area is located in subtropical monsoon climate zone, with sufficient heat, rainfall and sunshine. The frost-free period is long and mean annual temperature is 17.4 ℃. [3.2.1 (3)]	Opeara tion	Research and observation data indicate that the impoundment of Wuxikou Reservoir will only affect the local climate to a limited degree within 5-10km around the reservoir area, for example, smaller temperature difference between daytime and night, cooler summer and warmer winter, and slight increase of annual average temperature by 0.3 ~ 0.5 °C; however, all these changes are within the natural variation range; the total regional rainfall will not change significantly, but the spatial and temporal distribution will slightly change with slight decrease of precipitation in the reservoir area and the rainfall within 5-20km along the reservoir bank will increase. All the above changes are favorable for the growth of forests and economic crops near the reservoir. [5.10.1]	A positive impact, does not require mitigation measures
Ecology	Terrestrial plants	Fuliang County is highly covered by vegetation mainly consisting of coniferous forest (69.30%), broad-leaved forest (3.5%), bamboo (2.14%), shrub and herbaceous plant (7.55%) and cultivated vegetation (11.75%). In evaluation area, the plants in the reservoir eare have various species and they are dominated by temperate type, with the complex composition of floristic elements. [3.2.3.1 (2)]	Constru ction	The project covers an area of total 2531.6hm², vegetation mainly includes timberland, farmland vegetation (arable Corner) and shrub, respectively accounts for 11.9% , 30.1% and 10.8% of the total land area. Woodland is mainly comprised with shrubbery; high forest is mainly comprised with masson pines and mountain trees. Due to the influenced vegetation are distributed around the reservoir, the plants are the general common species, impact only acts on quantity, will not cause the disappearance of plant species. [5.1.1.1]	According to the characteristics of the regional vegetation, carry out trace rehabilitation of planting in the construction area, mainly for the living quarters, yards, debris, and both sides of the road, plan to rehabilitate the woodland 164 acres; the last area where the vegetation are not rehabilitated will be replanted by the relevant forestry administration bureau with the payment by construction entities based on the relative regulation. Rehabilitate in the mean time in open space around houses and roads in the trsettlement areas, plan to rehabilitate woodland 10.17hm². According to RAP, vegetation rehabilitation fee of the project area is of 29.8808 million yuan. During construction period, collect the high fertility of the topsoil, and restore the local soil system for future vegetation recovery and rehabilitation. [7.1.2]

Elements		Environmental baseline situation	Project Phase	Potential environmental impacts	Proposed mitigation measures
	Vegetation in Resettlement Sites	Resettlement area vegetation is subtropical evergreen broadleaf forest, due to the impact of human activities, the reservoir area vegetation is basically artificial secondary forest and shrubs. [5.1.1.1]	Construction &Operation	According to forecasts, housing construction for Wuxikou reservoir resettlement will use brick-concrete structure instead of brick-wood structure, so the demolished wood of the original housing could basicly meet the new housing needs. In addition, with the popularization of biogas and solar energy, rural residents has less proportion on fuelwood as domestic energy hence less demand for vegestration as domestic energy, therefore immigrants in the reservoir area have less impact on vegetation. [5.4.3.3]	/
	Ancient and Valuable Trees	In Fuliang county, there are 10 types of national level preservation plants, in the evaluation area, there are Taxus, Ginkgo and camphor. [3.2.3.1 (2) 3)]	Construction	In reservoir inundation area, six old and valuable trees in Zhitanxiang Village will be concerned, 5 camphors and a sweet gum at age of 200-500 years. In addition by the ecological survey of the resettlement area in the Lantian Village, Chutian Village, ShebuVillage, 5 old and valuable trees are found with name of camphor trees, chestnut, oak, Green Gang, aged about 100 to 250 years. [5.1.1.2 & 5.1.1.3]	According to the growing status of old trees, only one camphor tree as poor status will be cleaned up and the rest will be resettled at appropriate seasonal migration. During the construction period, the old and valuable trees in the reservoir area should be taken in protection. Especially for those in the resettlement area, taking a thorough investigation, situ conservation and strengthening cultivation, management, advocacy education and law enforcement. [7.1.3]
	Terrestrial animals	According to the survey, Wuxikou Reservoir and the surrounding area has been found with terrestrial vertebrates : 12 kinds of reptiles, 17 kinds of amphibians, 67 kinds of birds and 25 kinds of mammals . 4 kinds of National Class I level protected	Construction	During the contruction period, the impact to terrestrial animals is limited in the dam site. The construction will occupy habits of the important protected wildlife[6], and affect their feeding, force them to move to a suitable habitat nearby. But because they are active, when the project completion, animals will move back. Related impacts will gradually disappearfollowing the construction completion. [5.1.2]	In construction period and operation period, strengthen the publicity of the promotion, common sense of wildlife protection and environmental protection awareness to construction workers and power plant management staff. In each construction area and resettlement area, for the national and provincial levels protected wildlife, make a handbook of identifying, protecting measures and management requirements, hand out to each construction workers in the

[6] See Section 3.5 of this report for updated information.

Elements		Environmental baseline situation	Project Phase	Potential environmental impacts	Proposed mitigation measures
		wildlife: clouded leopard, leopard, black muntjac and white neck pheasants; 11 kinds of National Class II level protected animals: the tiger frog, mandarin ducks, eagles, silver pheasant, pangolins, bears, macaque, etc.;- 42 kinds of Jiangxi Province level protected: China toad, Pelophylax frogs, flat chest turtle, Elaphe carinata etc. [3.2.3.1 (3)]	Operation	After the reservoir is operated, the water surface will increase which is favorable for amphibians. For lizards and snakes and other reptiles, their original living area was flooded, its distribution area will gradually along with reservoir storage goes to upstream area to the other surrounding habitat migration. After the impoundment, the number of birds will have increased significantly. Mammals habitat will be flooded, making it to the relative upstream habitat, habitat range is relatively narrowed, but with limited impacts. [5.1.2.1]	construction area and each habitant in resettlement and immigration area. [7.1.4]
	Nature Reserve	In the evaluated region, there are 1 provincial-level and 6 county-level nature reserves. [3.2.3.3]	Operation	The construction and reservoir inundation will not involved in the Nature Reserve, only the limited resettlement near the Nature Reserve will make small impact with human disturbance. The influenced Natural Reserves are Huangzihao Nature Reserve of Black Muntjac, QingLongjian Nature Reserve of Clouded Leopards and Bazinao Nature Reserve of leopard with the closest distance to rettlement points of approximately 1km.[7] [5.1.4]	Strengthen publicity for protection and management provisions of nature reserve, popularization the protectioon knowledge of the nature reserve, strengthen the managementand inspection of the nature reserve, improve awareness of environmental protection of immigrants and local residents. At the same time, pay attention to the protection of wildlife habitat and keep clear when finding the national key protected wild animals, prohibit hunting and harm national key protected wild animals. [7.1.5]

[7] See Section 3.5 of this report for updated information.

Elements		Environmental baseline situation	Project Phase	Potential environmental impacts	Proposed mitigation measures
	Aquatic Ecosystems	Generally Changjiang River is classified as lentic habitat with lotic habitat at some parts. The phytoplankton of 57 genus in 7 phylums and zooplankton of 38 species with low distribution density are found in the region. Investigation shows macrobenthos of 17 species in 3 phylums mainly mollusca and annelida; there are four belts of aquatic vascular plants including hygrophyte, emergent plants, floating-leaved plants and submerged plants. There are 88 species of fishes in Changjiang River belonging to 15 families of 6 orders, 65.9% of which are cyprinids.Only small spawning grounds are distributed in the river. Due to the barrier effects of basin-wide cascade development on habitat and changes of hydraulic regime, no natural breeding population and spawning ground for fishes laying drifting eggs currently seems impossible to be formed in the river. [3.2.3.2]	Opeara tion	After impoundment, the reservoir area by the rapids river habitat will convert to the slow flow or stagnant lake habitats, it is suitable for hydrostatic life of plankton, macrobenthos, aquatic vascular plant species increasing. But increasing flow and changing of water level will make bad impact for plankton amd molluscs. WuxiKou Hydro Complex Project will run further exacerbate the existing cascade development, it will impact continuous habitat miniaturization trend and fragmentation barrier of the Changjiang main stream, and not conducive to the expansion of the scale of resources of the entire basin fish stocks, resource exchange and diversity development. After ipoundment, the fish species which drift eggs in a rapid production at the reservoir area will significantly reduce; the species which only adapt to the rapids and enthic habitats will gradually withdraw from the reservoir water; other species and resources which have no strong selective for habitats and populations may increase. [5.2]	By basin and united control under the dam, reduce the negative impact to plankton and molluscs which causing by decreasing of discharge and changing of water leved. Restrict area development and habitat destruction, set the areas of closed fishing and strengthen fishery management. For the fish species which have more impact by reservoir inundation, take compensation of reproduction and releasing of ecological. Make good monitoring and investigation of fish resources, and make proliferation and stocking programs according to the results of the monitoring and investigation. Long-term monitor and survey of the reservoir area and downstream of aquatic organisms and develop relevant research programs, and provide the necessary technical support for fish protection.
	Key protected aquatic organisms	There are only one kind of national Class II protected wildlife (otter) found in the project-affected area. [3.2.3.2 (7)]	Construc ction	Construction noise, machinery operation and personnel activities may cause the otters habitat disturbed and lead them to migration. [5.2.7]	Construction management during project implementation period should be strengthened to prevent human hunting which will lead to resource damage. [7.2]
				After impoundment of reservoir, water surface will increase, the expansion of the habitat and increasing of food sources will help expansion of otter populations, but not too much. [5.2.7]	

Elements		Environmental baseline situation	Project Phase	Potential environmental impacts	Proposed mitigation measures
	Changjiang Provincial Protection Zone for Spinibarbus sinensis	Changjiang Provincial Fishery Resource Protection Zone for Spinibarbus sinensis (experimental zone) is located downstream of Wuxikou dam. [5.2.6]	Construction & operation	The experimental Zone of the Changjiang RiverThorn Hollandi Provincial-level Aquatic Germplasm ResourcesReserve Areas is in the project downstream of 2.6km to reservoir, no inundation impact. Compared with database before reservoir construction, the reservoir discharged flow variance within the year is narrowed, the flow amplitude decreases which is conducive to the stability of the dam downstream habitat, ecological function and structure of the protected area and its conservation objectives will not be affected. [5.2.6]	Not affected.
Soil erosion	Construction activities	The project area is covered by the Southern red soil in hilly parts. Soil erosion is mainly caused by hydraulic erosion. The area is the key protection and supervision area of the soil erosion control in Jiangxi. The area of soil erosion in Fuliang County is 179.64km2, accounting for 6.3% of the total land area, including mild, moderate, strong and very strong erosion area, respectively accounting for 8.5% 11.8%, 53.5% and 26.2 %of the total soil erosion area. [6.1]	Construction	The project will disturbance and damage for the original topography, soil and vegetation, the total area is 145.13hm². The damaged area of soil and water conservation facilities is 101.51hm²(excluding the area to be flooded grass area), mainly composed by forest. According to calculations, the construction period will make 30,700 tons of soil erosion in total, including new soil erosion in the amount of 27,700t. [6.2.3]	Soil and Water Conservation program developes specific soil and water conservation measures respectively for the hub area, traffic, construction, production and living areas, debris field, yard, resettlement areas and special facilities for complex change. Combination of engineering measures, land remediation and vegetation measures to reduce Soil and Water Conservation. [6.7]

Elements		Environmental baseline situation	Project Phase	Potential environmental impacts	Proposed mitigation measures
Socio-economy	Social and Economic Benefits	Jingdezhen Municipality has the total land area of 5261km² and a total population of 1.54million in which 0.44 million in urban area. It is an industrial city mainly relying on ceramic industry supported by the industries of automobie, machinery, electronics and building materials. The city's industrial and agricultural output value in 2006 was 22.478 billion yuan, per capita disposable income of urban residents was 3945 yuan, and the net income of farmers is 3954 yuan per capita. The land area of Fuliang County is 2851km², with a total population of 0.281 million, of which the agricultural population accounts for 80.5%. The county's industrial and agricultural output value in 2006 was 2.23 billion yuan and the per capita net income of famers was 3492 yuan. [3.2.2 (1)]	Opeara tion	Project will improve Jingdezhen City flood control standards from 20 years to 50 years, which contribute positively to protect the lives and property of local people. At the same time generate average 80.81GWh power per year, and regulate 15m³ / s flow for the downstream river in the dry season. Not only to meet the long and short term water supply requirements for Jingdezhen City, Fuliang County and other nearby towns, but also improve the water status of industry, agricultury, people and animal arround Changjiang middle and lower reaches, promote local social and economic development. Improvement of investment and environment in the reservoir area will help the adjustment and upgrading of industrial structure and make good opportunity to urban rational distribution and economic development. At the same time, there are some influential history culture and scenic spots surrounding the reservoir area. Construction projects will improve the existing traffic conditions, combine with reservoir tourism development and increase the new economic growth point in the reservoir area. [5.5 & 5.10.3]	A positive impact, does not require mitigation measures
	Land Use	Fuliang County is covered by low mountain and hills, the total land area is 285083.68hm², including cultivated land 20921.26hm² and garden 6468.1hm², forest 234902.95hm², construction land6374.72hm², unused land 8223.05hm², other 12909.4 hm². [3.2.2 (2)]	Construc ction	The total expropriation area of the project is 2531.57hm², including cultivated land (11,150.51 acres, within 240.20 hm² of basic farmland) and forest land (8491.31 acres). After the reservoir completion, the area of water surface will increase, farmland irrigation will be improved. The project will help structural adjustment and further optimize of the regional land use. [5.4]	According to the relevant requirements of the land management sector, detailed resettlement plan has been organized, which will make corresponding compensations for basic farmland and forest land. Ensure the resettlement actionin the preparatory stage of the project, and make no influence for project schedule. Before the land acquisition, temporary land covering out of the project area has to follow a set of approval procedures. [Project RAP]

Elements		Environmental baseline situation	Project Phase	Potential environmental impacts	Proposed mitigation measures
	Traffic safety	/	Construction	There is higher risk on roads which are near residential areas and mixing equipments of spoil and cement.	Make training for drivers, continue vehicles maintainence, set speed limit, add road marking, divide parking area. Announce people at peak hours and special hours, and cooperate with police. If traffic accident happens out of construction area, take safety emergency plan Publicize by local broadcast and television, post notices, let people understand the new traffic pressure and corresponding safety measures.
	Population health	According to the 2007 statistical data, Fuliang County has 23 well estabilished medical organizations. During 2005~2007, totally 2439 cases of infectious disease have been found in Fuliang. The average annual incidence is 287.57/100000. The diseaces with high incidence are pulmonary tuberculosis, hepatitis, infectious diarrhea, dysentery and angina parotidea etc. [3.2.2 (3)]	Construction	During construction period, population density increases caused by people gathering in construction area. If the management is poor, infectious disease could be prevalent. In the beginning period of impoundment, mouse and mosquito densidy will be improved in arrounding vectors, the incidence of infectious diseases by mouse vector and mosquito vector may increase.	Subsidize to local medical establishments on funds, strengthen the technical training to corresponding anti-epidemic personnel, carry out disease detection and vaccination. Strictly require the contractors to strengthen the management of construction workers and work sheds. Strengthen healthy publicity, improve health consciousness of workers and migrants.

Elements		Environmental baseline situation	Project Phase	Potential environmental impacts	Proposed mitigation measures
	Life quality of Resettled People	According to investigation, the total income of rural residents in Fuliang county in 2007 is by average 4790.87 yuan per capita, mostly from farming, accounting for 69.65%. The income percentages from forestry, stockbreeding and fishery are very low. The average rural residential area in the reservoir area is 61.3m², the average residential area of town residents is 45.2m², infrastructure constructions of traffic, communication and water-supplying-draining are lack of unified planning, development is worse, living condition need be improved. [5.4.3.4]	Construction	The inundation will impact 5 towns, 21 villages and 119 groups of Fuliang county. The inundated cultivated land respectively account for 48.52%, 3.77%, 11.35% and 0.52% in total cultivated land of Zhitan town, Jiaotan town, Xingtian town and Jiangchun town. Except for Zhitan town which have big percents of inundation area, the percents of other 3 towns are small.	According to resettlement plan, by adjustment of cultivated land, the average cultivated land of backfward migrants is 1.09 acres,the average garden land is 0.67 acres, there is also some forest land. The average cultivated land of relocated migrants is 1.1 acres, the average forest land is 1.5 acres. The quanity and quanlity of cultivated land are nearly same before/after emigration. And the water conservancy falicities in emigration area will be improved by compensated fund and better condition of the reservoir. Emigration may use compensated fund to develop the farming or other investment, so it does almost nothing impast for the income of the emigration. While the housing condition, traffic condition and other infrastructure will be improved.
	Tankou hydrometric station	Tankou hydrometric station locates at Tankou town, Xingtian township Jingdezhen city. It was built in 1956, now it is used to observe water level, flow rate and rainfall. [5.4.3.8]	Construction	The inundation of the reservoir will concern Tankou hydrometric station.	By the proving of expert, Tankou hydrometric station will be entirely replaced, the now location is in Chengmen villiage about 11.0 km upstream, the total investion is 4.012 million, the replacement investion has been included in the project investion of Wuxikou. The replaced station can meet the functional requirement of water source using, floods and droughts.
Physical cultural resource			construction	There are 4 historical building under the inundating line of 56 m, one is protect cultural relics of county level, i.e., Site of Workers, Peasants and Soldiers' Congress for Eight Counties at Anhui and Jiangxi Boundary. During excavation, cultural relics might be found, and valuable relics or artwares may be damaged.	For the historical building which will be inundated by the reservoir, it will be replaced entirely, restored as original building and protect by translocation. If finding new phycisal cultural resource, the working should be stopped and make protection.

Note: The figures in [] in each cell indicate the section No. with reference to the original EIA (final version, dated December 2009).

5. ALTERNATIVE ANALYSIS

5.1. WITH/WITHOUT THE PROJECT

The main benefits from the implementation of Wuxikou Hydro-complex Project:

- The project implementation will improve the flood control standard of Jingdezhen and the towns, villages and farmland along the banks of Changjiang Riverand upgrade the flood control capability from the return period of 20 years to that of 50 years;

- The low water discharge and regulating flow rate for the river section downstream of the dam site will be increased, which will optimize the conditions of industrial and agricultural water use and the water supply for human and livestock for the middle and lower reaches of Changjiang Riverand guarantee the water supply safety of Jingdezhen City;

- The project implementation will increase the annual power supply capacity of Jingdezhen region by 81.3GW.h, which will relieve the tension of power consumption for the power supply system in this region.

In addition, Research and observation data indicate that the impoundment of Wuxikou Reservoir will only affect the climate within 5-10km around the reservoir area to a limited degree. For example, smaller temperature differences between daytime and night, cooler summer and warmer winter, and a slight increase of annual average temperature by 0.3~0.5°C are expected after project implementation. However, all these changes are within the natural variation range. The total regional rainfall will not change significantly, but the spatial and temporal distribution will change slightly with a slight decrease in precipitation in the reservoir area. The rainfall within 5-20km along the reservoir bank is expected to increase. All the above changes are favorable for the growth of forests and economic crops near the reservoir.

The net GHG emissions from the proposed reservoir itself can be ignored. According to the analysis in the preliminary design, the installation of this 32MW hydropower generation facilities can replace a 35.2MW thermal power plant. Compared with equivalent thermal power plant, the proposed project can reduce the CO_2 emission by 89100t/a.

If the project is not implemented, according to the requirements of Jingdezhen Urban Development Master Plan, the following additional measures have to be taken on flood control, water supply and power supply to achieve the same objectives:

- Flood control – Take measures to improve the flood control standard of Jingdezhen urban embankment to the level of 50 years' return period ; however, the non-urban areas along Changjiang Riverwill remain unprotected from floods.

- Water supply - Based on the statistics of Changjiang Rivercollected every year, in the driest season, without the ability of runoff regulation, the runoff of Changjiang River can only reach 1.28m^3/s. However, it is expected that by the year of 2020, the water demand of Jingdezhen urban area will reach 6.44m^3/s. To secure the water supply of Jingdezhen urban area, new water supply source needs to be found. In this case, the only possible source is groundwater. That means about 450,000m^3/day of water supply will have to rely on groundwater as the second water supply source. The exploitation of so much groundwater will be technically difficult with unpredictable environmental destruction resulted.

- Power supply - To relieve the tension of power supply for the city, the electricity has to be purchased externally with the annual cost about 65million RMB.

Generally, based on the three main objectives of Wuxikou Hydro-complex Project, if the project is not implemented, the basic need of flood control, water supply and power supply for the urban area of Jingdezhen will not be satisfied in the short term. Therefore, the project is technically irreplaceable with significant environmental benefits. Its implementation is very necessary, which can dramatically promote the national economy development of the region.

5.2. DAM LOCATION

5.2.1. ALTERNATIVE ANALYSIS OF DAM LOCATIONS DURING FSR PREPARATION

During FSR preparation, two alternatives for the location of dam site have been compared in terms of topography, geology, hydrology, hydropower potential, project layout, construction conditions, inundation impacts and project investment. The upstream dam location is located upstream of Luoxi Village of Jiaotan Town; the downstream dam location is located about 0.6km upstream of Wuxikou Village and about 2.9km away from the upstream dam location (as shown in the figure below).

Figure 12: Upstream and Downstream Dam Locations Sites during FSR Preparation

Table 14: Comparison of Dam Locations during FSR Preparation

Element for Comparison	Upstream Dam Location	Downstream Dam Location
Topography and Geology	The river valley is wide with terrace developed on both banks. The mountain near the abutment is relatively thin with thick covering layer. The rock mass is weathered seriously with slaty cleavage developed and poor integrity. The elevation of utilizable bedrock surface is relatively low, and deep excavation is required; the aquifuge is deeply buried in relation to bedrock for dam foundation, therefore large amounts of seepage prevention works will be required for dam foundation and abutment.	The valley at the downstream dam location is narrower than that at the upstream location with thick mountains at the abutment; The bedrock for concrete dam on the river bed is relatively fresh, and the utilizable bed rock surface is at a high elevation, so the required excavation is shallow; the aquifuge is shallowly buried in relation to bedrock for dam foundation, therefore smaller amounts of seepage prevention works will be required for dam foundation and abutment.
Hydrology and Hydropower Potential	Maximum water head: 21.87m; Minimum water head: 9.72m; Installed capacity 30MW; Annual mean power generation: 80.81GW·h	Maximum water head: 21.95m; Minimum water head: 10.24m; Installed capacity 34MW; Annual mean power generation: 85.80GW·h
Project Layout	With wide river, dam has to be wide. The side of reservoir can be installed with earth dam, different options can be considered for main dam	With the narrow river, the dam is narrow. Limited options can be considered for main dam. There shall also be two auxiliary dams
Construction Conditions	4.0km of access road needs to be extended for the access of large equipments, and Jianxi Bridge needs to be reinforced. The road investment is 3.6million RMB less than that of downstream location; with the same project size, the BoQ of diversion works is slightly more than that of the downstream option.	5.0km of access road needs to be extended with 2km of new road. The access road is long with higher investment. Since the river is narrow at the dam location, with the same project size, the BoQ of diversion works is slightly less than that of the upstream option.
Reservoir Inundation Impacts	7900 mu of forest and 10902.9mu of farmland will be inundated with 10628 people to be resettled. The social and environmental impacts are lower.	8555.6mu of forest and 12384.8mu of farmland will be inundated with 11820 people to be resettled. The social and environmental impacts are higer.
Total Static Investment (million RMB)	2658.99	2753.17

According to the above comparison, Alternative 2 excels Alternative 1 in terms of excavation depth and required quantities of seepage prevention works. Also Alternative 2 is expected with higher installaed capacity (by 4MW) and higher annual power generation (by about 5GWh). However, Alternative 1 will significantly decrease the environmental and social impacts resulting from reservoir inundation, and its total investment is 94.18milllion RMB lower than that of Alternative 2. The traffic conditions for the implementation of Altermative 1 are also better than those of Alternative 2 with less works of access roads required. Generally speak, Alternative 1 is more cost-effective considering the project cost and resulting impacts. Therefore, the upstream location was recommended as the preferred alternative in the project FSR..

5.2.2. ALTERNATIVE ANALYSIS OF DAM AXIS DURING PRELIMINARY DESIGN STAGE

Based on the results of alternative analysis for dam location during FSR preparation and the comments from the Ministry Of Water Resources, based on the dam location identified in the FSR, two alternatives for dam axis (upstream and downstream) have been analyzed in terms of geologic conditions, general layout of hydro-complex, construction conditions, inundation impacts, land use, project investment and environmental impacts. Among others, the downstream dam axis option is

the dam axis identified for the upstream dam location in the FSR. The distance between the two optional dam axises is about 200m.

Figure 13: Locations of Upstream and Downstream Dam Axis Identified during Preliminary Design

The comparison results are as detailed follows:

Table 15: Analysis of Dam Axis Locations at Preliminary Design Stage

Element for Comparison	Upstream Dam Axis	Downstream Dam Axis
Tophographic Conditions	The topographic conditions could meet the requirements of dam construction. The width of the valley at the elevation of 56m is about 470m and the length of dam axis is relatively short.	The topographic conditions could meet the requirements of dam construction. The width of the valley at the elevation of 56m is about 500m and the length of dam axis is relatively long.
Geological Conditions	The geological structure is simple, and there is no geological constraint for project construction. The excavation depth at the dam foundation is smaller than that of the downstream option. The thickness of relatively pervious layer is generally smaller than that of downstream option. There is risk of seepage around the dam on the left and right abutment. The geological conditions are better.	The geological structure is simple, and there is no geological constraint for project construction. The depth of utilizable strata at the dam foundation is bigger than that of the upstream option. There is risk of seepage around the dam on the left abutment.

Element for Comparison	Upstream Dam Axis	Downstream Dam Axis
Hydrology and Hydropower Potential	Their hydropower potentials are same, with the annual average power generation of 81.21GW.h	
General Project Layout	The general layout of the complex is centralized using concrete gravity dam and riverbed type power house. Earth rock dam for the left bank, and the dam axis is in fold line.	The general layout of the complex is centralized using concrete gravity dam and riverbed type power house. Earth rock dam for the left bank, and the dam axis is in straight line.
Environmental Impacts	Relatively far away from Luoxi village. Concrete dam for both banks with less environmental impactof borrow areas during construction.	Earth rock dam on both banks, and Luoxi Village is right downstream. During construction, the project impacts on the villagers are greater than those of upstream option. A larger scope is environmentally affected by borrow areas during construction.
Operation management	No evident difference	
Construction Conditions	The access road passes through the downstream dam axis, 200m upstream. Open channel diversion is used.	The access road is 210m shorter than that of upstream option. Open channel diversion is used.
Reservoir inundation impacts and land acquisition	The inundation impacts of upstream option is lower than that of downstream option by 30.10mu woodland and 45.93mu. There is a difference of 3.18million yuan for inundation compensation. For land acquisition, the upstream option will acquire 32.27mu additional farmland, but its acquisiton of woodland will be 35mu less, which make the total investment of land acquistion decrease by 8.87million yuan.	
Difference of Total Investment	The total investment of Alternative 2 is 30.38 million yuan higher than that of Alternative 1.	

The comparison shows that the upstream option is preferred in terms of project layout, inundation impacts, project investment and environmental impacts, so it is recommended as the location of dam site for Wuxikou Hydro-complex Project.

5.3. NORMAL WATER LEVEL

The reservoir inundation and the resulting resettlement is the critical environmental issue for reservoir project, and the inundation loss is closely related to the project capacity, i.e. the normal water level of the reservoir. Therefore, the anlternative analysis of normal water level is key for the alternative analysis of Wuxikou Hydro-complex Project. During the preparation of project proposal, four options of normal water level have been compared, respectively 70m, 66m, 60m and 55m, and the option of 60m is recommended. Then according to the comments of DRC on the approval of project proposal which requires to « lower normal water level, reduce the inundation loss and decrease the proposed capacity », five options of normal water level, respectively 54m, 55m, 56m, 58m and 60m were further analyzed for technical and economic performance during FSR phase, from which the option of 56m is preferred. Based on the findings of FSR, three options of 55m, 56m and 57m are compared in details, as shown below.

Table 16: Alternative Analysis of Normal Water Level for Wuxikou Reservoir (Preliminary Design Phase)

Item	Unit	Result of comparison			Conclusions of comparison
Normal water level	m	55.0	56.0	57.0	/
Flood control level	m	50.0	50.0	50.0	/
Dead water level	m	44.0	45.0	46.0	/
Flood control capacity	10^8m^3	2.964	2.964	2.964	Same flood control capacity
Regulating capacity	10^8m^3	1.200	1.330	1.490	The regulating capacity and regulated flow increase successively, which is helpful for ensuring the water supply of downstream Jingdezhen City; but all of the three options could meet the water demand for industry, agriculture and residents in the short and long term.
Regulated flow （P=90%）	m^3/s	16.89	18.09	19.02	
Regulated flow （P=95%）	m^3/s	15.95	16.45	17.32	
Installed capacity	MW	31	32	33	The installed capacity and power generation increase successively.
Annual average power generation	10^4kW.h	7868	8121	8364	
Population resettled	/	9668	9680	9899	The population resettled, flooded farmland and inundation compensation increase successively, and the associated environmental social impacts increase too.
Flooded farmland	mu	11702	11822	12796	
Inundation compensation	million yuan	2307.72	2319.43	2415.96	
Investment of hydro-complex project	million yuan	749.95	749.95	749.95	Same investment
Total investment	million yuan	3057.67	3069.38	3165.91	Total investment increases with the increase of population resettled and flooded farmland.
EIRR	%	8.8	8.81	8.68	Option 2 has the highest EIRR.
EIRR Difference	%	11.65		-0.86	By comparing the options pairwise, the EIRR difference turns from positive to negative, which indicates that Option 2 will generate the optimal economic benefits.

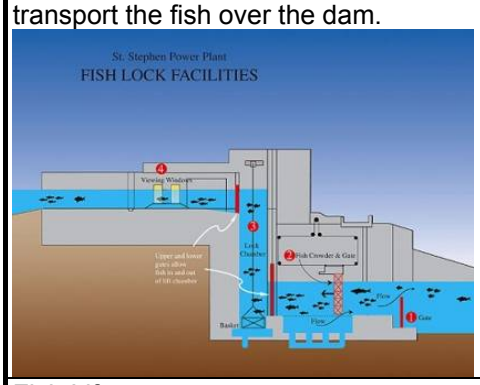
As shown above, the three options have equivalent benefits in terms of flood control and water supply ; however, the investment of Wuxikou Hydro-complex Project is mainly decided by the reservoir inundation compensation; therefore, the alternative analysis of normal water level for the project comes down to the balance between power generation and reservoir inundation. The EIRRs of all the options are over 8%, the social discount rate, which means all the options are economically feasible. However, in view of EIRR difference, the differences between Option 1 & 2 and Option 2 & 3 are respectively 11.65% and 0.86%. The switch from Option 1 to Option 2 is favorable with the EIRR difference above 8%, which means Option 2 is economically favorable ; however, the EIRR difference from Option 2 to Option 3 is negative, which means such switch is economically disadvantageous. The results of economic evaluation indicators show that the option of 56m is

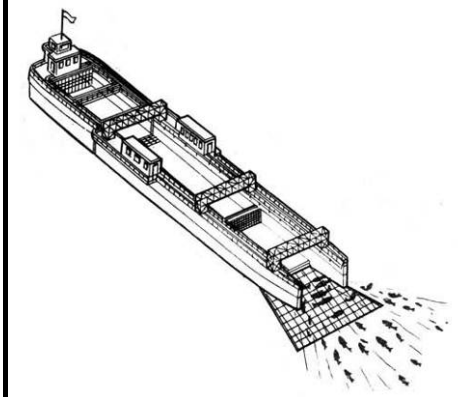
optimal. At the same time, according to the indicators of population resettled and flooded farmland, the impacts of Option 2 is moderate between Option 1 and Option 3. In conclusion, based on the actual conditions of Wuxikou Reservoir, the selection of normal water level should try to minimize the land inundation and resettlement when satisfying the needs of flood control, water supply and power supply. With the analysis of technical and ecnomic indicators, the option of 56m is further confirmed as the preferred option.

5.4. FISH PASS MEASURES

To reduce the impacts of proposed dam on habitat fragmentation and strengthen the exchange of biological resources between upstream and downstream, the fish pass measures should be taken to help the fishes pass the dam. The common fish pass measures widely applied internationally and in China nowadays include fishway, fish lock, fish lift, fish carrier and fish trapping and transportation. The characterization of the above fish pass measures is as follows.

Table 17: Analysis of Common Fish Pass Measures

Fish Pass Facility	Advantages	Disadvantages
Fishway Artificial watercourse for fish migration over the dam. 	Allow continuous fish pass without artificial interference, and the operation cost is low.	It could meet the fish pass requirements of this project; however, since the cascade development has be implemented upstream and downstream of the project, the habitat upstream and downstream has already been fragmented. There is little riparian habitat. If fishway is only applied to the Wuxikou, there will be insufficient source for fish-passing object to achieve the target and benefits.
Fish Lock Adopting similar principles and operation method as the ship lock to transport the fish over the dam. 	Adopting similar principles and operation method as the ship lock. The fish lock should adapt to certain variation of upstream water level. It is suitable for higher water head.	Impossible for continuous fish pass. The amount of fish pass is low. Since more electromechanical equipments are needed, the cost of operation and maintenance is relatively high. Since the cascade development has be implemented upstream and downstream of the project, the habitat upstream and downstream has already been fragmented. There is little riparian habitat. If fishway is only applied to the Wuxikou, there will be insufficient source for fish-passing object to achieve the target and benefits.
Fish Lift Fish pass machine using special lifting equipment for fish pass over the dam. 	Fish lift is suitable for fish pass over big dam, which can adapt to the big variation of water level in the reservoir. The fish pass capability is relatively high.	Poor continuity. Relatively high difficulty for construction and maintenance. Difficult to operate. The design of fish-trapping facility for fish lift is difficult with poor guarantee capability. At the same time, the fragmentation of habitat by cascade isolation also makes the source of fish pass object an important contraint. In terms of fish pass object, implementation difficulty and fish pass effects, the fish lift option is not suitable.

Fish Pass Facility	Advantages	Disadvantages
Fish Carrier Fish pass facility transporting fish school to pass the dam by boat. 	Flexible fish pass method, for a wide range of fish pass object, and not subject to the layout of main works, high operatability. Its fish pass effects are better than the above-mentioned options. Fish carrier could climb over several cascade and it is suitable for the fish protection in cascade development.	Requiring the river to have certain navigation capacity. There is no successful reference in China. The fish pass capacity, way of operation, frequency and period are also difficult to be determined.
Trapping and Transportation Organize professional fishmen to trap fishes downstream and use truck to send them to the reservoir and the river section upstream. 	The efficiency is generally high with relatively low investment. It is suitable for fish protection in cascade development with low fish production between different dams.	Operation year by year may lead to higher operation cost in the long run with high management requirements.

Considering the limited project impacts on local fishery resources based on the conclusions of existing envionmental impact assessment and cumulative impact assessment (as the appendix to this report), it is not economical to construct a permanent fish pass facility with high cost (internationally it costs 300,000-400,000$ or more) . The estimated operation cost of fish trapping and transportation is only about 16,000$ per year. That means the investment of a permanent fish pass facility is sufficient to afford over 20 years' fish trapping and transportation. On the other hand, for the protection and restoration of local fishery resources, the local fishery administration is experienced in implementing the fish release program with the practice in the last decade. From 2007 to 2010, totally 33million different kinds of carps have artificially released back into Changjiang River by Fuliang County Fishery Administration. Therefore, fish trapping and transportation has been proposed at current stage as the short-term mitigation measures for fish pass. The detailed plan is shown below.

Table 18: Design of Fish Pass Plan for Wuxikou Hydro-complex Project

Design of Method	Before implementatoin, the local professional fishery science reseach agency should be employed to develop the trapping and over-the-dam release implementation plan, and professional fishmen should be recruited for the trapping of fishes downstream under the guidance of fishery professionals. The fish will be then collectively transported to upstream of the dam and released in the reservoir and the upper reach in order to ensure the fish downstream of the dam can directly spawn and breed upstream for population exchange. The trapping will be implemented with small dragnets with manual operation to avoid any hurt to middle-size and large-size fish, especially the breeding ones. After trapping, the fish species will be identified and sorted. Then the fish will be transported with water with recording of trapping locations, species, quantities, transportation method and distance and locations of releasing throughout the process.
Target of Fish Pass	Mainly for the fishes accomodating to torrent and riparian habitat and spawning and breeding in riparian habitat, including Spinibarbus caldwelli, Spinibarbus sinensis, Gobiobotia filifer, Hemibarbus labeo, Hemibarbus maculatus, Acrossocheilus fasciatus, Plagiognathops microlepis, Cobitidae fishes, etc.
Implementation Agency	Local professional fishery science research agency
Supervision Agency	Agriculture Bureau of Fuliang County
Implementation Time and Frequency	Start from the first year after impoundment and implement for 10 consecutive years. According to the breeding time of main species for trapping, the implementation time is preferably in March~June. 1~2 times per year.
Location for Fish Trapping	Raohe River, entry point of Changjiang Riverinto Raohe River, and flowing river section upstream of Nianyushan
Locations of releasing	Main stream at tail area, tributary of Yangchun River in reservoir area, reservoir area of Zhangshukeng, Donghe River, Xihe River, Nanhe River.
Amount of Trapping	0.5-1.0t/year

Since 1981 (Ward et al., 1997), the USACE has been collecting juvenile salmonids and barging or trucking them downstream on the middle Columbia River and on the lower Snake River. The experience has proved that the barging or trucking of downstream migrants is an important tool in fish passage and protection in this system (Williams et al., 2005). Return rates of transported migrant salmonids excel that of in-reservoir migrant salmonids in some years depending on in-system environmental conditions, especially water temperature and flow rates and feeding and predation conditions in the estuary and just offshore at the time the smolts are delivered and released below the most downstream dam as well as thedevelopmental, energetic, and other physiological condition of the fish (Williams et al., 2005).

However, it is noticed that the current studies are unable to provide sufficient justification for the preference of trapping and transportation option to other others under local aquatic habitat and ecological conditions. In this context, the Comprehensive Reservoir Management Plan (CRMP) and the second phase Cumulative Impact Assessment (CIA) have been proposed as part of the ESMP to be completed six months before reservoir impoundment. Based on the results of these two studies, the draft fish pass plan will be further improved. In the project design, the project owner has agreed to reserve space for the possible installation of permanent fish pass facilities. The possible incremental budget as a result has been considered in the contingency of current ESMP cost.

6. ENVIRONMENTAL DUE DILIGENCE OF URBAN EMBANKMENT PROJECT

6.1. PROJECT OVERVIEW

6.1.1. PROJECT BACKGROUND

Jingdezhen city is not only a cultural city with a long history, but also an emerging industrial city. The city is located at the hilly land downstream of Changjiang River. Changjiang River and its tributary Nanhe River and Xihe River go through the urban area of the city. The general ground elevation is 24m to 31m, while the elevation along the river is lower. Historically the city has never been technically protected against floods, but only relies on the natural banklines as the barrier resisting floods. Therefore, the region frequently suffers from severe floods. Before 2000, there is hardly any flood control facility; the old flood control standard is lower than one in ten year level. Since the above reason, the urban area was flooded from Changjiang River in 1955, 1996, 1998 and 1999 with serious loss.

With economy development and urbanization of Jingdezhen City, the urban flood control problem gets more outstanding. According to the national flood control standard and development scale of Jingdezhen urban area, the flood control standard of Jingdezhen should be 1-in-50 years to 1-in-100 years. With the lack of flood control facilities in Jingdezhen, Raohe River Basin Development Plan developed in 1991 proposed a cascade development plan centered at Wuxikou controlled hydro-complex on the upper main stream of Changjiang River in order to improve the flood control capacity of Jingdezhen and provide a solution for other water conservancy issues. In Raohe Basin Development Plan, the controlled catchment area of Wuxikou reservoir is 2931km^2, accounting for 58.5% of the catchment area upstream of Dufengkeng station (located downstream of Jingdezhen urban area). In July 2007, NDRC approved FSR of Jiangxi Province Wuxikou Hydro-Complex Project based on review comments by the Ministry of Water Resource and the evaluation report developed by the National Investment Project Evaluation Center under the NDRC. According to the FSR, the normal water level of Wuxikou reservoir is 56.0m, flood control level is 50.0m, dead water level is 45.0m, and the total strorage capacity is 296 million m3. With off-peak regulation, the flood control standard of Jingdezhen urban area could be improved to 1-in-20-years, however, it still cannot satisfy the overall urban flood control requirements for Jingdezhen city.

Based on the urban development master plan of Jingdezhen, in December 1996 and May 1998 Jiangxi Water Resource Planning Design Institute developed the Jingdezhen Urban Flood control Development Plan and Jiangdezhen Flood Control Project Proposal, which defined the basic thought for flood control in Jingdezhen as « Combination of dyke (floodwall) and reservoirs, dyke (floodwall) before reservoirs, and step-by-step implementation» and proposed the zoning protection for urban area using different flood control standard based on drainage system. The report was approved by the Water Resource Department of Jiangxi Province and the experts from the flood control office of Jiangxi province. According to the comments in the document of GanShuiFangZi (1998) No. 024 by Jiangxi Water Resource Department as the reply to the application of flood control standard with the document of JingFuZi (1998) No.139 by Jingdezhen Government, it is agreed to construct Jingdezhen flood control system with return period of 20 years at the earlier stage. With the completion of Wuxikou reservoir, its flood control standard can be improved to the return period of 50 years by joint regulation with Wuxikou reservoir.

6.1.2. PROJECT IMPLEMENATION PROGRESS

From 2000, according to the urban development master plan of Jingdezhen, relevant authorities of Jingdezhen started to implement the urban embankment project according to the urban flood control requirements for Changjiang River at the level of 1-in-20-years. Based on the Preliminary Design Report of Urban Flood Control Project for Jingdezhen of Jiangxi Province Using Foreign Funds which was developed by Yangtze River Survey and Design Institute under Yangtze River Water Conservancy Committee, the 4 major drainage areas of Jingdezhe City will be protected by seven sections of floodwall. Central and eastern urban areas are protected by the dyke of Eastern city. The southwest area is protected by the dykes of Hexi, Guanzhuang and Guchengpan. The northwest area is protected by the dykes of Jigongshandi and Sanhedi. The power plant are is protected by the dyke of Qingtang. Since the thermal power plant has been relocated, according to the status of existing dykes and the flood control target of 1-in-20-years for the central urban area, 3 sections of these dykes have been officially included in the implementation plan, namely the dykes of Eastern City (15430m), Western city (2870m) and Sanhedi (1890m). The detailed plan is shown below.

Table 19: Flood control standard and flood control wall plan in Jingdezhen areas

Item	Name of Drainage Area	Flood control standard (Return Period)	Length of Floodwall	Location
		Year	m	
1	Eastern City	20	15430	Left bank of Changjiang River
2	Western City	20	2870	Right bank of Changjiang Riverand south bank of Xihe river
3	Sanhedi	20	1890	North bank of Xihe river
	Total		20190	

Nanhe dyke of Eastern city area was completed in 2001, and the other dyke projects are part of the urban flood control upgrading project, which are included in the One-River-Two-Bank Rehabilitation Project for Jingdezhen City as one of 36 key projects of Jingdezhen proposed in 2003. These dyke projects will be implemented together with roads, drainage pumping stations, rainfall and sewage network and greening works for both banks of Changjiang River within the urban area of Jingdezhen. This project was formally started in 2005. Up to now, totally 8.54km of Eastern city and Western city dykes have been completed, and another 2.53km of dyke in the Eastern city area will be completed in 2012. The detailed project progress is shown below:

Table 20: Progress of Jingdezhen Urban Flood Control Project

Condition	Drainage Area	Section of dyke	Year of Starting	Year of Completion	Length (km)	Investment (million)
Constructed	Eastern city	Nanhe	2000	2001	5.1	67
		Central ferry to Changjiang bridge	2005	2009	2.3	22.5
	Western city	Floating bridge to Zhushan bridge	2007	2010	1.14	27.55
	Subtotal				8.54	117.05
Under construction	Eastern city	Cidu bridge to Zhongdukou	2011	2012	1	25.5
		Changjiang bridge to Nanhekou	2011	2012	1.53	26.01

Condition	Drainage Area	Section of dyke	Year of Starting	Year of Completion	Length (km)	Investment (million)
	Subtotal				2.53	51.51
Proposed	Eastern city	Guanyinge to Cidu bridge	Tbd		1.37	23.29
		Huangnitou to Hutian bridge			4.13	76.71
	Western city	Magnetic material Co. to floating bridge			1.73	33.91
		Taojinling to Sanlvmiao (Sanhedi)			1.89	36.63
	Subtotal				9.12	170.54
Total					20.19	339.10

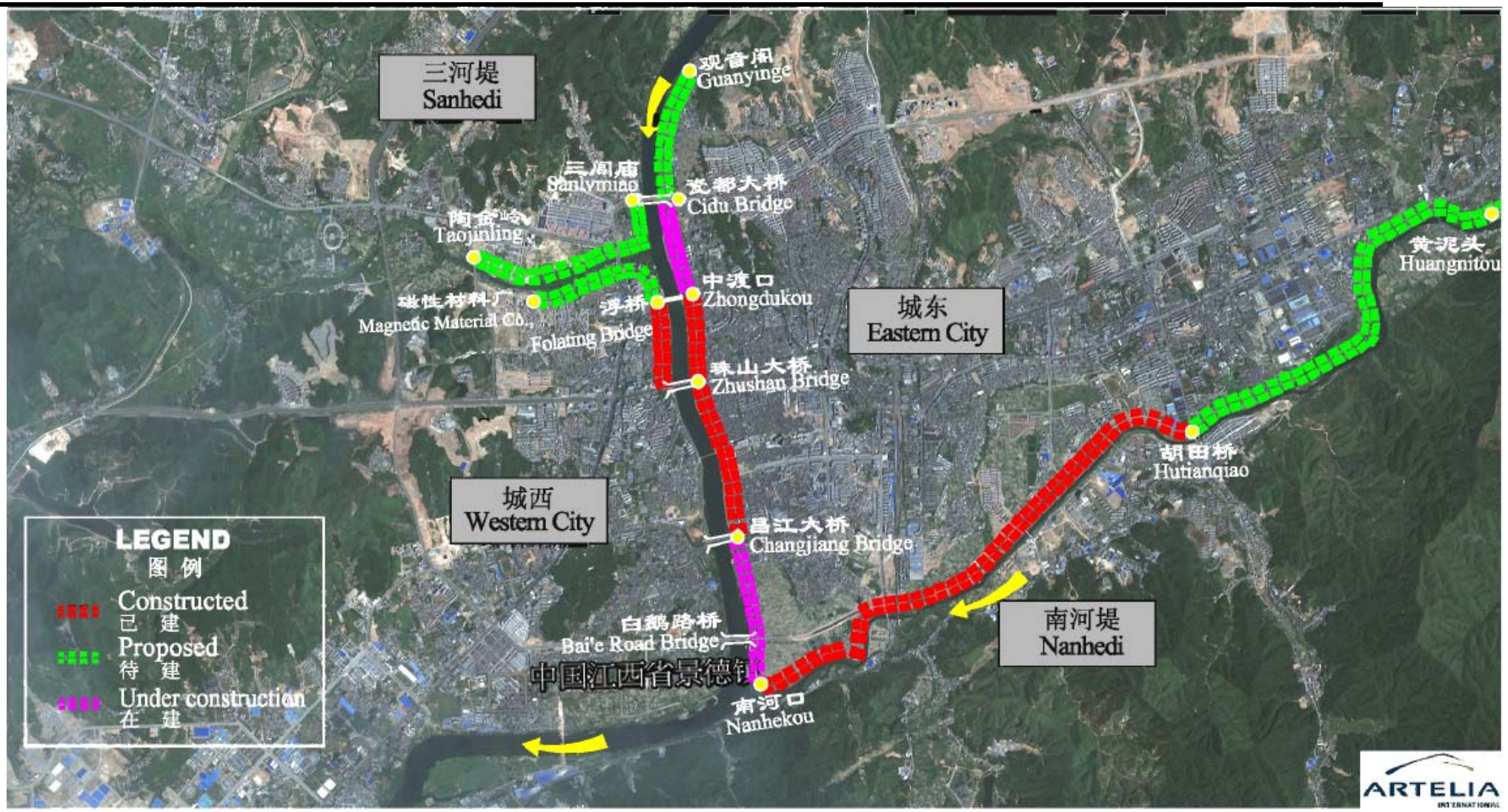


Figure 14: Progress of Jingdezhen Urban Flood Control Project

6.2. ENVIRONEMTNAL DUE DILIGENCE

6.2.1. OBJECTIVES AND METHODOLOGY OF DUE DILIGENCE

To supervise the implementation of environmental management for Jingdezhen flood control project and to make sure that the originally proposed environmental mitigation measures have been well implemented, Artelia Consultants have been entrusted by Jingdezhen Wuxikou Dydro-Complex Development Company to carry out environmental due diligence for the project.

The objectives of this due diligence is to generally review the environmental management of constructed and ongoing projects in order to: 1. evaluate if the project implementation meets national and local environmental laws and regulations; 2. evaluate the implementations of environmental mitigation measures defined in the original EIA report, and provide the recommendations for improvements.

The due diligence mainly adopted two kinds of methods by documents review and site investigation.

- Documents review: collect and review the documents relative to the project, includes:
    - Jingdezhen Urban Flood Control Development Plan Report (April, 1997)
    - Environmental Protection Preliminary Design for Jingdezhen Urban Flood Control Project (March, 2001)
    - Preliminary Design of Jingdezhen Urban Flood Control Project Utilizing Foreign Funds (May, 2002)
    - EIA Report of Jingdezhen One-River-Two-Bank Rehabilitation Project (March, 2004)
    - Approval of EIA Report of Jingdezhen One-River-Two-Bank Rehabilitation Project (April, 2004)
    - Some of the monthly supervision report for the dyke projects under construction as part of Jingdezhen Urban Flood Control Project (April, 2004)
- Site investigation: In March of 2012, the consultants visited the project management office of Jingdezhen Urban Flood Control Project, construction sites and constructed dyke sections. The site visit and direct communication with project supervisors helped the consultants to fully understand the progress of Jingdezhen urban flood control project and the implementation of relevant environmental management work.

The following contents have been covered by the due diligence:

- Review of main contents in the project environmental impact assessment report
- Verify the approval of project environmental impact assessment report
- Verify the implementation organization of project environmental management
- Investigate the implementation of project Environmental & Social Management Plan
- Make recommendations for the improvement of environmental management

In addition, as mentioned above, in the 9 dyke sections of Jingdezhen urban flood control project, 3 sections have been completed, respectively eastern city dyke (dyke section of Nanhe), eastern city dyke (dyke section from Zhonghedu to Changhe bridge) and western city dyke (dyke section from floating bridge to Changhe bridge). The eastern city dyke (dyke section from Cidu bridge to Zhongdukou) and eastern city dyke (dyke section from Changhe to Nanhekou) are under construction. The schedule of the other 4 sections, including eastern city dyke (dyke section from Guanyinge to Cidu bridge), eastern city dyke (dyke section from Huangnitou to Hutian bridge), western city dyke (dyke section from magnetic Material Co. to floating bridge) and Sanhedi (dyke section from Taojinling to Sanlvmiao), are not yet determined, they are. So the due diligence only focuses on the environmental management of constructed sections during operation and onging sections during construction.

6.2.2. IMPLEMENTATION ORGANIZATION FOR PROJECT ENVIRONMENTAL MANAGEMENT

During project implementation, the organizations related to environemtnal management and their main responsibilities include:

- Jingdezhen Municipal Government: responsible for leading, organizing and coordinating all the work related to project implementation, and implemente internal supervision and inspection.
- Office of Jingdezhen One-River-Two-Bank Project: responsible for project construction and responsible for the guidance, coordination and supervision of environmental management for the project before 2007.
- Jingdezhen River Embankment Administrastion : responsible for project construction and responsible for the guidance, coordination and supervision of environmental management for the project after 2007; responsible for the maintenance of constructed sections and the implementation of environmental management during operation period.
- Contrators: responsible for the extensive implementation of Environmental & Social Management Plan during construction.
- Construction supervisors: responsible for supervising the implementation of Environmental & Social Management Plan during construction.

The contractors and construction supervisors for constructed and ongoing sections are listed below.

Table 21: List of Contractors and Construction Supervisors for Constructed and and Ongoing Dyke Sections

No.	Name of Dyke Section	Contractor	Supervisor	Progressing
1	Eastern city dyke (Nanhe)	Sinohydro No.5 Bereau Co.	Shangrao Water Conservancy Supervision Co.	Constructed
2	Eastern city dyke (Zhongdukou to Changjiang bridge)	Gezhouba (Group) Corporation	Jiangxi Jianhong Supervision Co.	Constructed
3	Western city dyke (floating bridge to Zhushan bridge)	CRCC 16th Bereau	Jiangxi Water science institute Supervision Co.	Constructed
4	Eastern city dyke (Cidu bridge to Zhongdukou)	Gezhouba (Group) Corporation	Jiangxi Jianhong Supervision Co.	Under construction

No.	Name of Dyke Section	Contractor	Supervisor	Progressing
5	Eastern city dyke (Changhe bridge to Nanhekou)	Gezhouba (Group) Corporation	Jiangxi Jianhong Supervision Co.	Under construction

In March 2012, by visiting of the office of Jingdezhen urban flood control project and communicating with the officers, it is understood that there is at least one fulltime staff from both contractor and construction supervision company who is responsible for implementing and supervising the management of environmental safety. Also, all the above contractors and construction supervisors are very experienced in the construction and management of water conservancy projects with sufficient capability to fulfill their environmental management responsibilities.

6.2.3. LAWS AND REGULATIONS RELATED TO PROJECT ENVIRONMENTAL MANAGEMENT

The national and local laws and regulations related to the environmental management of this project are listed below:

- Environmental Protection Law of The People's Republic of China（1989.12.26）
- Law of the People's Republic of China on Water and Soil Conservation（1991.6.29）
- Land Administration Law of the People's Republic of China（1998.8.29）
- Law of the People's Republic of China on Prevention and Control of Pollution From Environmental Noise（1996.10.29）
- Water Pollution Prevention and Control Law of the People's Republic of China（1996.5.15）
- Law of the People's Republic of China on the Prevention and Control of Atmospheric Pollution（1995.12.29）
- Law of the People's Republic of China on the Prevention and Control of Environmental Pollution by Solid Wastes（1995.10.30）
- Law of the People's Republic of China on Appraising of Environment Impacts（2003.9.1）
- Regulations on the Administration of Construction Project Environmental Protection（No. 253 Order of the State Council of the People's Republic of China 1998.11.18）
- Jiangxi Province Construction Project Environmental Protection Regulations
- Technical Guideline of Environmental Impact Evaluation (HJ/T2.1~2.3-93, HJ/T2.4-1995, HJ/T19-1997, State Environmental Protection Administration)

6.2.4. EIA REPORT OF URBAN FLOOD CONTROL PROJECT AND ITS APPROVAL

As one of 36 key annual development projects in Jingdezhen, in 2003 Jingdezhen One-River-Two-Bank project started preparation. The project includes road reconstruction along both Changjiang Riverbanks, construction of urban dykes and drainage stations, reconstruction of water delivery pipe network and green landscape etc. Construction of urban dykes has the length 8.303km, including

6.158km of Eastern city dyke (Guanyinge water factory to Nanhekou) and 2.145km of Western city dyke (Magnetic materials Co. to highland near Shibadu).

According to Order No.253 of the state council Regulations on the Administration of Construction Project Environmental Protection and Measures for the Administration of Environmental Protection of Transport Construction Projects, following national laws and regulations, by authorization of Jingdezhen One-River-Two-Bank project office, Jingdezhen Institute of Environmental Science developed the environmental impact assessment report in March of 2004 which are based on carefully studing FSR, site visiting and investigation, collecting the extensive information. The report got the official approval from Jingdezhen Environmental Protection Bureau on 9/4/2004.

By conclusion of the report, One-River-Two-Bank project combines the design of flood control, relaxation, culture, tourism and traffic improvement, it will improve urban roads on both banks of Changjiang River, beautify the bank environment, meet the standard of urban flood control, low traffic pressure, improve land business value, improve people's living quality, it makes positive impact to environment and society, so governments of all levels and people of every estate support a lot. The potential negative impact of flood control project mainly happens during construction, including ecological impact, noising impact, air impact and society impact (see the following table for details). But if strictly following Three Same Time system that environmental protection facilities and main constructions are designed at the same time, constructed at the same time and brought to service at the same time, if ensuring the funds of environmental management, and if implementing the mitigation and suggestion in the report, the negative impact could be controlled. The investment for environmental management is 96.35 million yuan. With such investment, it is expected that local ecological environment may restore in 3 years with improvements.

Table 22: Main Environmental Impact and Environmental & Social Management Plan of Jingdezhen urban flood control sub-project of One-River-Two-Bank project

	Environmental element	Main impact	Mitigation	Implementing agency
Construction	Land acquisition and resettlement	Land acquisition and resettlementl of the project will involve Xijiao Cultivate and Breed field of Changjiang district and Zhushan district, Taibaiyuan, Shishibu, Xijiao which are under administration of city.	- Considering the current condition and society development, the migration shall be developmental. Combine centralization and decentralization, separate areas, resettle nearby. Keep well for removal and resettlement; - Calculation for compensation funds of land acquisition and resettlement, shall follow the relevant laws and regulations, and consider the local situation.	Project owner
	Ecology	- During construction of dykes, permanent and temporary land occupation will make negative impact to local plants. - Around the project, there are less animals and plants, Roads and dykes engineering makes no obvious impact to animals and plants.	- Forest land can't be used for soil excavation. - Prevent to excavate soil on cultivated land. If must, the surface soil shall be kept and recover when the project finishes. - Disposal of soil and rock can not damage farmlands and other facilities, can not block rivers. Location shall be selected carefully. - Greening design of One-River-Two-Bank project will implement simultaneously with construction. In design, it is preferentially considered to use local plants like arbor, shrub and grass. The target is to recover and compensate plants. The cost has been added to the total project investment.	Contractor

	Environmental element	Main impact	Mitigation	Implementing agency
	Soil erosion	Because of soil excavation, soil stacking and construction engineering, the old landform and plants will be damaged a lot. By action of rainfall and gravity, soil erosion could easily happen by human.	- Select adaptive positions along roads to plant trees in completion of subgrades. - If the current irrigation or drainage is damaged, repair or reconstruction by appropriate ways. - Take all necessary measures to prevent soil and rock to block rivers, water channels or current irrigation and drainage. - When constructing the permanent drainage, first construct temporary water channel or pipe for irrigation and drainage. - Take adaptive measures to prevent construction wastewater discharge to rivers and irrigation water channels. - At the edge of subgrades, dykes construction areas, soil excavation fields and spoil fields, some effective measures shall be set such as retaining wall and geotextile fence. - Try to prevent excavation soil in the rain season.	Contractor
	Noise	The noise during construction is mainly come from machines and vehicles. It makes certain impacts to the residential area nearby. According to Noise limit in Construction Field, the machinery noise will be limited within 40m (daytime) and 300m (nighttime).	- Strictly execute Industrial Company Noise Standard, to prevent workers to be harmed by noise. Workers near noise sources should put on earplugs and helmets. And working hours should be limited. - Fixed machines shall be located 300m far away from school and bigger residential area. If it is impossible to avoid, temporary measures shall be set for low noise, such as setting temporary noise blocks. - If the distance between construction field and residential area is less than 300m, high noise machines are forbidden to work in nighttime, and the contractor should try to stop working in nighttime. - Strengthen maintenance of machines and vehicles, keep them in low noise level.	Contractor
	Air	Based on the wind direction, batching, excavation of soil and rock, recovery dust will impact the sir quality within 100m to 500m on downwind direction. The transportation, loading and unloading of construction materials will make secondary dust to the air along roads.	- Take adaptive measures, including watering, to low the TSP density during construction, especially for the areas near residential areas. - Stacking fields of materials must be far away from residential areas. Setting cover or watering to prevent dust pollution. - Mixing equipment should be sealed well and set with dust removal device.	Contractor

	Environmental element	Main impact	Mitigation	Implementing agency
	Environmental monitoring	/	- Air: monitor TSP and asphalt smoke for next positions: batching plant, borrow area and spoil disposal site, other sensitive areas and residential areas around the construction roads. Monitoring frequency is 2 times per year. - Noised: monitor construction noise within 45m of big residential area or sensitive unit (school). Frequency is 2 times per year. - Water environment: monitor COD, pH, SS and petroleum at Guangyinge, Zhongdukou, 200m downstream of Zhushang bridge and 100m upstream of Bailu bridge.	Jingdezhen Environmental Monitoring Station (entrusted by project owner)
Operation	Economic and social benefits	The project will greatly improve the flood control and road facilities on both banks, promote sustainable economic development of Jingdezhen, advance the regional development of industry, agriculture, tourism, investment promotion, commerce circulation and other businesses.	Positive impact, do not need mitigation.	/
	Residents living quality	After project completed and put in use, the project area will be the administrative development center. Along the project area, a lot of relaxation, entertainment and tourism sources will be developed, followed with development of relevant sector and supporting facilities. The residents will get more job opportunities and have wide income source. The project make positive impact for improving living quality.	Positive impact, do not need mitigation.	/

Source: Environmental impact report of Jingdezhen One-River-Two-Bank Project

6.2.5. IMPLEMENTATION OF PROJECT ENVIRONMENTAL & SOCIAL MANAGEMENT PLAN

During site investigation, the consultant respectively visited constructed dyke sections and sections under construction, and discussed implementation of project Environmental & Social Management Plan with managers and supervisors of Jingdezhen urban flood control project office. The following is main conclusions for implementation of project Environmental & Social Management Plan:

- Constructed sections: according to the communications with the project construction company, there are no any environmental problems and complains during construction of constructed sections. The implementation complies with the national/local laws and regulations. The consultants visited the constructed section near Zhushan Bridge. According to the site conditions, with the dykes' completion, flood control and roads facilities along Changjiang Riverhave been greatly improved. Vegetation restoration

measures has implemented as per the project design, plants grow well. These areas turn to an ideal place for residential relaxation. The consultants also noticed that the completion of dyke landscape had also promoted the development along Changjiang river and improved living environment of local residents with expected social and environmental benefits achieved.

Figure 15: Current Situation of Constructed Section of Jingdezhen Flood Control Project (near Zhushan Bridge)

- Sections under construction: The consultants visited the construction site of Eastern City dyke (Cidu bridge to Zhongdukou), and made detailed discussion with officials of Jingdezhen urban flood control project office and construction supervisors. Up to now, there are no any environmental problems and complains during construction of the sections under construction. The implementation complies with the national/local laws and regulations. The following is the current implementation of project Environmental & Social Management Plan during construction:

    - Land acquisition and resettlement: 1. for sections under construction, the policy and procedure of compensation must comply with the policies of China, Jiangxi province and Jingdezhen Municipality; also comply with the involuntary resettlement policy of the World Bank. 2. The plan of Land acquisition and resettlement must be scientific and reasonable, meet resident's requirements, make resettlement working smoothly and meet project requirements. 3. Compensation shall be guaranteed, can be paid fully to affected people, payment shall be transparent and effective.

    - Ecological environment: during construction, plants along the river will have certain impacts. But if plant engineering design of One-River-Two-Bank can be implemented synchronously with the main project, and ensure the recovery as soon as possible, the ecological environment could be improved.

    - Soil erosion: based on the information from construction site and project office, soil erosion protection plan has been implemented very well during construction. Use measures of protection in subareas and retaining wall to effectively control soil erosion in construction site.

    - Air pollution: to low air pollution by engineering, the contractor shall reduce batching stations in construction field and organize periodic watering to control the dust pollution by construction and transportation. According to the situation of construction site, there is no obvious air pollution. In addition, the project is united with reconstruction project of the old city, residents nearby have been removed, so construction site is far away from sensitive positions.

    - Noise pollution: to low the noise pollution by engineering, during construction, the contractor shall reduce the working frequency of high noise machine, and try to stop working in night time.

    - Environmental monitoring: the project locates at Jingdezhen city, environmental monitoring will be implemented by environmental protection bureau with daily air and noise monitoring. By contractor's feedback, during construction, the local environmental protection bureau has carried out environmental monitoring for one time, without notices over limit. But it is the normal monitoring to Jingdezhen urban environment, so the project office doesn't get any monitoring result.

    - Completion acceptance of environmental protection: According to the contractor, although there are 3 dyke sections completed, as one part of Jingdezhen Flood Control Project, the local environmental protection bureau must implement completion acceptance when all section are completed.

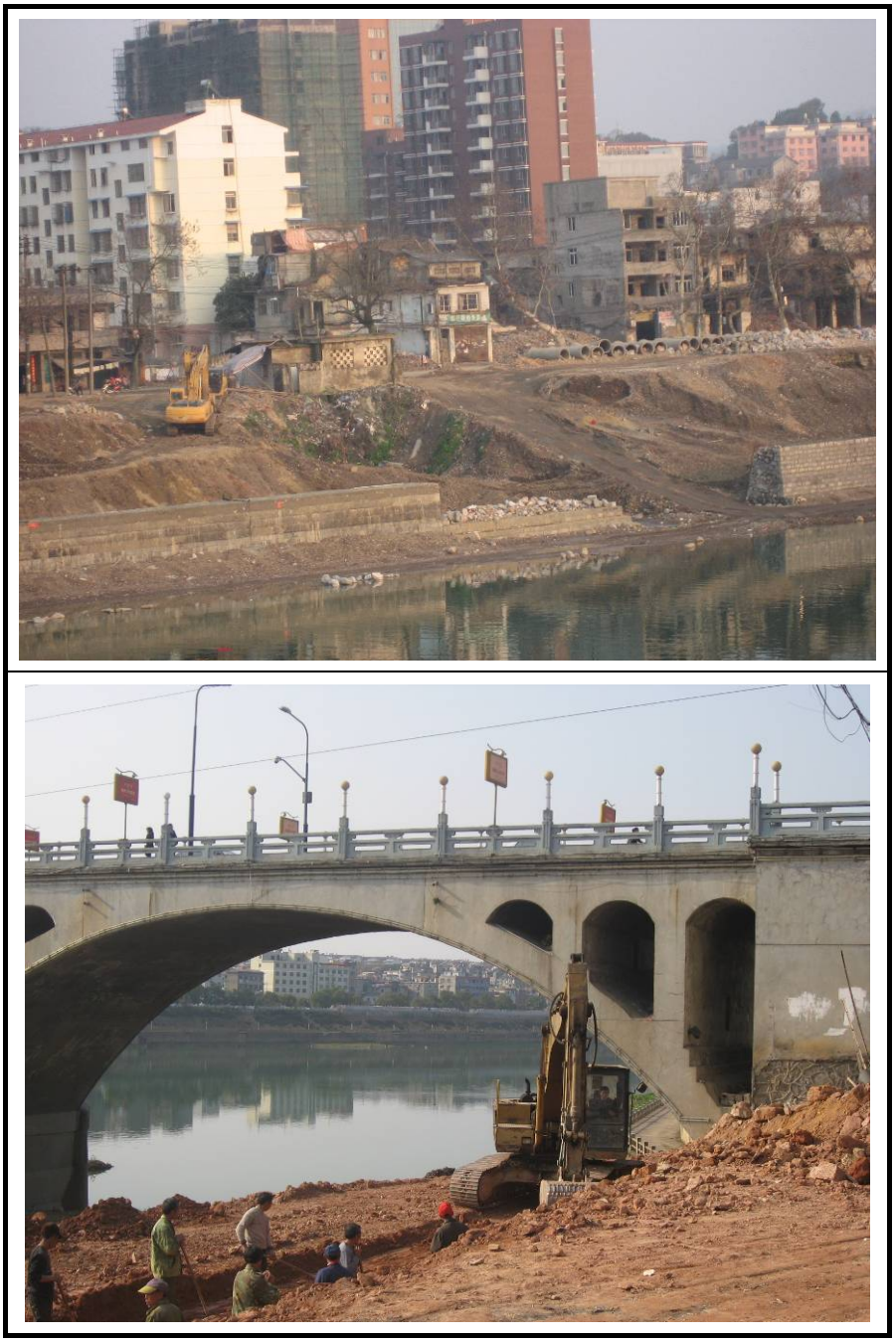


Figure 16: Construction Site of Eastern City Dyke (Cidu Bridge to Zhongdukou)

6.2.6. CONCLUSIONS AND RECOMMENDATIONS

According to the results of above investigation, the preparation and implementation of Jingdezhen Flood Control Project complies with the national/local laws and regulations. Also so far there is nothing we saw inconsistent with WB environmental safeguard policies. The contractor has rich experience on water conservancy project. During construction, mitigation measures have been implemented well to low the negative impact of soil erosion, ecology damage, air and noise pollution. The mitigation measures have got positive effect. Vegetation measures well implemented along the constructed dykes have greatly improved surrounding environment and living quality of local residents with expected social benefits achieved.

Based on the current achievements, the following recommendations have been proposed by the consultants to further improve project environmental management:

1） Further strengthen soil conservation work of construction sites by increasing watering and materials covering. Especially in the recent rain season, make sure to implement the mitigation measures against soil erosion in order to prevent negative impacts of soil erosion on industrial and agricultural production, flood control and river water quality.

2） Strengthen environmental management recording and archiving during construction, record the implementation of mitigation measures and other environmental problems identified during about project implementation in the monthly supervision reportfor future review.

3） The project office and the contractor shall gather the regular environmental monitoring results around construction site implemented by local EPB, which will help to understand environmental quality of construction site, and the mitigation measures can be strengthened accordingly if necessary.

7.CUMULATIVE IMPACT ASSESSMENT

To supplement the domestic EIA for the proposed Wuxikou Hydro-complex Project as part of the cascade development on the main stream of Changjiang River, a Cumulative Impact Assessment has been carried out during the preparation of supplementary environmental impact assessment in June 2012 in order to:

- Evaluate if the proposed project to be assisted by the Bank (irrespective of the source of financing of its components) will have an effect on a Valuable Ecological Component (VEC);
- If this effect acts cumulatively with that of other projects (either from the past, current time, or the future);
- If the effect of the Bank project, in combination with the other effects, may cause a significant change now or in the future in the characteristics of the VEC, after the application of mitigation measures.
- Identify appropriate actions for the Bank project to address its contribution to significant impacts.

The study has taken into consideration all pertinent environmental issues that have been raised in the original domestic EIA for Wuxikou hydro-complex project. Due to the tight schedule, the study has been predominantly implemented based on the review of currently available documents with the supplementary information from meetings, site visits and public consultation.

At this stage, the focus and priority of the study has been given to the cascade development of main stream in Jiangxi Province from the entry point of Changjiang River into Jiangxi Province to Yaogongdu in Poyang County, Jiangxi Province covering the stretch of 219.28km. Based on the available development plans of Jingdezhen Municipality, two temporal scenarios have been considered in the assessment, i.e., the short-term horizon targeting at the year of 2020 after the operation of Wuxikou Hydro-complex, and the long-term horizon to be ten years later, i.e. 2030 to be consistent with the urban development master plan of Jingdezhen.

By establishing environmental baseline and reviewing relevant sector development plans in the region, the environmental elements of water quality, hydraulic regime, aquatic ecology, and downstream water use have been identified as the key Valuable Ecological Components (VECs) of this study based on the matrix analysis. The development activities identified for the two scenarios are summarized as follows:

Name of Scenario	Short-term Scenario (2020)	Long-term Scenario (2030)
Development Activities	- Operation of existing cascade developments (Zhangshukeng, Nianyushan and Huanggang); - Completion of Wuxikou Reservoir together with related supporting project, functioning for flood control, power generation and water supply; - Completion of planned city dyke for the urban area of Jingdezhen; - Development of Wuxikou Reservoir as fry breeding base for Jingdezhen; - Licensed sand excavation within specified river section under the management of local water resource bureau.	- Installation of rubber dam at Jingdezhen to maintain the water surface for the landscaping of urban area; - Licensed sand excavation within specified river section under the management of local water resource bureau.

Generally speaking, with a long history of cascade development on the main stream of Changjiang River since 1980's, the environment and habitat of Changjiang River have already been significantly changed. The public consultation carried out during the study also shows that the local residents are already aware of the environmental deterioration of Changjiang River and the decrease of fishery resources in the River. However, it is generally believed that except the adverse effects on migratory fish from Poyang Lake, the cascade development of Changjiang River is not the main cause for the decrease of local fishery resources. The interviewed villagers all held positive attitude towards the construction of Wuxikou Hydro-complex Project considering the positive project impacts such as further reduction of flood risk, improvement of fish reproduction, promotion of economic development and consequent increase of residents' income.

Based on the desk study and public consultation carried out for the CIA study, four key VECs have been identified for this CIA study. Based on the available information, the analysis targeting at these key VECs indicates that no irreversible negative environmental impact will be resulted on the key VECs due to the implementation of Wuxikou Hydro-complex and other identified projects/activities in the river basin. The anticipated impacts for the four key VECs are summarized as follows:

- **Hydraulic regime:** Wuxikou reservoir will play a key role in the changes of hydraulic regime for Changjiang River. However, the reservoir operation will not change the inter-annual runoff distribution but to some extent equalize the natural streamflow process in a year. The proposed seasonal regulation of Wuxikou Hydro-complex will change the runoff distribution in a year for the lower reaches. The discharge flow in rainy season will decrease in comparison with natural conditions; however, in dry season, the discharge flow will increase with the reservoir regulation. Therefore, except in the rainy season from April to June, the runoff downstream of the dam will be stabilized. However, with the existing cascade development on the river, the impacts on hydraulic regime are only considered significant within the reservoir area, but not for the downstream sections.

- **Downstream water use:** Water use by the project will not affect the utilization of water resources within the study area, the downstream water use will be satisfied both the in the short-term and long-term scenarios, and the conditions of industrial and domestic

water use in the middle and lower reaches of Changjiang River will be significantly improved with the operation of Wuxikou Reservoir.

- **Water quality:** Based on currently good water quality and predictable development trends, the proposed Wuxikou hydro-complex project with other identified projects/activities in the Changjiang River Basin will not bring significant impacts in terms of water quality. However, more specific water quality modeling based on more solid survey data needs to be carried out to verify current conclusion.

- **Aquatic ecology:** After reservoir impoundment, the new habitat conditions and higher nutrient contents in the reservoir area will be positive for the growth of aquatic life suitable for tranquil habitat, and the deeper water areas upstream of each cascade development will become good wintering grounds for fishes. Accordingly, the species and quantities of water fowls may significantly increase, in particular, around the reservoir. On the other hand, the major negative impacts on local fishery resources are the impacts on the some fish species required short-distance migration for reproduction such as spinibarbus sinensis, spinibarbus hollandi and xenocypris microlepis and potential impacts on the fishes downstream of Wuxikou dam due to the fluctuation of its downstream discharge.

To minimize the above-mentioned negative impacts, the following mitigation measures have been proposed and integrated in the project ESMP. During the implementation of these mitigation measures, cooperative actions will be required from different organizations/authorities including the project developer and operator, Jingdezhen EPB, Jingdezhen Water Resource Bureau, local fishery administration and local governments.

1. **Control of water quality with pollution control measures:** Closely supervise the implementation of local pollution control plans and the strict enforcement of relevant applicable environmental protection laws and regulations.

2. Protection of **aquatic ecology** by:

    - Joint Operation of Cascade Development Facilities: Joint operation shall be implemented for all the relevant cascade development facilities on Changjiang River (in particular, Wuxikou and Zhangshukeng) to main necessary flow to meet the water supply demand and ecological demand downstream.

    - Habitat Protection: The development activities with negative impacts on aquatic habitat such as sand excavation, wastewater discharge and solid waste dumping should be strictly banned in the river basin; with the operation of Wuxikou Reservoir, the approval of any new water conservancy project should be strictly controlled and no construction of new dam will be allowed.

    - Artificial Fish Pass: Regularly organize local fishermen to catch fish from downstream of Wuxikou dam, and transport the caught fish to Wuxikou reservoir or the river section upstream.

    - Fishery Administration: Strengthen the local fishery administration from the following aspects:
        1) Implement the fishing ban issued by the local government (JingFuFa[2009]No.25);
        2) Cage fish farming and other potentially polluting industries will be forbidden around the reservoir;
        3) Carry out fishery development study for Wuxikou reservoir;
        4) Implement career transfer and compensation for affected fishermen in the reservoir area in accordance with RAP and social impact assessment;

- Artificial Multiplication of Fish: Establish a fish multiplication and release station in Luoxi Village on the right bank downstream of Wuxikou dam, which will be constructed together with Wuxikou Hydro-complex.

- Strengthen the local fishery administration through capacity building.

3. Long-term monitoring of key VECs in the river basin: The water quality of Changjiang River at different sections and aquatic life in the reservoir area and the river section downstream should be monitored in the long term, as part of the project monitoring plan.

In addition to the above mitigation measures, since the assessment at this stage was mainly carried out based on the review of collected secondary information, it is necessary to carry out further investigation and study for better evaluating and quantifying the significance of impacts particularly on water quality and local ecology specific to the proposed cascade development in Changjiang River Basin. Before the further CIA study, a detailed and technically supported **Comprehensive Reservoir Management Plan (CRMP)** will be necessary to provide necessary information on the overall management of proposed Wuxikou Reservoir. A detailed and technically supported Comprehensive Reservoir Management Plan (CRMP) is recommended to identify issues related to future monitoring and adaptive management. The study should be completed during dam construction period in 2~3 years. The study outcome should be reviewed and approved prior to reservoir inundation, and the draft Terms of Reference for the CRMP study is integrated in the report.

Combined with the key findings of CRMP study, the **Phase 2 CIA study** will be further carried out so that the impact analysis can be further quantified and more specific mitigation measures can be included in the project implementation. The proposed draft Terms of Reference for the Phase 2 CIA study has been developed and included in the report.

Considering the results of the above-mentioned studies and the long-term following-up environmental and social monitoring, it is recognized that the proposed ESMP may need future adjustments. An **adaptive management** approach will therefore be adopted for environmental and social management components. Safeguards will be managed in a flexible manner in order to fully reach the objective of meeting the requirements for management of: fish and fisheries in the reservoir and downstream; water releases and environmental flows; increased erosion downstream; water quality in the reservoir and downstream; health impacts; and resettlement and livelihood development. Adaptive management is expected to be important in at least four areas, respectively 1) response to updates in the legal framework; 2) actual circumstances on the ground; 3) budget; and 4) schedule. Adaptation will only take place if the outcome of this adaptation is conducive to better achievement of the project objectives and principles.

Finally, for better fulfillment of the roles for all the involved authorities, necessary capacity building program should be developed based on the key findings of Phase 2 CIA study. All the staffs of project operator and relevant officials in the involved authorities should be covered by the program to give them a better understanding of the CIA study and their critical responsibilities in the environmental management for the proposed cascade development

A separate CIA report has been developed for the project (see the appendix), the conclusions and recommendations of the project CIA will be considered part of the project EIA, and relevant findings have been included in the project ESMP.

8.FORESTRY

The inundation area, the relocation of ~20km railway, the construction sites, the construction of resettlement sites and the construction of power transmission line will affect some secondary and regenerated forest. The compensation measures proposed in the ESMP. The identified project impacts on local forestry are summarized in the table below.

Table 23: Forestland Affected by Jiangxi Wuxikou Integrated Flood Management Project

No.	Type of Area	Timber Forest (mu)	Economic Forest (m)	Shrubbery (m)
1	Hydro-complex construction area	130.0		379.6
2	Reservoir area	3991.6	18.3	2541.6
3	Rural resettlement sites	584.5	95.6	111.0
4	Relocation of Zhitan Township	275.0	/	/
5	Rehabitation of inundated special facilities	1371.7	8.9	428.2
Total		6352.8	122.8	3460.3

According to 2011 statistics data, the total area of forestland in Fuliang County is 3.13million mu, which means the affected forests only account for about 0.2% in the total amount.

In addition, since the project area has already been significantly affected by human activities, the affected vegetation mainly consists of shrubs, bamboo forest and economic forest of low ecological value. The project-affected area is currently mainly villages, farmland, shrubs and woodland with relatively low biodiversity value. In the hills between the elevation of 60m and 1000m above the reservoir storage level (above 50m) there mainly distribute pines and firs which are common in the tropical monsoon climatic zone.

For the re-routing of Anhui-Jiangxi Railway, it is expected that the project implementation will lead to the occupation of 68.31ha non-commercial broad-leaved woodland for water conservation. The investigation shows that there is no precious and rare vegetation in the project-affected area, so the project construction will not affect the flora-diversity in the region, and the occupied non-commercial woodland only accounts for about 0.09% in the total area of non-commercial forestland in Fuliang County.

Therefore, generally speaking, the project impacts on local forestry resources are considered as insignificant. The mitigation measures have been included in the project ESMP to minimize the resulting impacts.

9.PEST MANAGEMENT

9.1. PROJECT ACTIVITIES INVOLVING PEST MANAGEMENT

Although no project fund will be used to procure pesticide, during project implementation, the following activities will be relevant to pest management or use of pesticide:

1) Sanitary clean-up of construction sites: Use of pesticide to kill mosquitoes and flies in order to prevent the spreading of infectious diseases and to cut off their transmission routes;

2) Deratization in the resettlement areas by using rodenticide;

3) Livelihood restoration plan for resettlers in rural areas with the cultivation of radix pseudostellariae (276.5 mu) and economic camellia oleifera (1671.9 mu); and

4) Vegetation restoration.

For 1) and 2), less toxic pesticide/rodenticide will be carefully selected under the project and applied in a way that minimizes adverse effects on beneficial organisms, human beings and the biophysical environment. The storage and use of selected pesticide/rodenticide will be considered as hazardous waste covered by the Hazardous Materials & Waste Management Plan under the ESMP; for 4), attention will be paid not to select the single or exotic invasive tree species in order to minimize the risk of tree diseases and insect pest.

For 3), the project will put strong emphasis on mitigating any adverse effect of increased agro-chemical use by introducing more efficient application techniques to farmers. The project will support Integrated Pest Management (IPM), including:

- Managing pests (keeping them below economically damaging levels) rather than seeking to eradicate them;

- Relying, to the extent possible, on non chemical measures to keep pest populations low; and also

- Selecting pesticides (when they have to be used) that are less toxic, and applying them in a way that minimizes adverse effects on beneficial organisms, human beings, and the biophysical environment

As a result, there is a need for preparation of a Pest Management Plan, in particular, for the planned cultivation of Radix Pseudostellariae and Camellia oleifera as part of the livelihood restoration plan under the project.

The JWIFMP Pest Management Plan (PMP, as Appendix 7 in the ESMP) will promote the use of biological and environmental control methods for pests and diseases, which will reduce the reliance on synthetic chemical pesticides. The Jingdezhen Plant Protection and Quarantine Station (JPPQS) and its county subsidiaries already promote IPM approaches to the control of pests and diseases in Jingdezhen Municipality.

9.2. CURRENT PEST MANAGEMENT APPROACH IN JIANGXI

Studies conducted during project preparation indicated that the following issues on the current pest management approaches used in the project area:

- Still largely depend on chemical control methods, especially for camellia oleifera
- Use of high toxicity chemicals (Class I, WHO), such as dimethoate and dichlorvos
- Over application of pesticides. There was study showing that with pesticide application, residue of organochlorine pesticide has been found in the harvested radix pseudostellariae.
- Inappropriate handling and management of pesticides and other agricultural chemicals
- Environmentally unsound disposal of chemicals and chemical packaging
- Inadequate enforcement of laws and regulations on labeling and sales of agricultural chemicals
- Low level of awareness amongst farmers, extension services and chemical resellers of IPM.
- Poor sense of safe use of pesticides.

9.3. GENERAL APPROACH OF JWIFMP PEST MANAGEMENT PLAN

9.3.1. OBJECTIVES

In addressing the issues listed in Section 2.3, the JWIFMP Pest Management Plan will aim to:

- Using pesticides of low-toxicity and environment-sound features;
- Reducing the accessibility of farmers to agricultural chemicals with low quality or poor labeling practice;
- Pushing forward the safe use and management of agricultural chemicals;
- Accelerating the awareness, recognition and application of IPM;
- Reducing environmental pollution due to improper use of pesticides; and
- Reducing the health risks due to the application and management of pesticides.

9.3.2. FOCUS AREAS OF JWIFMP PEST MANAGEMENT PLAN

The focus areas for JWIFMP Pest Management Plan will be:

- On farm – develop with farmers approaches relevant to their farm
- Chemical resellers – training and monitoring to ensure that all pesticides sold meet labeling laws requirements, are approved products (Class II and below), and that IPM approaches are promoted to farmers

On Farm: IPM approaches will be incorporated into the training of project-supported extension staff who will be responsible for training the farmers. Many extension staff are also involved in the reselling of agricultural chemicals through input supply shops managed by township and county extension stations. Field demonstrations using established IPM approaches (farmer schools) will be conducted in all farms for livelihood restoration with the cultivation of radix pseudostellariae (276.5 mu) and camellia oleifera (1671.9 mu) under the project.

Awareness Improvement and Capacity Building: Chemical resellers will be provided with training in chemical use and handling by both extension staff (many of whom are involved in chemical reselling), and approved distributors and manufacturers.

9.3.3. INTEGRATED PEST MANAGEMENT

The overall goals of pest management under JWIFMP are (i) the insect pests are controlled and (ii) the use of chemical pesticides is reduced. The objectives will include:

- To reduce the loss due to insect pests (less than 5%).
- Te reduce the use of chemical pesticides by more than 10% in 3~5 years.
- To eliminate intoxication accident due to improper storage of pesticides or improper management of the packing materials.
- To forbid the use of virulent pesticides (WTO Class-1) and to avoid the incident of the related diseases such as cancer.
- To keep the pesticide residue in agricultural product below the thresholds designated by WHO and national authorities.

Accordingly, the following principles have been established:

1) To strength the monitoring and forecast of pests and diseases;
2) To apply suitable measures of pest control, especially farming, physical and biological measures; and
3) To minimize the use and dosage of chemical pesticides.

The IPM will cover the above-mentioned physical, agricultural, biological and chemical measures and also the strengthening of monitoring and forecast activities, as summarized below.

1) Pest Management by Agricultural Practices

- To cultivate disease resistance varieties. This is an effective measure to reduce the use and dosage of chemical pesticides;
- To cultivate crops at proper time in a season;
- To improve cropping patterns (including deep ploughing to bury plant garbage, rotational cultivation, timely seeding) to depress pest population;
- To upgrade the health of plantlets. Seeds are selected and poor plantlets are discarded to avoid pest infection;
- To keep farmland health by removing infected crop residues;

- After harvest, the rain-fed farmland should not be deep ploughed to avoid pest over-wintering in soils. The suitable ploughing depth is 26~33 cm; and
- Soil fertility should be built by means of rich basal manure and proper application of chemical fertilizers. More Ca fertilizer but less N and P fertilizers is helpful for upgrading the resistance to insect pests. The crops should be timely irrigated. Advanced irrigation such as drip irrigation can effectively reduce the disease inter-infection among the crops.

2) Pest Management by Physical Measures

- Yellow boards can be used to trap aphids;
- Light trapping can also be used.

3) Pest Management by Biological Measures

- The use of biological pesticides such as nicotine;
- The use of natural enemies such as chilocorus rubidus and rodolia limbata.

4) Pest Management by Chemical Measures

Proper use of pesticides under the combination of other measures is an effective and cost-efficient approach to higher effectiveness and good harvest. The pesticides of high quality should be featured with high efficiency, low toxicity and safety to human beings, animals and crops. The principles of pesticide management include:

- It is forbidden to use virulent and high-pesistant pesticides;
- Specified pesticide is used to control specified pests;
- Pesticide is sprayed only when the damage is up to the threshold;
- Pesticide is sprayed at proper dosage;
- Pesticide is replaced by environment-sound measures if applicable; and
- Standard for the Safe Use of Pesticides (GB 4285-89) should be highly respected.

5) Monitoring and Forecast

The monitoring and forecast of pests and diseases will be strengthened. 7~10 days before action, the plant protection stations at county level should provide the farmers with information of pest control (including the techniques, suitable time and precautions). At the same time, the above stations should also give timely notices to the plant protection station and institutions in the neighboring counties for joint action and better effects.

6) Principles in Selecting Pesticides for JWIFMP

In the pest management under the frame of the project implementation, it is necessary to combine the application of pesticides with agricultural measures, physical measures and biological measures. The use of pesticides must be abided by the principles of cost efficiency, safety and effectiveness. The Project Management Office will cooperate with the plant protection stations and institutions to work out a list of efficient low-toxicity pesticides.

9.4. CAPACITY BUILDING FOR PEST MANAGEMENT UNDER JWIFMP

In the local context, the information compaign will be carried out to upgrade the awareness of policy implementation, to reinforce the construction of plant protection facillities at grass-root levels, to intensify the management of the sales and use of pesticides through strengthening the constrution of plant protection infrastructure, and to provide technical training and personnel resource development for local technician and farmers.

9.5. MONITORING AND EVALUATION OF PEST MANAGEMENT IN JWIFMP

The monitoring will be conducted by Fuliang Agricultural Technology Extension and Service Center under the cooperation between the project offices and the project owner. Once incident of insect pests is observed, it should be timely reported and timely action is also required. Project office will be responsible to make sure that regular monitoring and management will be conducted. In the peak period of insect pest incident, Fuliang Agricultural Technology Extension and Service Center will be responsible for monitoring the pest control according to the pest management plan under the framework of the Project. All levels of local agricultural technology extension and service centers will be responsible to guide, supervise, monitor and train the integrated pest management in Fuliang County.The project office together with the stakeholders will be responsible to monitor and timely report the pest incident and take corresponding actions according to the IPM plan.

9.6. BUDGET

Pest management should be integrated into the daily management of the project offices. The budget thus required should be included in the overall budget of Fuliang Agricultural Technology Extension and Service Center in the budget lines of pesticide reasonable use, forecast and monitoring, training, information publicity and management expenditures.

10.PROJECT IMPACTS ON LOCAL PCRS AND MITIGATION MEASURES

Through field survey, as well as the overall deep analysis on the project impact with the site visit for Fuliang Country Cultural Relics Bureau, it is confirmed that, in the material and cultural resources aspect, a country level cultural relic (Worker, Farmer and Soldiers Congress of 8 Counties), 3 ancient buildings (ancestral hall), a private church, a number of old and valuable trees and 4477 graves, will be inundated with the implementation of Wuxikou Hydro-complex Project, shown as follows. According to the relevant requirements of the material and cultural resources of the Bank's security policy (OP4.11), June 9, 2012, the environmental consultants and Mr. Wu Fengchen[8] who is an specifically employed local expert for the project and has been long engaged in the study of local history and culture, visited the project heritage ancient status quo may be affected in the region, and proposed measures to deal with. See the following sections.

[8] WU Fengchen, born in August 1944, comes from JiangXi Fuliang Country, associate research fellow, has been long engaged in the study of local history and culture, as well as to participate in the compilation of "Fuliang Education Study", "Fuliang Annals". His representive works include "Tea Treasures of Fuliang County", "Fuliang Folk Custom", "Millennium County Yamun", "Acient Road's History in Fuliang" etc. He is now Vice President of Fuliang County Senior Scientists and Technicians Association, the Deputy Secretary-General of Fuliang County history and culture study association and the specially-appointed documenter of the Historical Archives and Policy Study Commission under Jiangxi Provincial People's Political Consultative Conference.

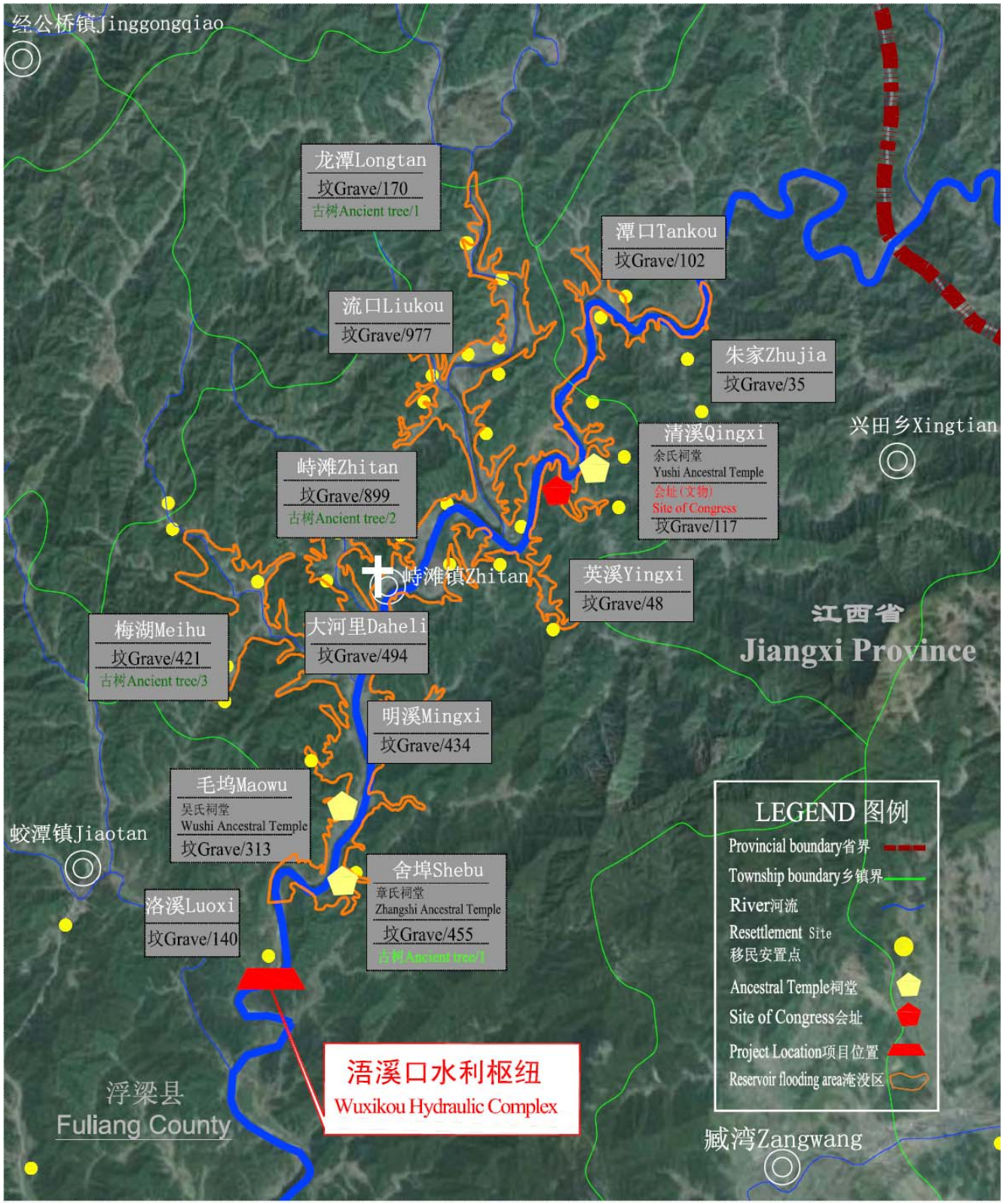


Figure 17: PCRs Affected by Wuxikou Project

10.1. PROJECT IMPACTS ON CULTURAL RELICS AND MITIGATION MEASURS

During the preparation period of Wuxikou Project, there was an overall ancient building survey done by local Cultural Relics Bureau to the reservoir area of Wuxikou Hydro-complex project. It was identified that there is no national and provincial key cultural relics protection units within the scope of project area (normal water level of reservoir for 56m), excepting a country level cultural relilcs protection units "Worker, Peasants and Soldiers' Congress of 8 Counties in Jiangxi and Anhui Province" in Zhitan Township Qing Xi Village will be inundated. In view of this case, on March and December 2012, the consultants have confirmed with Fuliang Country Local Cultural Relics Bureau, as well as to have two visits on this site. As metioned above, the environment consultant experts, accompanying with the local hired cultural relic expert Mr. Wu FengChen, visited again the site, made the assesement to the status quo and the heritage value, as well as to elaborate the recommendations of relevant protection measures.

Gate for Site of Workers, Peasants and Soldiers' Congress for 8 Counties in Anhui and Jiangxi provinces

Inside

Figure 18: Site Visit Pictures for Project-inundated Cultural Relic (Site of Workers, Peasants and Soldiers' Congress for 8 Counties in Anhui and Jiangxi provinces)

The site of "Worker, Farmer and Soldiers Congress of 8 Counties in Jiangxi and Anhui Province" was originally the Zhang's ancestral temple located in Qing Xi Village of Zhitan Township, which was originally built in Ming Dynasty with the floor area of 330m^2. In July 1934, a total of more than a thousand people in 8 counties in Anhui, Jiangxi, including the person in charge of party, government, and military, the representive of Worker-Farmer revolutionary group, as well as the local military in addition with the civilian, held a four-day Worker, Farmer and Soldiers's Congress of 8 Counties in Jiangxi and Anhui Province. It was when Anhui-Jiangxi Soviet Government and military sub-sector was formally established and the Anhui-Jiangxi Soviet Power entered into the heyday. In June 1994, this site has been officially awarding as a county-level cultural relics protection units.

The Ancestral Temple is a three-courtyard and three-hall historic building, according to the site visit, the first section, hall of offerings and the ancestral hall is basically preserved well; excepting the top part of hall wall has been weathered, the wall has no strange damage. The different craves of the hall are the exquisite, the column is solid wood, and intact. There is a cultural relics that a inscription "Feng Xian Da Lao Ye stone monument" writed by the head of conuties in the east wall, in the both wings of the Ancestral Hall, there are ancient civil construction which are badly broken, now the Ancestral Hall is open for the villagers, act on the resettlement and sacrifice of ancestral, marriage, funeral and family events.

For the conference site, according to the requirements of Cultural Relics Protection Law, it will be integrally moved and rehabitated as original for off-site protection before the project implementation. Since it is recognized as the county-level cultural relic, its movement should be consulted with the county cultural relics protection authority. It is understood that the specific procedure is as follows:

1） After investigation and consultation carried out by the culture relic specialist, the site selection report and integral movement and rehabilitation plan shall be developed. According to the

"Culture Relic Protection Law of the People's Republic of China" (2nd revision dated December 2007), the report should be approved by the Provincial government (Provincial Bureau of Cultural Relic Protection).

2） According to the "Culture Relic Protection Law of the People's Republic of China", the cost of integral movement and rehabilitation should be included in the overall project cost by the PIU;

3） The county culture and broadcasting bureau shall be responsible for tendering and bid evaluation, and only the construction company licensed for cultural relic protection projects can undertake the movement and rehabilitation project;

4） The integral movement project shall be implemented under the supervision of project owner, competent construction supervisor and professionals from the county culture and broadcasting bureau, the construction company implement the integral transportation and reinstatement ;

5） After the project is completed, the municipal cultural relic bureau shall be responsible for project check and acceptance.

10.2. PROJECT IMPACTS ON HISTORIC BUILDINGS AND MITIGATION MEASURES

With the completion of project preliminary design, in December 2011 and March 2012, the consultants visited the project sites and the county culture and broadcasting bureau twice; it is confirmed that the implementation of Wuxikou Hydro-complex Project will lead to the inundation of three historic buildings of Ming/Qing Dynasty (considering the 56m inundation line), all of which are ancestral temples, respectively in Jiaotan Town and Zhitan Township ; the ancestral temples were all jointly funded and built by the villagers of the family in simple brick-wood structure. Due to the lack of regular maintenance for long, they are all shabby now. As confirmed by the county culture and broadcasting bureau, they are not recognized as reserved cultural relics.

According to relevant requirements of WB PCR safeguard policies, in June 2012, the environmental consultants again visited the project sites together with a locally employed specialist of cultural relics and historic buildings, Mr. Wu Fengchen to evaluate the current status of these historic buildings and their cultural relic value. The corresponding recommendations on mitigation measurs have been elaborated.

Table 24: List of Historic Buildings Affected by Wuxikou Hydro-complex Project

Name	Zhang's Ancestral Temple	Wu's Ancestral Temple	Yu's Ancestral Temple	
			General Ancestral Temple (also named Middle Ancestral Temple)	Upper Ancestral Temple
Type	Historic Building	Historic Building	Historic Building	Historic Building
Epoch	Qing	Jiajing period of Ming Dynasty	Ming	Ming
Location	Shebu Village of Jiaotan Town	Maowu Village of Zhitan Township	Qingxi Village of Zhitan Township	
Floor area (m^2)	191	577	271	256

Name	Zhang's Ancestral Temple	Wu's Ancestral Temple	Yu's Ancestral Temple	
			General Ancestral Temple (also named Middle Ancestral Temple)	Upper Ancestral Temple
Functions	Placement of ancestral spirit, ancestor worship, marriage ceremony and funeral, family gathering	Placement of ancestral spirit, ancestor worship, marriage ceremony and funeral, family gathering	Placement of ancestral spirit, ancestor worship, marriage ceremony and funeral, gathering and meetings of family heads	Same as the general ancestral temple, as the occasion for ancestor worship of family branch
Current Status	Originally three-courtyard-three-hall historic building, but the first hall was swept away at the end of Qing Dynasty and only the ancestral and ancestor hall remain. The eave column of the ancestral hall is decorated with Kylin wood-graving support arches and painted. The wooden structure of ancestral and ancestor halls is well protected with mostly intact outer wall with little damage. The ancestor hall is for the worship of memorial tablets for different ancestors.	Originally three-courtyard-three-hall historic building; with integrated structure. With decorated gateway and stone gate. The platform in the first hall is installed with well-carved lotus caisson ceiling, crescent beam, arches and sparrow brace with gold painting. Its value of cultural relic is relatively high; there is two-storied gallery connecting platform and the coutyard of ancestral hall, which is for rich ladies to watch play at ancient times. The solid wood pillars, bluestone column base, crescent beam, wooden pier and cirrus for ancestral hall are well carved. The portraits of Wu's ancestors and ancetral spirits are worshiped in the ancestor hall.	Originally three-courtyard-three-hall historic building; With decorated gateway and bluestone gate. The lower inscribed tablet is written with « Longstanding and well-established», the middle inscribed tablet is drawn with the three Gods of Luck, Prosperity and Longevity, and the top layer is drawn with the portrait of a millitary officer which is the sign showing the millitary exploit of Yu's ancestors, General Yu Fu and General Yu Fengsun (General Wulve) at the early of Ming Dynasty. The indoor wooden structure is well protected. The crescent beam, cirrus, truss, wooden pier and sparrow brace are well carved. The columns are in solid wood with intact bluestone column base. There is black and white painting on the inner wall. The walls of the temple is well protected, and the wooden structure at the dooryard of ancestor hall is with slight leakage and damage.	Originally three-courtyard-three-hall historic building; the first hall has collapsed with the courtyard remaining. The ancestral hall is complete with bluestone column base for relatively well-protected giant columns in solid wood.The crescent beam is thick, the round ridge roof is complete, and the crescent beam, supporting arch, cirrus and sparrow brace are carved in details and well protected. The outer walls of ancestral and ancestor halls are generally complete, but the corridor between ancestral and ancestor halls is badly damaged. The ancestor hall is a two-storied building, the ground floor is the platform and the 2nd floor is for the worship of ancestral spirits and achiving of family documents.

Zhang's Ancestroal Temple in Shebu Village - Facade

Zhang's Ancestroal Temple in Shebu Village - Inside

Zhang's Ancestroal Temple in Shebu Village – Worship of Ancestors

Zhang's Ancestroal Temple in Shebu Village – Site Visit of Cultural-relic and Historic-building Specialist

Wu's Ancestroal Temple in Maowu Village - Facade

Wu's Ancestroal Temple in Maowu Village - Inside

Wu's Ancestroal Temple in Maowu Village - Platform

Wu's Ancestroal Temple in Maowu Village – Worship of Ancestors

Yu's Ancestroal Temple in Qingxi Village - Outside

Yu's Ancestroal Temple in Qingxi Village - Inside

General Ancestral Temple of Yu's Ancestroal Temple in Qingxi Village – Wooden Structure

General Ancestral Temple of Yu's Ancestroal Temple in Qingxi Village – Cultural-relic and Historic-building Specialist Working on Site

Upper Ancestral Temple of Yu's Ancestroal Temple in Qingxi Village – Ancestor Hall

Upper Ancestral Temple of Yu's Ancestroal Temple in Qingxi Village – Wooden Structure

Upper Ancestral Temple of Yu's Ancestroal Temple in Qingxi Village – Yu's Genealogy

Upper Ancestral Temple of Yu's Ancestroal Temple in Qingxi Village – Study of Yu's Genealogy

Figure 19: Pictures for Site Visits of Project-inundated Historic Buildings

Although these ancestral temples are seldom used in recent years which are normally closed most of time, they are still the gathering occasions of wedding ceremonies and funerals for the villagers of the family and also used for the storage of sundries and coffins at ordinary times. The results of public consultation show that the middle-age people and the elderly have more passion for the ancestral temples but the passion is also wearing out. The youth is mostly indiffernt about the ancestral temples. With reservoir inundation, the movement and reconstruction of ancestral temples may result in certain impacts on the public activities of wedding ceremony and funeral. The villagers of affected villages indicated that they hope the inundated ancestral temples could be reconstructed as original in the project implementation. The specific locations can be discussed, and there is no specific requirement for relocation ceremony.

After the site visit in June 2012, it was suggested by the cultural-relic and historic-building specialist that the above-mentioned affected ancestral temples should be moved and rehabilitated. Among others, the Zhang's ancestral temple shall be integrally moved with the complementary construction of first hall to give it a complete structure; the Wu's ancestral temple shall be integrally moved; for

Yu's ancestral temple, it was originally composed of one general ancestral temple and two branch temples (upper one and lower one), in which the lower one has collapsed with the general temple and upper temple remaining. According to the records of Yu's Genealogy, Yu Fu (father) and Yu Fengsun (son) were both the generals at the beginning of Ming Dynasty with glorious militry exploit. The great-nephew of Yu Fu, Yu Zhong, passed the imperial examination and was the friend of Yu Jing (royal secretary) and Fan Zhongyan (assitant administrator), which proves that Yu Family at Jiangfeng was ever one of prosperous families in Fuliang. It is suggested that it should take the opportunity of movement and reconstruction to combine the general ancestral temple and the upper ancestral temple. It is understood that the relevant cost for the movement and rehabilitation of these ancestral temples has been included in the RAP, which will then ben covered by Wuxikou project. The detailed procedure is as follows:

1） With sufficient public consultation, the corresponding village committees shall define the location for the reconstruction of ancestral temples, and shall develop the movement and rehabilitation plan with the guidance of the county culture and broadcasting bureau.

2） Cost for movement, demolition and reconstruction will be listed in the project budget by the PIU of Wuxikou project.

3） Experienced consruction contractors, preferably those with license for cultural relic protection projects, shall be employed to implement the integral movement projects under the supervision of representatives from villiage committees and competent construction supervisor.

4） The county culture and broadcasting bureau shall provide necessary technical guidance and assistance during project implementation.

5） After the project is completed, the corresponding village committees shall be responsible for project check and acceptance with the support of the county culture and broadcasting bureau.

10.3. PROJECT IMPACTS ON LOCAL CHURCH AND MITIGATION MEASURES

The project implementation will inundate one Christian church in Zhitan Township, which is a two-storied cement building with the floor area of 295.4m^2. The church has already been built for 5-6 years, when the land was provided by the township government free of charge and the fund was from local parishioners. The church was mainly used for the divine services of nearby parishioners. Currently it serves about 60-70 parishioners from nearby Zhitan Township and Liukou Village.

Table 25: Local Church Inundated by the Project in Zhitan Township

According the results of previous pubic consultation, based on the good understanding of willingness of affected parishioners, the RAP of Wuxikou Hydro-complex Project has confirmed that during the relocation of central area of Zhitan Township, the church will be rebuilt before demolition like other inundated facilities. Its new location is preliminarily selected in the northwest of the new site. The Church will be rebuilt with the same function, size and standard as before. The villagers will be informed of its reconstruction beforehand to avoid any impact on the activities of parishioners. Relevant cost has been included in the overall budget of the project RAP.

10.4. PROJECT IMPACTS ON ANCIENT AND RARE TREES AND MITIGATION MEASURES

According to the survey during the preparation of preliminary design, there will be six ancient trees inundated by the reservoir (as listed in the table below), all of which are in Zhitan Township. Among others, there are 3 camphor trees in Meihu Village, 2 camphor trees in Zhitan Village and 1 Liquidambar formosana in Longtan Village. According to the different growth conditions of these ancient trees, it is planned to remove one of the camphor trees in poor growth conditions (as shown in the figure below) and all the other five will be transplanted.

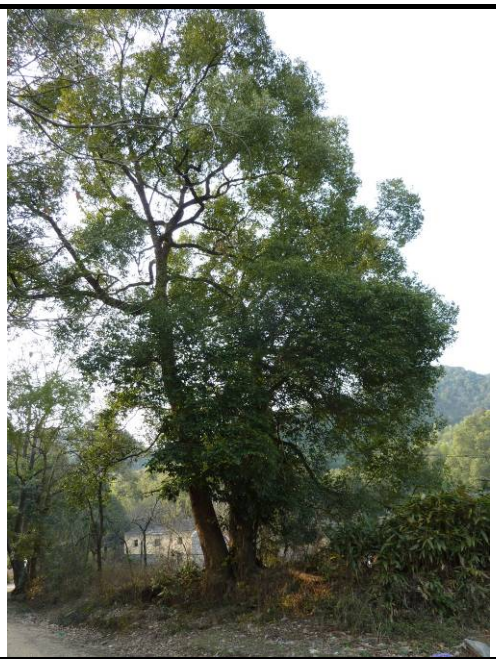
Table 26: Ancient Trees in Project-inundated Area

No.	Tree Species	Growth Status	Age (year)	Location	Action to be Taken
1	Camphor Tree	17m tall, with the circumstance of 400cm and crown breadth of 24 ×22m, with good growth vigor	450	On the river beach in Banshang Group, Meihu Village, Zhitan Township, at the elevation of 56m	To be transplanted
2	Camphor Tree	12m tall, with the circumstance of 240cm and crown breadth of 19 ×12m, with good growth vigor	280	At the riverside in Banshang Group, Meihu Village, Zhitan Township, at the elevation of 56m	To be transplanted

No.	Tree Species	Growth Status	Age (year)	Location	Action to be Taken
3	Camphor Tree	20m tall, with the circumstance of 390cm and crown breadth of 20 ×16m, with average growth vigor	400	At the riverside in Qiulong Group, Meihu Village, Zhitan Township, at the elevation of 56m	To be transplanted
4	Camphor Tree	8m tall, with the circumstance of 420cm and crown breadth of 18 ×6m, with weak growth vigor	450	On Zhitan Street in Group 1 of Zhitan Village, Zhitan Township, at the elevation of 56m	To be removed
5	Camphor Tree	16m tall, with the circumstance of 430cm and crown breadth of 13 ×13m, with average growth vigor	500	On the street in Group 1 of Zhitan Village, Zhitan Township, at the elevation of 56m	To be transplanted
6	Liquidambar formosana	20m tall, with the circumstance of 140cm and crown breadth of 6× 8m, with average growth vigor	200	In Longtan Village of Zhitan Township, at the elevation of 49m	To be transplanted

Camphor Tree No.4 in Zhitan Village (Front)

Camphor Tree No.4 in Zhitan Village (Side)



Camphor Tree No.5 in Zhitan Village (Front)

Figure 20: Pictures of Site Visit for Ancient Trees Inundated by the Project

Among the six ancient trees inundated by the reservoir, according to the site investigation, the camphor tree on Zhitan Street in Group 1 of Zhitan Village in Zhitan Township is in poor growth conditions, which makes it difficult to be transplanted. According to the domestic EIA, it is preliminarily planned to transplant all the five ancient trees requiring transplantation in the living camp of the project owner and their transplantation is designed together with the greening works within the project owner's camp. The soil at their original habitat for the five transplanted ancient trees and the soil at the transplantation locations are both red earth and the habitat conditions are generally consistent in terms of sunlight, heat, water and soil. The locations for transplantation are within the scope of permanently acquired land for the project, and centralized transplantation is in favor of following-up management and cultivation. Therefore, the above transplantation measures are generally feasible. It is confirmed by the interview of the county forestry bureau in March 2012 that the detailed transplantation plan will be developed by the county forestry bureau, and the county government will identify the implementation unit (county forestry bureau/project owner), and the transplantation will be implemented under the guidance of the technicians from the county forestry bureau.

In addition, according to the current RAP, in the planned resettlement sites, one ancient camphor tree is found in Chenjia Resettlement Site in Shebu Village, as detailed below:

Table 27: Distribution of Ancient Tree in Project Resettlement Site

No.	Tree Species	Growth Status	Age (year)	Growth Conditions	Location
1	Camphor Tree	20m tall, with the circumstance of 120cm and crown breadth of 6 ×7m, with good growth vigor	100	At the elevation of 62m, on the flat land	Chenjia Resettlement Site in Shebu Village

In addition, to minimize the loss of ancient tree resource, corresponding measures will be taken during project construction. In particular, the county forestry bureau will carry out detailed survey for ancient and rare trees subject to the impacts of resettlement activities within the resettlement areas. During the implementation of RAP, the species, distribution, quantities and variation of

ancient and rare trees will be further checked, and the archives of ancient and rare trees will be established based on the survey. While strengthening the publicization with local medias (TV, cablecasting, wall paper, etc.), the identified ancient trees will be protected with the enclosure and labeled with tags. Implement protection responsibility system for ancient and rare trees, and appoint experienced villagers for management, cultivation and routine observation in order to detect the problems and take timely measures.

10.5. PROJECT IMPACTS ON GRAVES AND MITIGATION MEASURES

According to the latest RAP, the implementation of Wuxikou Hdyro-complex Project will result in the relocation of totally 4623 graves in 21 villages of 5 towns/townships in the hydro-complex zone and reservoir area including Zhitan Township, Jiaotan Town, Xingtian Township, Jiangcun Township and Jinggongqiao Town, as shown in the following table and Figure 17.

Table 28: Distribution of Project-inundated Graves

No.	Component	Town/Township	Village	No. of Graves
1	Hydro-complex Zone	Jiaotan Town	Luoxi	30
2			Shebu	98
3			Jiansheng	18
4			Jiaotan	0
5			Luoxi wood farm	0
	Subtotal for Hydro-complex Zone			146
6	Reservoir Area	Zhitan Township	Longtan	170
7			Liukou	977
8			Qingxi	117
9			Zhitan	899
10			Chixi	0
11			Meihu	421
12			Daheli	494
13			Mingxi	434
14			Yingxi	48
15			Maowu	313
16		Jiaotan Town	Luoxi	110
17			Shebu	357
18		Xingtian Township	Tankou	102
19			Fangjiawu	0
20			Zhujia	35
21		Jiangcun Township	Guyan	0
22			Zhongzhou	0
23		Jinggongqiao Town	Chutian	0
	Subtotal for Reservoir Area			4477
Total				4623

According to the site visit, the local graves are normally sparsely distributed on the hills near the villages. According to the local customs, the grave relocation matters much for a family, which concerns the family destiny. The grave relocation normally goes through three steps of grave excavation, picking-up and entombment. Before grave excavation, the land of god should be summoned with chanting. The process of grave relocation shall respect the willingness of affected

villagers and local customs. The geomancer should select the date, time, location of grave and orientation, and the family rituals shall be held. The affected graves should be compensation according to the local price level, and relevant cost has been included into the project RAP.

Figure 21: Grave in Luoxi Village within Project Inundation Areas

10.6. ARCHAEOLOGICAL CHANCE-FIND PROCEDURE FOR CONSTRUCTION PERIOD

For archaeological chance find during construciton and corresponding proection of cultural relics, the following measures proposed in the ESMP should be implemented to avoid any damage of valuable physical cultural relics.

（1） Construction workers will be trained to identify potential sites or items of cultural significance. Construction workers will be trained on the appropriate reporting and communication procedures to be followed if they identify any potential items and the importance of implementing these procedures.

（2） The following steps will be implemented to protect any previously unidentified site/item of potential cultural significance:

a) If a construction worker identifies a potential site/item of cultural significance, he/she will immediately notify the construction supervisor on-site;

b) The construction supervisor will determine whether the site/item has potential significance;

c) If the site/item is considered to have potential significance, the construction supervisor will immediately cease work within a 50 m distance from site boundaries;

d) The construction supervisor will immediately notify the CC-EC;

e) The CC-EC will follow communication process and inform EMU-EM who will inform CSC-PM and PMO;

f) Protect the site and immediately report to the local cultural relic protection administration in accordance with the requirements of the Law of Cultural Relics Protection.

（3） Temporary fencing or similar will be used to mark a 50m radius from the site.

（4） No work will be carried out within a 50m radius of a potential site until directed by EMU.

（5） Notification to CSC-EMU will be made 15 days prior to intended construction in the vicinity of identified objects or sites.

（6） Any directions or requirements from CSC-EMU in relation to measures to protect the site will be recorded and communicated by the CC-EC and its field inspectors to the construction workforce. All such requirements will be strictly adhered to.

In addition, during the site investigation, some ancient relics with relatively low cultural value or in poor conditions are also found within the project-affected areas, which are found difficult and not worth full conservation and integral movement, for example, some small stone arch bridge built in Qing Dynasty. For these relics, it is recommended to carry out an archeological archiving program within the whole project-affected areas duirng project implementation in order to conserve some valuable structural components or keep graphic records of these relics by the means of photographing or making a television documentary. The program is recommended to be implemented as one of the technical assistance components under the project.

11. IMPACT ANALYSIS OF ANHUI-JIANGXI RAILWAY RE-ROUTING PROJECT

There will be about 19.5 km of railway that would be inundated by this Wuxikou Hydro-complex Project. At the same time, there was meeting in Dec.17 of 2008 between Anhui Provincial Government and the Ministry of Railway; and also a meeting in Dec.25 of 2009 about the construction of railway between Anhui Province and Jiangxi Province. Among these meetings, it has shown that the railway, which would be inundated by this Wuxikou Reservoir, would be partial railway, which would be upgraded to electrified railway. This upgrading project covers the components of changing route in Ningguo, Jixi and Wuxikou, and also re-routing other four minor change with total length of 58.5 km. These work will be completed before the completion of Wuxikou Reservoir Project. And this re-routing work will be implemented by Henghuang Railway Co.

For this re-routing project, the fourth explosion & Design Institute of China Railway Ltd. Co. was hired for the preparation of "Environment Assessment Report of WanGan Railway Electrified Railway Upgrading Project". In the environment assessment report, it made detailed assessment of major environment impact of this WanGan Railway Electrified Railway Upgrading Project (including the re-routing part of WanGan Railway) and also defined the mitigation measures to these impacts. According to this report, it shows that the current existing railway is passing through the ecology protection zone (no development zone) of Raohe River Source Ecology Function Zone (under the planning stage, which was submitted in 2009). With the re-routing of this railway, the new railway will pass through the ecology economy zone (planned as region for development with priority). Therefore, the re-routing will decrease the impact of railway to the ecology system of Raoheyuan Zone. In 2011, Jiangxi Provincial Department of Environment and related municipal & county level EPBs agreed that this re-routing railway will pass through this Yaoheyuan protection zone with bridges, railway bed and tunnel. At the same time, soil erosion protection measures shall be taken for this railway upgrading project, and also to ensure the environment being protected in the project impacted zone. There is also environment sensitive points being identified. They are mainly residents along the railway named: Yingli, Zhaoyanzhou, Lujia, Xizhuang, Maowu, Shefushangmen and Maopengli Villages with total hosueholds of 212 (refer to Figure 22）. The major concern are the noise and vibration from the railway.

The environment assessment report was approved the national Ministry of Environment Protection in Sept. 23 of 2011 (the reference number of approval file is: Huanshen [2011] No. 267). In June of 2012, consultants walked through new route of this WanGan Railway. Consultants have confirmed the conclusion made by the fourth explosion & Design Institute of China Railway Ltd. Co. in the environment assessment report of this railway upgrading project. The major conclusions of EIA report and site visit made by consultants are listed in table of Table 29. During project construction and operation, commitments will be made by the project developer and operator to implement the project ESMP.

Existiing Yingli Station in the Section to be re-routing

Yingli Village Along Railway

Figure 22: Current Situation of WanGan Railway Re-routing Project

Table 29: Major Environment Impact and Mitigation Measures of WanGan Railway Re-routing Project

Enviro-social index		Potential impact/Issues	Mitigation Measures/action plan	Implemented by	Supervised by
I.		Construction period			
Resettlement		Route change of Anhui-Jiangxi Railway will acquire land peromently of 28.32hm^2 (among which, there is 6.2 hm^2 farm land, 20.9hm^2 of forest), temporary land use of 38.56hm^2， 25 households will be resettled。 There will be negative impact on the agricultural along the railway during the construction	The railway route change project is part of the project for changing Anhui-Jiangxi Railway to electricity powered railway, which is being implemented by the Ministry of Railway. When the project being implemented, the resettlement action plan prepared by following the applicable Chinese laws and World Bank policies will be followed.	PIUs, and local government	Local government
Soil Erosion		There will be total of 616.7×10^4 m^3 of earth moving work. Among which, there is 327.3×10^4 m^3 removal and 289.4×10^4 m^3 for earth fillin. About 277.5×10^4 m^3(84.8%)soil removed could be used for fillin. With all these works being done and with waste generated from tunneling, there will be total of 11.9×10^4 m^3 soil needed and 49.8×10^4 m^3 to be disposed. There will large impact on local geographic situation, local scenery, vegetation and soil erosion and local irrigation. In addition, the abandoned railway lines (about 8.7 km), which might not be used anymore, would lead to dramatic soil erosion	There will be one soil acquisition site with area of 1.2 hactre forest. There will be total of 61,000 m^3 soil to be taken from this site. The wasted soil disposal site has been defined with area of 7.3hm^2 (forest). The mitigation measures of soil erosion of this project have been defined in the soil erosion solution of project and the same as budget. These measures will be implemented during the construction period.	PIU, Contractor and supervisor	Municipal hydrologic bureau and local EPB
Ecology	Damage of vegetation	The vegetation damaged by the project is mainly forests. 68.31ha of non-commercial broad-leaved woodland will be permanently occupied by the project.There is no precious and rare vegetation in the project-affected area, so the project construction will not affect the flora-diversity in the region.	- Compensation will be made for the permanently occupied non-commercial woodland for its rehabilitation; - The side slope for the foundation and tunnel for the railway shall be planted with vegetation – grass, trees, etc. it is expected that the lost vegetation from construction would be recovered in 1 – 3 years.	PIU, contractors, construction supervisors, and local forest department	Municipal Water Resource Bureau and local EPB

Enviro-social index		Potential impact/Issues	Mitigation Measures/action plan	Implemented by	Supervised by
	Raohe River Source Ecological Functional Zone	The existing railway passes through the ecological protection zone (where development activities are forbidden) of Raohe River Source Ecological Functional Zone. After re-routing, the railway will only pass through its ecological economic zone (where is prioritized for development). Raohe River Source Ecological Functional Zone is planned for the principal ecological purpose of water conservation which is then followed by the purposes of soil conservation and biodiversity conservation.	In 2011, Jiangxi Provincial EPB and munipal and county EPBs has agreed that the proposed re-routing project can pass through the protection zone with bridges, roadbed and tunnels; however, it is required to strengthen water and soil conservation during project implementation in order to ensure the environmental safety in the project area.	PIU, contractors, construction supervisors, and local forest department	Municipal Water Resource Bureau and local EPB
	Animal and vegetation diversity	The invetigation showed that there was no habitat of precious and rare wildlife distributed in the project area. The new railway route is in fact in the same passage of old railway route. Animal living in this area shall have already got certain adaptability and relatively high anti-interference capability. The project implementation would have no impact on the diversity and number of wildlife here.	Generally no impact, no mitigation measure needed.	/	/

Enviro-social index		Potential impact/Issues	Mitigation Measures/action plan	Implemented by	Supervised by
	Bridge construction	There will be 36 bridges with large size and midiem size, and total length of 7.976km. The water quality of Changjiang River will be impacted if they are not constructed properly.	- The construction site, camping sites and material storing site shall be selected away from Changjiang River, and in the down wind direction. - Action shall be taken during the construction to try to avoid waste and construction residue dropped into Changjiang River; - The sites and river side near to construction sites shall be cleaned in order to limit the impact on Changjiang River water quality; - In addition to the limitation of construction activity zone and ecological recovery of construction site, there shall be public education to construction workers and construction management . And also preventing the intentional damage .	PIUs, DIs, contractor and supervisor	Municipal EPB
	Tunnelling	There will be total of 11 tunnels with total length of 4.26km. the ground level to the top of tunnel is about 200 m. the ground is covered with pine tress and brushes with shallow roots. Therefore, there shall be no concern about potential damage made to root from tunnelling. At the same time, it has found that water for these vegetation is mainly from precipitation. There shall be no impact of tunnelling to the life of these vegetation.	No negative impact	/	/
Air quality	Dust from construction	The major dust would be from the construction sites and from the road of material transportation vehicles. When weather is dry and with bad road condition, the immediate dust generated from traffic coulld reach to 8～10mg/m^3 of TSP. This would be over the national ambient air quality standards	- Curtain and fence shall be installed to surround the construction site, which is close to residential area. - The slope of soil piile shall be limited. The disposed soil shall be well compacted. Unbagged cement shall not stored in an open area. During the sunny and windy day, those temporary stored soil shall be watered ; - For those large earth work construction sites, in a non-rainy day, watering shall be taken to limit dust; - With wind equal or larger than Stage 4, there shall be no earth work and earth fill in work; - Vegetation engineering shall be implemented as it is described in design document. The detailed information refers to soil erosion solution of project	PIU, Contractor and supervisor	Municipal EPB
	Exhaust of construction machine	Those large or medium size construction machines are mainly using desiel or gasoline. There will be NO2、SO2、dust in their exhaust. But with small amount of discharge, the impact to local air quality would be limited	Having routine checking and maintanence. Ensure these machines could meet with applicable national vehicle exhaust discharge standard	PIU, Contractor and supervisor	Municipal EPB

Enviro-social index	Potential impact/Issues	Mitigation Measures/action plan	Implemented by	Supervised by
Noise	All foundations along new route will be done manually. The supporting piles of railway will be done by installation trains. These will limit the construction noise. The major noise would be from the part of upgrading the old route, construction of bridges, tunnels. There will be tractors, large trucks, compactors and material transportation trucks. Large number of people will be impacted. However, this noise will be limited in the daytime, and it is not a consecutive noise source. It expected that it would still be an acceptable level to local people.	- Strictly following the noise standards for current construction machines, and for construction sites - High noise generation activity is not allowed on the site close to residential area in the night - Implementing the vegetation component described in engineering design report. Details refer to the soil erosion solution report	PIU, Contractor and supervisor	Municipal EPB
Water quality	Wastewater would be mainly from the construction workers (COD:200～300mg/L， grease, 50mg/L、SS:80～100mg/L)and care wash from construction machines and transportation vehicles(COD:50～80mg/L， Petroleumn:1.0～2.0mg/L、SS:150～200mg/L), the local creeks or cannels will be silted if these wastewater would be discharged without treatment	Sedimentation tanks shall be installed on construction site. All wastewater will be treated before it gets discharged.	PIU, Contractor and supervisor	Municipal EPB
Solid waste	The solid waste would be mainly from the construction camping sites as domestic solid waste and from construction site as construction waste	The domestic solid waste from construction site would be collected and shipped out by Environment & Sanitation Bureau of Fuliang County	PIUs, Fuliang County Environment and Sanitation Management Station	Municipal EPB and sanitation bureaus
Vibration	There is no large vibration source. It is believed that there is limited impact on the area near to new railway	No impact, no mitigation measures	/	/
Cultural heritage	With current investigation results, there shall be no cultural heritage inside of construction zone. However, there might be cultural heritage site being discovered, and there is a possibility that this site and possible related artifacts might be found and damaged.	When there is cultural heritage being identified, construction work shall be suspended. This cultural heritage site will then be protected.	PIU, Contractor and supervisor	Fuliang County cultural and Broadcasting bureau, Jindezhen Relic bureau
Traffic safety	The transportation of construction materials and temporary construction along the railway will have impact on local inland transportation and river transportation	- Provide information to local people about increased traffic and safety measures could be used through broadcasting, TV channels and posts. - Driver's training, vehicles maintanence, speed limit, more traffic post and defined parking space, etc. - Inform people at the peak traffic time and special moment. Cooperating with local traffic policeman and local river transportation management bureaus	PIUs, contractors, supervisors, local traffic police station and shipping management bureau	local traffic police station and shipping management bureau

Enviro-social index	Potential impact/Issues	Mitigation Measures/action plan	Implemented by	Supervised by
II.	Operational period			
Air quality	There will be no new added boilers, which will generated pollutants. The electricity powered train will be used. And there is no air pollutants emission. With the project implemented, boiler flue gas emission will be decreased. This will have positive impact on local air quality along the railway.	Positive impact, no mitigation measures are needed.	/	/
Noise	Along this new railway route, there is 212 households in Yingli, Zhaoyanzhou Lujia, Xizhuang, Maowu, Shefu, Shangmen Villages. It has been estimated that when the railway upgrading being completed, the environmental quality along the railway will be decreased (increase of noise level (3.6~23dB). Number of impacted population will increase. There will be always noise over the limits at night (about 0.6~7.7dB over the limits)	- With well planned, the land application along the side of railway shall be limited; - Providing environment training to station managers and driver to limit the use of horn of train; - Having trees along both side of railway to limit the noise; - Engineering solution could be taken:1)resettle the 11 households, which have house in the distance less than 30 m from railway; 2)on the left side of railway, at Maowu and Shefushangmen section, (K367+750～+960), there will be noise curtain with height of 3m for length of 210m; 3)installing ventilation noise curtain (total of 970 m2) for the sensitive points, which are far away from railway or small scale and scatter sensitive sites.	PIUs, contractors, supervisors, and railway management department	Municipal EPB
Vibration	Along this new railway route, there is 212 households in Yingli, Zhaoyanzhou Lujia, Xizhuang, Maowu, Shefu, Shangmen Villages. It has been estimated that when theupgraded railway will be operated, there will be noticeable vibration problem to these sites, especially for the first raw of houses, which will sense the vibration over the limits(>80dB).	15 households in 30 m from railway will be resettled in order to ensure the vibration along the railway would meet with the vibration standard.	PIUs and local government	Municipal EPB
Water quality	There will be wastewater generated from railway station and wastewater generated from train maitanence. The major pollutants would be COD、BOD、grease, NH3-N and Petrolemn. These wastewater will pollute the local environment if they were discharged without treatment	All wastewater shall be treated and then discharged into irrigation canels , or for greenery area of railway stations, or to municipal wastewater network to local WWTP	Railway operation management department	Municipal EPB
Solid waste	With the completion of project, this railway will be transferred from passenger & cargo line to only cargo line. This means that less solid waste will be generated along the line. Even with the minor increase of railway crew generated solid waste.	All solid waste will be managed by local sanitation agencies. There will be very limited impact on local environment	Railway operation management department and local sanitation bureau	Local sanitation bureau and Municipal EPB

Enviro-social index	Potential impact/Issues	Mitigation Measures/action plan	Implemented by	Supervised by
Magnetic radiation	With the completion of project, there will be increase of magnetic pollution. It has been estimated that, even with the increase of magnetic radiation, it still could meet with the national standards. No threaten to local resident health. However, there will be impact on people for them to receiving TV signals. This will bring complain from local residents.	The route of this railway shall be optimized to avoid the impact on local houses, etc. installing magnetic shield lines in order to avoid potential interference to local communication system	DIs, PIUs, contractors and supervisors	Municipal EPB

12. ENVIRONMENTAL IMPACT ANALYSIS OF RESETTLEMENT PLAN

According to "resettlement action plan of Wuxikou Hydro-complex Project" (version of May 2012), there will be population of 9964 from 2,497 households from 20 village communities in 5 villages (towns). Among these, there are 8483 from rural area of 2,115 households and 1481 from urban area of 382 households from one town (Zhitan Town). During the preliminary design stage, optional resettlement sites were investigate, compared and discussed. 60 centralized resettlement sites were selected finally, and also 26 long distance resettlement locations. The distribution of these resettlement sites and locations are shown in Table 5 and Table 6.

In addition, Zhitan Town locates inside of reservoir area. With the construction of reservoir, the entire Zhitan Town will be inundated. Fuliang County Government has made its adjustment to its administration structure, and decided that the entire Zhitan Town shall be resettled to another location. It is estimated that, by the year of 2015, there would be total of 2,338 population to be resettled, and about 21.02 hm2 land would be needed for this resettlement.

In this chapter, the potential environment impact and defined mitigation measures shall be described in the chapter for the construction of centralized resettlement sites and the removal of entire town and construction of new town.

12.1. ENVIRONMENT IMPACT ASSESSMENT OF RESETTLEMENT SITES

The selected resettlement sites for Wuxikou Hyro-complex project are located on the open space of the shoreline of Changjiang River. The normal size of these resettlement sites have the population of 300~850. For the old residential area, About 67.9% of houses in the reservoir area were built in 1960s and 1970s. these houses are mainly built with wood and bricks. At the same time, these farmer's houses are constructed by farmers. And they were not well organized, and with no public infrastructure of providing required services. The major drinking water sources were from local creeks and groundwater wells. There is few water treatment and storage facilities. No sanitation and drainage systems for local people have been installed.

There are 60 sites have been selected for resettlement according the information obtained through geographic investigation done by professionals and estimation of local environment capacity. Among these 60 resettlements sites, there are 26 resettlement sites are long distance removal from original residential area, and there are 34 resettlement sites are a bit back up from original residential area to get away from inundated regions. All resettlement sites are geographically stable with good environmental situation for new settled area of people. For all these 60 resettlement sites, they are either close to original residential area or villages in the same county. These sites have the similar geological, weather condition and also cultural traditions as the original residential area. These will ensure a high compatibility of society between resettled people and original residents on these sites.

There will also be potential environment impact from resettlement sites construction and living. These environment impact and the related mitigation measures are shown below:

Table 30: Potential Environment Impact and Mitigation Measures for Resettlement Site Construction of Wuxikou Hydro-power Project

Enviro-Social index	Potential Impact/Issues	Mitigation Measures/action plan

Enviro-Social index		Potential Impact/Issues	Mitigation Measures/action plan
I.		Construction period	
Land acquisition		With the construction of resettlement sites, there will be 5,147 people of 1,472 households from 19 village of 8 towns being impacted. There is total of 4,648 Mu land to be acquired (3,781.3 Mu farmland)。	Detailed resettlment action plan has already been prepared. This plan will ensure all land acquisition and resettlement would meet with applicable Chinese laws and policies from the World Bank. Assistance would be provided to resettled people to ensure their life and their working condition would reach to their original level as soon as possible, or even better than before resettlement. The implementation of resettlement action plan shall be ensured in the project implementation stage.
Soil erosion		A total area of 68.45hm^2 for resettlement sites. For the preparation of these site, if there is no appropriate solution being taken for site preparation, there might be regional soil erosion to local environment	The excavation and earth filling shall be balanced according to the "Water and Soil Conservation Report". And site shall be prepared by following the actual land scape. There shall be trees and grasses arounding the resettled zone and on the sides of road. It is expected that there would be 2.35hm^2 for the urban resettlement sites and centralized resettlement sites would have vegetation of 10.27hm^2。
Ecology	Vegetation damage	There will certainly be some local forest being destroyed by this project. The vegetation on the land being acquired has normally low value, such as low value trees, vegetation in farm land and bruches. This vegetation destroyed area is among 20 villages or towns in Fuliang County. Except for the farm land vegation, there is timber forest about 859.5 mu, economic value forest 95.6 Mu and brush 111 Mu and 27.1 Mu grass	There is about 10.27hm^2 belt space surrounding the resettlement site, where trees will be planted. In addition, in those area in Fuliang County, which could be planted with trees , shall be used for compensation. Under all these actions taken, if there is still not enough to compensate the vegetation lose, implementation agencies shall pay money to provincial forest department to let them for selecting suitable area for compensate the vegetation lose of this project
	Ancient tree	Among all planned resettlement area, there is one Camphor tree in Shefu Chenjia resettlement zone. It has about 100 years. This tree might be impacted by the resettlement.	During the implementation of resettlement action plan, there shall be further investigation to the ancient trees in the project area, and also resettlement sites about their existence, types, locations, and number. Achieve of these tree shall be established. Public education and information shall be made through TV, broadcasting, public boards, etc. at the same time, trees shall be protected through isolation wall. Local residents with forest management experience will be pointed for protection, observation, reporting and action to be taken
	Terrestrial animal	Among the animals in this area in the national protection list, there are those whose living condition might be threatened or being haunted by local people. These are : Rana, Large Indian civet and Civet cat. Mandarin duck might be impacted by damage of their living condition, noise, pollutant discharged and being hunted. And for Pangolins, which has relatively limited living area and low adptation ability to environemnt, would be impacted by damage of living condition, noise, pollutants discharged and being hunted.	- Public information and education: providing public education to resettled people about environmental protection and wildlifeprotection； - To the national and provincial animal protection lists, public education brochures will be provided to the resettlement zones about how to identify these animals, how to protection these animals and related regulatories.
	Natural protection zone	There are Wentianwwu and Changtian resettlement sites near to Huangzihao black elk natural protection zone. The construction and life in these resettlement sites will have impact on this natural protection zone.	- Public information post will be made at those major entrances and along the boundary of this protection zone. There will be total of 4 post(1.2m*0.8m)； - Staffs of natural protection zone management bureau shall enhance their petrol during the resettlement period in order to prevent the potential hunting of wildlifein national protection list； - The resettled population shall be provided with education of environment protection. Resettlment people shall be informed about protection of local eco-system during their constructio of their own houses and also during their daily production. In addition, the wildlifeand their living environment shall also be well maintained by local people. No hunting of wildlifeon national protection list, and try to avoid distrubance of wide life.

Enviro-Social index		Potential Impact/Issues	Mitigation Measures/action plan
Ambient air	Construction dust	There will be dust generated during the construction of resettlement site. This will have impact on local residents	- The soil pile shall be limited with its slope. All disposed soil shall be compacted on time. No unpackaged cement shall not be stored without covering - During the non-rainy day, watering action shall be taken for dust prevention. When there is wind with speed over stage 4 (5.5 – 7.9 m/s), construction work shall be stopped.
	Vehicle exhaust and traffic dust	There will be impact on local residents for the exhaust from material transportation vehicles and dust generated from traffic.	- There shall be regular checking and maintanene of vehicles. All these vehicles shall meet with existing national vehicle exhaust dischare standards. - When transporting dusty material, the material should be watered or covered. When shipping unpacked cement, the vehicle tanks shall be well sealed. All these vehicles shall be cleaned regularly. - In the non-rainy day, for road with residents nearby, and large traffic, this road shall be watered
Noise	Construction noise	Residents nearby of resettlement site will be impacted by the construction on the resettlement sites	- All vehicles shall be able to meet with applicable noise standards for construction machine and standard for noise control in construction site - No high noise construction works onsite which has residential area nearby at night
	Transportation noise	Noise generated from transportation vehicle will impact the residents nearby	- Speed limit of 30km/h in the residential area, and no horning is allowed. - Maintanence to vehicles and raod shall be kept. At the same time, regulary checking to the vehicle will be implemented. All vehicles shall be able to meet with « noise limits of vehicles » and « allowable noise level of automobiles ». low noise vehicles will be encouraged.
Water quality		There will be some wastewater generated during the construction of resettlement sites and also wastewater from camping sites of workers. These wastewater might pollute local environment if it is not properly treated.	- For resettlement sites which is a minor moval from original site, their wastewater shall be treated by using the existing treatment facility before it is discharged into local water body; - For resettlement in another location, there shall be sedimentation tank installed in this resettlement site for simple treatment of wastewater generated, and discharge
Solid waste		The soil to be disposed could be used to fillin other places. And the quantity is more or less balanced. There will only be small amount of soil to be disposed when construction is done for houses and infrastructures	These soil shall be disposed nearby for making flat land according to the requirement from “soil erosion prevention report”
Cultural heritage		According to current investigation, there is no cultural heritage related for planned resettlement area. There might be cultural heritage discovered during the construction. Then, there might be damages to those new discovered cultural heritage sites or artifacts on site.	If there is cultural heritage site discovered, the construction shall be stopped, and protection measures shall then be taken.
Social impact	Traffic safety	The risk of traffic accident will increase with the local traffic increase due to the construction of resettlement sites.	- Public education shall be made to local people for new increased traffic and potential safety measures could be taken through broadcasting, TV channels and posts. - Giving training to drivers, providing good maintainence to vehicles, speed limit, increasing traffic post, definng parking area - Informing local people, coordinating with traffic policeman in the peak hour and some special moment.

Enviro-Social index		Potential Impact/Issues	Mitigation Measures/action plan
	Vulnerable group	Some peole' benefit might be negelected during the resettlement period ; the resettlement might not be finished on time because of lack of labors, great resettlement pressure , low public involvement, etc.	- Providing special care or special assistance to vulnerable group or group becoming more vulnerable because of resettlement. Such action could be : cooperating with local civil affairs bureau, having special fund to these vulnerabel groups ; - Providing priority to vulerable group for technical training, job guidance and job opportunities ; - Duringthe project implementation, providing vulnerable group people first for positions with no technical difficulties. - Providing vulnerable group family with housing compensation. For those family with their resettled house (built by bricks and timber) with 25 ㎡ /capita, providing them with compensation to ensure 25 ㎡/capita limit would be met; - During the resettlement period, local village community shall help resettled family for selecting location for house, and also providing assistance for house moving and house construction.
	Women	Their working hour will be decreased; tea producing activity, which is normally dominated by female, would still be sustainable; however, female might be less involved in training and working ; the real need of females might be ignored , such as : house appearance, house arrangement ; female might even bear more pressure on debt pressure. Female dominated family might be more vulnerable during the resettlement	- The females' need and suggestion shall be considered since in the project design stage. - No technical needed position from project implementation shall be provided to female and other vulnerable group first - It shall be ensured that female could sign for resettlement compensation ; - Training for tea, Taizhi Jinshen, etc. shall be provided with consideration given to female. At least 30% of participants shall be females ; - The training shall be provided in a way properly to female from time and other aspects. - Limit the project suspension time, speeding the project implementation ; - Following strictly the resettlementt action plan and applicable regulation and policies. Female coming from other places throughmarriage shall be provided land with priority from community reserved land ; - Special policy and compensation shall be provided to family that female dominates (the male might be disabled, such as) ;
	Indigenous residents	With the resettlement population, the average land per person will decrease; the pressure on public infrastructure and service will be increased; there will also be problem about how to distribute the public resource to people, etc.	- Land resource:a. redistirbution of land shall beinformed to local original residents first, and being consulted with local original residents； b. the original residents will be compensated by followiing the provincial standard of annual productivity of land and regional land price and also investment resettlement standards ; - Public resource:a. providing land preparation, provision of water, power and roadd to resettled site in advance. This is to try to avoid the potential shortage of water, power and road and other public service to local people； b. local government shall make effort to make original resident and resettled people to share the public resources rationally, and promote the good relationship between resettled people and local original residents
II.		Operational period	
Water quality	Centralized resettlement area	There will be total of 60 resettled sites with total resettled population of 8644. The total wastewater flow rate is about 830m^3/d	The wastewater treatment process was recommended as anaerobic process for treating wastewater generated from these resettled sites. The treated wastewater shall meet with GB8978-1996Class I. chemical dosing is prepared for possible further treatment if the biological treated wastewater could not meet with standard

Enviro-Social index		Potential Impact/Issues	Mitigation Measures/action plan
Solid waste	Centralized resettlement zone	There will be total of 60 resettled sites with total resettled population of 8644. The estimated domestic solid waste generation rate is about 1578t/y. local environment will be damaged if this solid waste could not be managed properly.	The sanitation management shall be enhanced. The solid waste will be done with households. Solid waste from households will be put to garbage bins; waste in public area will be put into solid waste tank. Organic waste will be put to underground tank. Inorganic waste will be put to solid waste station; construction waste will be put to disposal site. And other solid waste will be incinerated. The solid waste will be finally disposed to facilty nearby, such as Sanlong Landfill facility and Ehu Town solid waste treatment facility. At the same time, public education for the farmer on solid waste sorting will be put in place.
Natural protection zone		There will be resettlement site close to Huangzihao black elk protection zone. This resettled site will have human activity, which will impact the living condition of wide life	Same mitigation measures listed in the construction period before
Rare aquatic life		The impacted water area of this project has otters, which are on the Class II national protected animal list	During the facility operational period, protection action will be taken along the shore line for otter's living condition. Development, which might have impact on otter's living condition, will be forbidden. Public eduction will also be put to residents along the shoreline and resettled people (for five year from the beginning of operation)
Pest management		For livelihood recovery of resettled migrants, the plantation of heterophylla falsestarwort (276.5mu) and oil tea trees (1671.9mu) has been planned. During the plantation, pesticides may be used for pest management.	According to the WB policy OP3.09 Pest Management, a pest management plan has been developed for the project, as attached in Appendix 7. The concept of Integrated Pest Management has been introduced to reduce the chemical pollution to natural environment and local ecology due to the use of pesticide.
Hazardous materials		In the resettlement area, 0.5% bromadiolone will be used for rat killing. If the rodenticide is not properly handled or stored, it may threaten the human life and health.	Refer to Appendix 4: Hazardous Material and Waste Management Plan for the notice on the use and storage of such rodenticide.
Social impact	Life quality	After resettlement, the migrants will have the farmland with the quantity and quality similar to the conditions before the inundation; meanwhile, by making use of land compensation fund and beneficial conditions with reservoir operation, the land productivity of resettlement areas will be improved. There will generally no impact on the life style and livelihood of migrants; however, their living environment and traffic conditions will be significantly improved. In general, their life quality will be dramatically improved.	Positve impacts, no mitigation measures needed
	Public health	There might be waste from lavatories, animal houses, tombs, which will pollute the water when reservoir would be filled in with water. With the enlarge of water surface, more mosqitoes might be generated ; with the inundation, the density of rats arounding the reservoir will increase, disease lead by rats or vectors might increase. Therefore, there will be more need for epidemic control	Enhancement of local clinics: The village clinics will be provided with budget for village accepting resettlement. More equipments will be procured with medicines and test kids for village clinics in reservoir area. Viral hepatitis, diarrhea, typhoid, hemorrhagic fever, canicola fever, malaria are the key diseases to be tested. Clinic training: Staffs in the village clinics and the clinics in communities of resettlement sites will be trained. Cleaning of reservoir bottom: Disinfection shall be done to lavatories, night soil ponds, animal houses and tombs, which will be inundated by reservoir. All domestic solid waste shall be treated sanitarily. All existing hospitals, clinics shall be cleaned competely. Waste collected from these facility shall be disinfected or to the landfill. The entire area to be cleaned is about 912,500m^2.

Enviro-Social index		Potential Impact/Issues	Mitigation Measures/action plan
			Living sanitary condition: The resettlement sites selected are high, good environment with water resource. Biogas tank will be installed for treating local night soil. Enhancing the disinfection of water resources and management to improve the drinking water quality. The resettlement site and its surrounding shall be sanitarily cleaned before they move in. All solid waste sites shall be planned in advance. All public sanitary facilty in towns with resettlements shall be planned. Public lavatory shall be installed with local population (one seat for every 50 population)
			Disease testing and epidemic innoculation: During the resettlement period, there will be once every two year testing for vector and natural focus infection disease (about 150 personnel/per test). For resettlement people with fever, blood test for malaria will be made (590 personnels/year for two years) ; every year before the epidemic season starting, for sensitive groups with minor moval from reservoir (back up a bit), 5% of population vaccacination would be put on them for Hemorrhagic fever, leptospirosis disease.
			Public education: For those people staying their partially inundated community and no resettlement is needed and for people resettled, during the resettlement period, there will be once every year of public education for infection disease widely seen in this area and vaccination of these disease. There will also be public education for epidemic prevention and public health.
			Vector control: Mainly for rat control. Locations would be surrounding of house, in house, and farm land (old farmer's house, area above the inundated line of reservoir for resettlement sites). Effort will be made to ensure the rat density would not be higher before the reservoir being construction or meet with national standard. Rat control action will be taken through cooperating with the reservoir impoundment – the first round will start when power is generated from the Group 1 power generator and the water level of reservoir reaches 56m. Monitoring action will also be taken for rat types and density. Site visit shall be made to understanding better about rat situation. The rat control action shall be planned according site visit for different time, locations, etc.
		Use of Miehailing Aerosol and Bromdiolone for vector control may cause risks to human health if without appropriate handling and storage.	Respectively refer to their material safety data sheets attached to the products for safety instructions on product handling and storage.
	Community organization	The integrity of village might be threatened; there might be change of village population and also change of village organization; resettled people in the new community might be Marginalized ; there might be a whole series problems for resettled people to be able to adapted in the new community ; more pressure will also be put onto the public infrastructure in the resettled site ; the work loan of community committee might also be increased in the resettled site.	- The resettled population shall be done through resettling the entire village or at least resettled with family; - Resettled people shall involve to the local manament life : there shall be at least one resettlement representative in both village committee and district committee; - Providing convenience to people resettled with family and family tribe; - All resettlement and original residents shall share the same warefair and responsibility. They shall live togehter in their daily life as : recreation, training, job ,etc. - Distributing land, and public benefit with fair during the resettlement period; - Enhancing the capacity of village committee. Person with reputation shall be dedicated to the resettlement, and response to daily monitoring of resettlement ; - The ownship of public assets in original village shall be respected. Effort shall be made to promote the equalization of resettled people and original residents

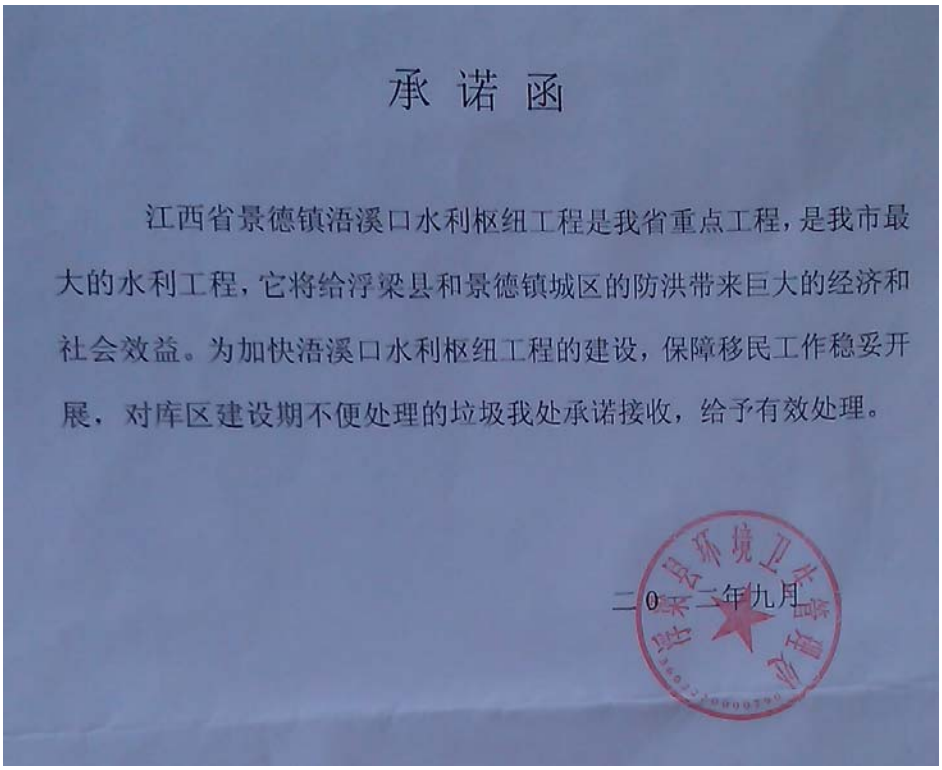
Enviro-Social index		Potential Impact/Issues	Mitigation Measures/action plan
	Traditional culture	The traditional family tribe relationship might be diminished after resettlement	- The resettlement will be done with respect to resettled people. Special consideration will be given to the willingness of resettled people. Effort will be made to keep the original family tribe network. Also, effort could also be made to not put the family tribe people togehter if there is difficulty between them ; - There shall be completed consultation being performed for family tribe to be resettled together. Special attention shall be paid to the leader of this family tribe ; - Promoting the mirage and recreation between resettled people and original residents. - Ensure the issue about resettled people access to medical care, doing business in new place and children going to school;

Table 31: Domestic Wastewater Treatment Facility Design for Centralized Resettlement Sites of Wuxikou Hydro-complex Project

Village and town	Pop. In 2015	Number of resettlement site	Wastewater flow（m3/d）	Treatment process	Volume of wastewater	Volume of sludge	Air volume	Total volume
Zhitan village	3341	28	320.7	Anaerobic	1122.6	641.5	229.3	1993.4
Jiaotan Town	548	4	52.6	Anaerobic	184.1	105.2	37.6	327.0
Xingtian Village	515	4	49.4	Anaerobic	173.0	98.9	35.3	307.3
Fuliang Town	1731	8	166.2	Anaerobic	581.6	332.4	118.8	1032.8
Sanlong Town	228	2	21.9	Anaerobic	76.6	43.8	15.6	136.0
Hongyuan Town	481	3	46.2	Anaerobic	161.6	92.4	33.0	287.0
Zhuangwan village	108	1	10.4	Anaerobic	36.3	20.7	7.4	64.4
Xianghu Town	762	4	73.2	Anaerobic	256.0	146.3	52.3	454.6
Wanggang Village	148	1	14.2	Anaerobic	49.7	28.4	10.2	88.3
Ehu Town	782	5	75.1	Anaerobic	262.8	150.1	53.7	466.6
Total	8644	60	829.8		2904.4	1659.6	593.3	5157.4

The domestic solid waste is proposed to be disposed at the nearby Sanlong Municipal Solid Waste Sanitary Landfill Site, which is designed for the disposal of domestic solid waste from the urban area of Fuliang County and nearby suburban areas with the capacity of 730000m^3. Its service life will be 25 years. The landfill site has got its EIA developed by Jingdezhen Municipal Environmental Assessment Institute and approved by the municipal EPB. Currently the main works for the landfill site has been completed by September 2012 except the leachate drainage system. It is expected that the project will be completed by middle 2013, when the proposed Wuxikou project starts construction. The administration of Sanlong Municipal Solid Waste Sanitary Landfill Site has issued a committement letter for the acceptance of solid waste from the implementation of Wuxikou project, as shown below.

Figure 23: Committement Letter for Disposal of Solid Waste from Wuxikou Hydro-complex Project



承 诺 函

江西省景德镇浯溪口水利枢纽工程是我省重点工程，是我市最大的水利工程，它将给浮梁县和景德镇城区的防洪带来巨大的经济和社会效益。为加快浯溪口水利枢纽工程的建设，保障移民工作稳妥开展，对库区建设期不便处理的垃圾我处承诺接收，给予有效处理。

二〇一二年九月

Committment Letter

As a provincial key project, Jiangxi Province Jingdezhen Wuxikou Hydro-complex Project is the biggest hydraulic project of Jingdezhen Municipality, which will bring significant economic and social benefits for the flood control of Fuliang County and urban area of Jingdezhen. To facilitate the construction of Wuxikou Hydro-complex Project and ensure the smooth implementation of associated resettlement work, our department hereby makes the committement to accept and effectively treat the solid waste from the reservoir construction and difficult to be disposed.

Fuliang County Environmental Sanitation Administration Bureau
September 2012

12.2. ENVIRONMENT IMPACT ASSESSMENT OF RESETTLEMENT OF ZHITAN TOWN

The location of current Zhitan Town is about 50 km to northeast of Fuliang county central urban area. It is the capita of Zhitan Village with population of 2149. There is public water supply system to people living in this town. No public drainage system has been installed. The altitude of this town is in between 54 to 56 meter. With the construction of Wuxikou Hydro-complex, this town will be inundated. Therefore, the entire town shall be resettled. It has been decided by Fuliang County Government that Zhitan town shall resettled to new place with its administrative function being maintained.

A updated resettlement plan has been made based upon:

- Ensure an appropriate cooperation of town construction, social & economy development and environment protection;
- Rational plan for various building, road, and public infrastructure, etc.;

This resettlement plan was consulted among Zhitan Town residents and local government. The final site selected for resettlement of Zhitan Town is a hilly land on eastern side of Zuoyuan Group of Zhitan Village Community of Zhitan Village (see picture below). The area is covered mainly by rice farm land with mountains on its north, and Dawuli on its west, the eastern side is close to the original site of Zhitan village government building. The total area of this site is about 997,351m2. The short term development will focus on the sides of New Zhitan Avenue with total area of 235,094.57m2. In the long term, the development will expand from the short term site. The local geographic condition is relatively simple, and could meet with the requirement of Zhitan New Town's short term and long term development. The simplified land use has been planned as: residential land (40.18%）, land for public building（32.06%）road & plaza（9.09%）, land for public infrastructure （7.27%）and greenery area（4.57%）。

Figure 24: Current Situation of Land Planned for Resettlement of Zhitan Town

The Zhitan New Town site is very stable with Seismic peak ground acceleration of 0.05g. There has been no bad geophysical phenomenon being detected. It has also small slope, good vegetation, natural drainage creeks and flow rate are small with no potential of side sliding, flood and mud flow, etc.

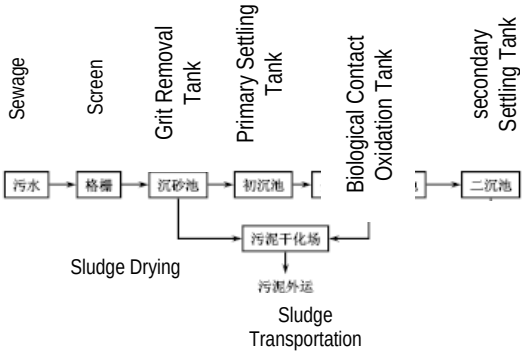
In this new site, there is many natural resources, with good vegetation coverage. There is Wuxikou Reservoir will on its eastern side. This will provide enough water source to local people. With this large reservoir constructed, there will be inland lakes formed. This would lead to a natural scenery, which would be good for local resident's life, and would be good to build recreation sites. All these would be good of having a new town constructed here. Also, because it is a resettlement of entire town, there will be no disruption of the town's original political, economical, cultural, social function and structure. The new site of Zhitan Town has Changjiang River. The new installed railway will pass through this town. It will also be surrounded by a county level road, which will connect with State High Way 206. All these will bring great convenient of transportation. On the aspect of water supply, there are plenty of surface water bodies on the new resettlement site. And there is also quaternary overburden layer pore water and fissure water of bed rocks. These water have good quality and large quantity. And even better, there is Wuxikou Reservoir right beside of this site. The water supply for living and production will be ensured. At the same time, with the construction of Wuxikou Hydro-complex, which will have functions of flood control, power generation and sailing, there will be enough power provided to this town.

The potential environment impact and its mitigation measure of Zhitan Town new site construction are given below：

Table 32: Potential Environment Impact and Mitigation Measures of Zhitan Town New Site Construction

Environment index		Potential environment impact	Mitigation measures
I. construction			
Land application		The new site of Zhitan Town will be on the west side of its old site. There is similar situation on the aspect of climate, natural and economy. There is plenty of natural resource and good vegetation condition. It is a good site for establishment a new town.	Positive impact. No mitigation measures is needed.
Land acquisition and resettlement		There will be total of 314.7 mu (18 mu is farm land) of land to be acquired in this town. There will be 20 people impacted from 5 households.	There is already a detailed resettlement action plan, which will be implemented in the project implementation stage.
Soil erosion		The total area of this town is about 23.52hm2. there might be soil erosion if the construction of this town could not be well managed.	The earth removal and earth filled in shall try to be balanced according to the requirement listed in "Soil Erosion Prevent Solution Report". At the same time, there shall be greenery area belt along the out ring of resettlement site and related roads. The planned total vegetation area of this town is about 2.35hm2.
Ambient air quality	Construction dust	There might impact on local residential from the dust of resettlement site construction	- The soil pile shall be limited with its slope. All disposed soil shall be compacted on time. No unpackaged cement shall not be stored without covering - During the non-rainy day, watering action shall be taken for dust prevention. When there is wind with speed over stage 4 (5.5 – 7.9 m/s), construction work shall be stopped.
	Vehicle exhaust and traffic dust	There might be impact on local residents from the dusts and exhaust produced from material transportation vehicles on the road	- There shall be regular checking and maintanene of vehicles. All these vehicles shall meet with existing national vehicle exhaust dischare standards. - When transporting dusty material, the material should be watered or covered. When shipping unpacked cement, the vehicle tanks shall be well sealed. All these vehicles shall be cleaned regularly. - In the non-rainy day, for road with residents nearby, and large traffic, this road shall be watered

Environment index		Potential environment impact	Mitigation measures
Noise	Construction noise	The noise from construction of resettlement site would impact the local residents	- All vehicles shall be able to meet with applicable noise standards for construction machine and standard for noise control in construction site - No high noise construction works onsite which has residential area nearby at night
	Traffic noise	Noise generated from transportation vehicle will impact the residents nearby	- Speed limit of 30km/h in the residential area, and no horning is allowed. - Maintanence to vehicles and raod shall be kept. At the same time, regulary checking to the vehicle will be implemented. All vehicles shall be able to meet with « noise limits of vehicles » and « allowable noise level of automobiles ». low noise vehicles will be encouraged.
Water quality		There will be some wastewater generated during the construction of resettlement sites and also wastewater from camping sites of workers. These wastewater might pollute local environment if it is not properly treated.	Tthere shall be sedimentation tank installed in this resettlement site for simple treatment of wastewater generated, and discharge
Solid waste		The soil to be disposed could be used to fillin other places. And the quantity is more or less balanced. There will only be small amount of soil to be disposed when construction is done for houses and infrastructures	These soil shall be disposed nearby for making flat land according to the requirement from “soil erosion prevention report”
Terrestrial vegetation		There will certainly be some local forest being destroyed by this project. The occupied timeber forest is about 275 Mu.	4.57% of land from planned town will be used for vegetation. The measures listed resettlement action plan and project soil erosion prevention plan will be implemented for compensating and recovery of damaged vegetation.
Cultural heritage		According to current investigation, there is no cultural heritage related for planned resettlement area. There might be cultural heritage discovered during the construction. Then, there might be damages to those new discovered cultural heritage sites or artifacts on site.	If there is cultural heritage site discovered, the construction shall be stopped, and protection measures shall then be taken.
Transportation safety		The risk of traffic accident will be increased with the local traffic increase because of the construction in resettlement sites.	- Public education shall be made to local people for new increased traffic and potential safety measures could be taken through broadcasting, TV channels and posts. - Giving training to drivers, providing good maintainence to vehicles, speed limit, increasing traffic post, definng parking area - Informing local people, coordinating with traffic policeman in the peak hour and some special moment.
II. Operation			

Environment index	Potential environment impact	Mitigation measures
Water quality	The estimated population of this new town (resettled Zhitan Town) will be about 2338. The estimated wastewater would be about 234m^3/d. this wastewater will pollute local environment if it is not well treated.	A wastewater treatment facility will be installed on the western side of this town. A combined system will be installed for the wastewater collection. The final selected treatment process is aerobic treatment process, as shown below. The treated wastewater will be discharged as per Chinese wastewater discharge standard. 
Solid waste	The estimated population of this new town (resettled Zhitan Town) will be about 2338. The estimated solid waste generation is about 427t/year	There will be a new solid waste transfer station installed for this town. The local solid waste will be collected by local sanitation agencies, and transport to a centralized solid waste treatment facility for final disposal.
Public health	With the population growth of this new town, there shall be measures for protecting the public health	Installing public infrastructures for resettlement people. Building public toilets with one seat for every 50 people. Three public toilets have been planned in this town. They will locate on the southern side of public affair site, western gate and eastern gate of central park
		Once every year education for epidemics frequently seen locally about they prevention and inoculation. And also to increase the knowledge of public epidemic control and public health issues
Life quality of resettlement people	There will dramatically improve for living condition and transportation condition of resettlement people in this new town.	Positive impact, no mitigation measures is needed.

13.IMPACT ANALYSIS OF ROAD PROJECT

The length of access road for the project totals 18.6km, covering 24.69hm^2, mainly farmlandand forestland. Among others, the 9.1km is construction road for temporary use, with an area of 6.73hm^2 as farmland, forestlandand wasteland; while the rest 9.5km is permanent road involving an area of 17.96hm^2. In addition, 260m-and 50m-width bridges have been involved in this project. For the resettlement sites, totally 39.9km of rural roads have been planned. For road projects, the major environment impact comes from construction period, the related impact analysis and relief measures have been shown as follows:

Table 33: Environmental Impact Analysis and Mitigation Measures of Road Project

No.	Project Phase	Impact Element	Major Environmental Impacts	Mitigation Measures
1	Cons-truction	Air	Exhaust emissions from concrete machine mixing and running; dust caused by site excavation, land leveling, material handling, dumping and construction generate a lot of dust will impact ambient air quality.	Good-condition precipitators should be installed at concrete mixing station to control the dust emission in line with the requirements of GB. Necessary measures should be taken during the construction for emission reduction, dust prevention and dust suppression by sprinklers and additional shelters. Strict management on vehicles should be carried out to avoid overload and over speed; road watering and covering materials should be used to reduce the dust's impact on surrounding environment.
2		Noise	Transport noise on access roads might impact normal livings of villagers of Wuxi, Jinjiazu and Luoxi.	The transport noise should be in line with national noise standards, using low-noise vehicles; Greening along streets should be stressed, road maintenance and vehicle maintenance should be valued ,so that noise source could be reduced as most as possible; The management of transport vehicles should be implemented strictly, controlling the speed passing concentrated residential areas avoiding loudspeakers, warning signs and speed limit should be set at access roads and all temporary crossings.
3		Wastewater	A small amount of alkaline wastewater will be produced during concrete process stage, the oily wastewater from machines and domestic wastewater from camps on site might affect the water quality. The piling works and the construction of the bridge project will impact on water quality of rivers.	The wastewater produced during concrete operation stage can be used on dust watering; no need for further treatment, the surrounding water environment will be influenced. The domestic wastewater is in small quantity, the COD concentration will decrease after mixing in water body. With simple treatment, the water quality of outflow at 15 m downstream can reach III class. Some oily wastewater produced at site will cause little environment impact after simple treatment.
4		Solid Waste	The wastes produced during construction period might deteriorate the environment quality of surroundings.	The construction waste should be controlled strictly with manuals during construction. The residual materials should be minimized, for those left on site should be well kept at places to be fully utilized in future.

No.	Project Phase	Impact Element	Major Environmental Impacts	Mitigation Measures
5		Soil Water Conservation	The total length of new- and re-built road for temporary and permanent purposes is 19.5km, with an area of 9.40hm2, the land excavation will directly worsen surface, in result of ecosystem deterioration or degradation, as well as soil erosion. The bridge construction will cause soil erosion at local to some extent.	During construction, drainage systems will be built up along temporary roads on both sides, the road slopes will be protected, the trees will be planted along streets. After its completion, the road should be cleared up, the wastes should be removed, and the cement floor should be replaced with planting or agricultural rehabilitation based on the local conditions. The engineering quantity for soil conservation include 3240m^3 of drainage ditch excavation, 5.4hm^2 of land leveling, 3142.5m^3 of masonry sash slope; 3.4hm^2 of afforestation, 22667 tree planting and 3.4hm^2 for grassing. The engineering quantity for Permanent road include sash slope 3928.13m^2, land leveling 1.20hm^2, poplar 2000, lespedeza 4000 and grass 1.2hm^2.
6			The borrow areas at Baojia and Luoxi will be used which might cause soil erosion to some extent.	Before mining, drainage system should be built up at 5m outside with slope protection. The temporary spoil should be well controlled with setting up temporary retaining wall and covering the mounds. When the project is finished, the land should be cleared up, the necessary measures should be taken on the exposed surface and afforestation should be planted on damaged areas.
7			The residue produced by the project might cause soil erosion at partial areas.	The residue area will be reserved for the whole project with retaining wall, drainage system and vegetation.
8		Ecology	With the transportation rehabilitation, regional vegetation and terrestrial animals will be impacted. For those affected species are common and the influences on them are limited and temporarily, and will disappear gradually with construction completion.	In consideration of local vegetation characteristics, the planting rehabilitation along street, the afforestation, the planting and grassing will be carried out; the detailed engineering quantity has been shown at Item No.4.
9		Restoration	Historic site might be found during construction.	During construction, the historic site should be kept well once it's found. The contractor has responsibilities to reserve the site and protect historic items, suspending the working and informing the supervision engineers and local relic department. The working could be continued when the necessary measures have been taken by local authority.
10		Land acquisition	The land will be occupied to build the temporary and permanent roads.	When temporary working has been finished, the land restoration should be carried out as soon as possible. For permanent land, RAP should be developed with the related compensation.
11	Opera-tion	Noise	Noise generated by transportation along the permanent road might have some environment impact on surroundings.	The traffic management should be strengthened, for the permanent roads, especially near the concentrated settlements, it's necessary to set up warning signs and speed limits to mark against loud whistle and clear speed limit.

No.	Project Phase	Impact Element	Major Environmental Impacts	Mitigation Measures
12		Air	The emission from transportation on permanent road might cause some air pollution on its surroundings.	The traffic management on passing vehicles should be stressed to limit overloading, prohibit over speed, and reduce dust emission by spraying and watering.

14. ENVIRONMENTAL MANAGEMENT OF ASSOCIATED POWER TRANSMISSION LINE PROJECT

The construction of associated power transmission line for Wuxikou Hydro-complex Project will be started at the latter stage of the project by local grid company, therefore, this chapter has provided preliminary analysis of environmental and social impacts during the construction and operation of the associated power transmission line project in order to provide reference for the future project environmental impact assessment and better develop necessary environmental mitigation measures for the project for the next step.

14.1. ENVIRONMENTAL IMPACT ANALYSIS

As described ealier, the associated project mainly involves 24 km of power line with voltage of 110 KV (from the Wuxikou Hydro-complex to local power transfer station). The impact of having a power line includes impact from construction, operation and maintanence of power ling with details listed below：

（1） Construction Period :

a) The land acquisition for the project will change the original land use;

b) The vegetation might be damaged during construction, resulting in water and soil loss, adverse impact on local flora and fauna, and degradation of local ecological environment and natural scenery;

c) The construction activities, such as: building access road, transportation of materials, erection of power tower, installation of power cable and lightening line, etc., will generate noise, wastewater and dust, which will impact local environment;

d) The installation of spanning transmission lines will take safety risk which might cause power outages and affect the local power grid's operation.

（2） Operation Period :

a) In the power transmission or voltage conversion process, there will Power frequency electric field and magnetic field generated, and magnetic radiation might be generated during the power transferring and voltage transferring. These will interfere the local wireless signals, have impact on communication and operation of IT equipments and medical equipments, etc.;

b) Under adverse weather conditions, some audible noise will produce by transmission line ;

c) The transmission line and transmission tower might affect local birds by electrocution;

d) The structure for transmission line might affect the local landscape;

a) There might be damage to local ecosystem when crews are maintaining the transmission lines.

b) If it is not well installed, there might be damage to local people's life or treasures because of fire or lightenging generated from power grid.

14.2. GENERIC ENVIRONMENTAL AND SOCIAL MANAGEMENT FRAMWORK

An generic environment and social management framework has been drafted in order to mitigation the listed potential environment impact from this power transfer project. This framework shall be used as reference by local power management departments for project environment impact assessment to be done during the project implementation and facility operational stages.

Table 34: Generic Environmental and Social Management Framework for Associated Power Transmission Line Project during Construction and Operation

Enviro/Social index	Impact/Issues	Mitigation Measures/Action Plan	Implemented by	Supervised by
I.	Construction period			
resettlement	The implementation of this project will acquire some land. This will have impact on local residents. However, the design work of this project is still to be done. Therefore, the detailed information of land acquisition and resettlement is still to be defined.	The route of this railway shall be further optimized in order to limit the land acquisition, and avoid the passing through the area with dense residents. With the power line to be implemented by local power supply agencies, a detailed resettlement action plan will be required by following the Chinese laws and policies and also for the implementation of this resettlment action plan	PIUs, and local government	Superior state land management agency and local land management agency
Soil erosion and ecology	The original topography and vegetation could be damaged by this project. This might lead to local soil erosion. There will also be disturbance and destory to the wildlifeliving condition	- The selected route shall avoid the natural reserves and other environmentally sensitive area. Try to make use of existing roads and not to damage the natural landscape. - When installing power line, with high power tower acrossing the local forest shall be encouraged in order to limit the damage to forest.； the foundataiton of power tower could be using injection piling technology to avoid surface digging and damage to local vegetation； with power cable to be installed, some termporary cable installation towner shall be used in order to avoid damage to vegetation below the power lines. - The surface soil and sub-layer soil digged when power tower foundation to be made shall be stored separately. When doing refill, sub-surface soil shall be filled in first, then surface soil filled in order to ensure an easy recovery of vegetation - Construction shall not be performed during the windy or rainy weather in order to limit the soil erosion. - Education and training shall be provided to workers in order to ensure the environment management. There shall be strictly control of construction size, ensure good construction behavior and wildlifehunting is strictly forbidden.	PIU, Contractor and supervisor	Municipal hydrologic bureau and EPB

Enviro/Social index	Impact/Issues	Mitigation Measures/Action Plan	Implemented by	Supervised by
Air quality	The local embient air quality will be polluted because of the dust generated during the construction period.	- The slope of soil pile shall be limited. The disposed soil shall be compacted anytime. The open stored soil shall be watered in sunny and windy day. - For the construction site with lots of open earth removal work, there shall be watered to the site in order to limit the dust during the non-rainy day. - There shall no construction in windy day. - For the sensitive sites near construction site, there shall be fence installed. This shall be installed by following the estimated results of environment impact assessment	PIU, Contractor and supervisor	Municipal EPB
Noise	There will noise impact from construction to the residents nearby	- The noise standards for construction machines and construction site shall be strictly followed. - High noise construction activities shall be forbidden at night in the site near to residential area. - For the sensitive sites near construction site, there shall be temporary noise curtain installed . This shall be installed by following the estimated results of environment impact assessment	PIU, Contractor and supervisor	Municipal EPB
Water quality	The discharge of untreated wastewater from comping site of construction workers and wastewater from construction will pollute the local water body	There shall be sedimentation tank installed in construction camping sites and construction site. All wastewater shall be treated to meet standards for discharging	PIU, Contractor and supervisor	Municipal EPB
Construction safety	During construction, there is safety risk when spanning transmissionline, which may cause power failure and the normal operation of local power grid.	Strengthen the construction management, especially the education and training of construction workers on construction safety to prevent any potential safety accident.	PIU, Contractor and supervisor	Power grid company
Cultural heritage	There might be cultural heritage being discovered during the construction period. And there might be damage to the discovered cultural heritage or artifacts	Construction shall be stopped when cultural heritage site being discovered. And protection shall be made to this cultural heritage immediately	PMO, Contractor and supervisor	Fuliang County cultural and Broadcasting bureau, Jindezhen Relic bureau
II.	Operation			
Ecology	During the maintanence period to power line, the maintanence crews might damage the local eco-system	There shall be training to the maintanence crews for eco-system protection. The crew’s activity shall be limited in a small space in order to limit the potential disturbance to the local eco-system	Power management bureaus	Municipal EPB
Noise	During the power line operational period, in a bad weather, there will be noticeable noise generated from corona	- Stay away from local houses, and other sensitive points when the route being selected. - The corona and noise could be minimized through design optimization, selecting high voltage electric equipment, conductors, increasing the effective diameter of conductor, and selecting conductor with no corona generation in bad weather	DIs, PIUs, contractors and supervisors	Power management department
Solid waste	During the maintanence period, crews might generated waste, and leave it on site.	All waste shall be taken away by maitanence crew when their work has been done.	Power management bureaus	Municipal EPB

Enviro/Social index	Impact/Issues	Mitigation Measures/Action Plan	Implemented by	Supervised by
Magnetic radiation	Magnetic radiation will be generated from Power frequency electric field and magnetic field, when the electricity being transferred or voltage being changed in this power line project. Magnetic radiation will have impact on local environment and residents, having impact on wireless signals, local communication, and impact on functions of IT equipment and medical equipments	- Stay away from local houses and other sensitive points when the route being selected. - Slecting low interference equipment on the aspect of Power frequency electric field and magnetic field and wireless signal. Some shielter device could be installed for those equipment which might lead to large megnetic vibration. All holes, gates and connections shall be sealed. Average voltage action shall be taken to the high voltage equipment ; - Increasing the height of power cable. Installed shield lines at place where shielding effect could be good in order to limit the impact on local communication system	DI, PIUs, contractors and superisors	Power management department
Public health and safety	If power cable not being well installed, there might be fire or lighting during the operational stage. This would bring risk to public assets and safety	- Ensure the proper height of power cable to the ground level, and also the cross of two lines. All these shall meet the « design guide of power cable bridging with voltage in between 110 to 750kV » - Routine checking shall be ensrued during the operational period to ensure the line safety	DI, PIUs, contractors and superisors, and Power management bureaus	Power management department

15. SOCIAL IMPACT ANALYSIS AND MITIGATION MEASURES

Based on the social impact assessment report dated May 2012 provided by Hohai Universit, this chapter will analyze the potential social impacts of Wuxikou hydro-complex Project, and summarizes the corresponding mitigation measures proposed against these potential social impacts during project construction and operation.

15.1. RESETTLEMENT WILLINGNESS SURVEY

During October and November 2011, the Fuliang County Resettlement Headquarters organized township and village officials to conduct a resettlement willingness survey on 2,220 displaced households in the townships affected by reservoir inundation (Xingtian Xiang, Jiaotan Town and Zhitan Xiang), and 737 households of indigenous residents in the townships in the resettlement areas (Fuliang Town, Sanlong Town, Hongyuan Town, Zhuangwan Xiang, Jiaotan Town, Wanggang Xiang, Xianghu Town and Ehu Town). The survey findings include: 1) As compared to the resettlement plan, 387 out of the 2,220 displaced households have different expected resettlement modes from the resettlement plan, accounting for 17.43% of all samples. Some villagers in Hongqi Group of Longtan Village, Zhitan Xiang, and Tansan and Chaye Groups of Tankou Village, Xingtian Xiang expect outward resettlement, but since only houses and no productive resources are inundated, these households were planned for backward resettlement; villagers in Zhengjia, Diaoyu and Yangjia Groups of Zhitan Village, Yaojia, Banshang and Zhangjia Groups of Meihu Village, and Chengjia Group of Daheli Village, Zhitan Xiang were planned for outward resettlement due to the insufficient environmental capacity for backward resettlement. 2) Among the 737 households in the resettlement areas, 671 are willing to accept migrants and 48 are unwilling, accounting for 7.15%. They are unwilling to accept migrants mainly because they cannot get along well with migrants and social conflicts are likely to arise. Some villages once received migrants from the Three Gorges Reservoir, but experienced conflicts due to differences in crop structure and cultural customs, so host residents having such an experience are worried about conflicts with migrants.

15.2. SOCIAL IMPACT ANALYSIS

15.2.1. POSITIVE IMPACTS

The following positive social impacts are expected from the Wuxikou Hydro-complex Project which will promote the development of local social economy.

a) **Improving the urban flood control capacity of Jingdezhen City**: The upper Changjiang Riveris one of the main rainstorm centers in northeastern Jiangxi, and Jingdezhen City on the middle Changjiang Riveris often hit by floods. In 1998 Yangtze River floods, 271,800 persons were affected, accounting for 88% of urban population; during 2008-2010, 3 catastrophic floods occurred in Jingdezhen City, when the average levels of the Changjiang Riverwere above 31 meters, 3 meters beyond the warning water level, resulting in repeated urban water-logging. At the checked flood level, the gross storage capacity of the Wuxikou Reservoir 475 million m^3, 2.7 times that at the normal pool level, so that it can regulate and

intercept floods, reduce the peak discharge of the downstream river channel, and mitigate the risk of flooding and water-logging effectively. Through combined operation with urban embankment works in Jingdezhen City, the city's flood protection standard will be increased from every 20 years to every 50 years, thereby reducing flood losses.

Interview 1—urban resident of Jingdezhen City

"During the Dragon Boat Festival of this year, it kept raining, and the city was flooded by half a meter; taxies ran at double the fare, and some people even caught fish with a net on streets." "Presently, floods are more serious than in the past. Even in 1998, the situation of the Changjiang Riverwas not so bad. Now, we have to wade through water across streets, and streets are full of stinking odor."

Interview 2—villager of Liukou Village, Zhitan Xiang

"There is a major flood almost every year. After raining for over 10 days, the fields are full of water; last year, even my house was flooded." "The pedestrian bridge in the village has been flushed away, and children have to be carried on the back of parents to get through it."

b) ***Meeting water and power supply demand, and promoting sustainable economic development:*** After its completion, the Wuxikou hydro-junction will provide a regulated discharge of 16.45m3/s (95%) to the downstream river channel, and meet the demand of urban water supply, and ecological and environment water utilization of Jingdezhen City. The hydropower station of the Wuxikou Reservoir has an installed capacity 32MW, an annual power output of 8,121×104kWh and a guaranteed output of 2,234kW. When completed, the Project will play the role of peak regulation in the regional power grid, and provide necessary funding sources for the regular operation and management of the hydro-junction, and sufficient electric power to the locality. Water resource development features high investment intensity, high return and strong industry promotion effects. Rich water resources will provide great potential for regional economic development, reduce air pollution from thermal power generation and coal burning, and protect regional air quality. This has realistic significance in promoting economic development, especially for cities like Jingdezhen in which agriculture is dominant.

c) **Improving infrastructure, and the production and living environment of migrants:** During resettlement, traffic facilities that will be partly inundated by the reservoir, such as roads, wharfs and ferries, will be reconstructed to the original function, size and standard, and 4 highway bridges, 9 passenger ferries, 4 car ferries and 8 highway traffic terminals, 3 district/township terminals, 5 bus stops, 10kV power transmission lines of 116.21km, 35kV power transmission lines of 23km, one 35kV substation, irrigation canals of 15.8km, and 7 reservoirs/dams will be newly built. In rural areas, circular roads will be built to provide convenient traffic. Infrastructure will be planned for resettlement sites with a population of over 100; an excellent leisure environment will be created for those with a population of over 400, including green spaces, ground decoration and street furniture. In the subsequent support stage, financial support will be provided for the construction of basic farmland, water, electricity, housing, medical, educational and other infrastructure in the resettlement area. Through infrastructure construction in the resettlement area, a favorable living environment will be created for migrants, so that they enjoy better production and living conditions than in the reservoir area, and grater convenience in medical care, traveling and education. This will greatly promote local socioeconomic development, and make it possible for migrants to increase income and become richer.

d) ***Promoting the development of tourism and related industries:*** After reservoir impoundment, many artificial lakes will be created, and the broad, wandering reservoir will become a new scenic spot. Presently, the tourism planning of the whole reservoir area has

begun in Zhitan Xiang. Through constructing the round-lake road, supporting agritainment development, developing wharves, giving play to advantages in farm and sideline products, further processing bamboo, tea-oil tree, tealeaf, fungi, fruit, chestnut and other farm products, and developing Red tourism and eco-tourism under the tourism development plan, migrants will become richer stably. The tourism of the townships around the reservoir area will hopefully develop, thereby providing market for local farm and sideline products. The agricultural development of these townships will be combined with tourism development to create a synergetic effect.

e) ***Promoting new countryside building, and improving urbanization level:*** With the planning of new countryside building and the development of local tourism resources, migrant houses in the reservoir area will be built into traditional Anhui-style architecture. In particular, the Zhitan market town will be re-planned, reconstruction, and expanded in size and function, thereby attracting more people to the market town. In addition, the reservoir area's infrastructure and service facilities will be more sophisticated, and the living environment will be improved gradually, which is consistent with the goal of new countryside building. In addition, during the construction period, 500-800 unskilled jobs will be made available to local residents, not only providing job opportunities to them, but also promoting the transfer of rural labor to nonagricultural industries and driving the urbanization process. With the implementation of the RAP, especially productive development measures, local industrial restructuring will be promoted, and the transfer to nonagricultural industries with higher economic value, such as forestry, fruit, tealeaf and tertiary industries, thereby laying a good foundation for migrants' production restoration and income improvement. With the implementation of the state subsequent support policy and the rapid development of the local energy economy, the living standard of migrants will reach or exceed the local rural average in the next 3-5 years, thereby setting an example for local socialist new countryside building.

f) ***Increasing job opportunities, and improving villager income:*** The Project will drive investment in infrastructure construction, and the development of related industries, including construction, building materials, real estate, catering and accommodation, and generate considerable job opportunities for local residents, thereby mitigating the pressure of employment. Second, without affecting the water quality and ecological environment of the reservoir, the reservoir area may be used to develop aquaculture and tourism, in which priority will be given to migrants. Flexible-minded residents living around the reservoir area may develop agritainment, and use most of land in the drawdown area to grow late rice, potato, vegetables, etc. to generate additional income. With the establishment of a new eco-tourism village cluster in the reservoir area, local residents' production and living conditions will be improved.

15.2.2. POTENTIAL NEGATIVE IMPACTS

The potential negative social impacts of Wuxikou Hydro-complex Project mainly include the social impacts resulting from project construction and inundation, land occupation and resettlement and the potential impacts on the livelihood of fishmen, vulnerable groups, women, community organizations, indegenous people and traditional culture.

15.2.2.1. IMPACTS ON FISHERMEN'S LIVELIHOODS

According to the information from local fishery authority, there are totally 88 species of fishes found in Jingdezhen Municipality, most of which belong to Cyprinidae. Before 1950's, the fishery in the river basin mainly relies on fish catching; the fish-farming industry develops quickly with the development of artificial ponds and small reservoirs in the river basin since 1960's. The statistic data show that in the total output of aquatic products of 2565 tons in Changjiang river basin in 1985, only

about 25.4% was from fish catching. With rapid development in the basin in recent decades, some rivers in the basin have been severely polluted by untreated wastewater discharge from industries, and it has almost resulted in the extinction of aquatic flora and fauna in Xihe River, one of the tributaries of Changjiang River. Due to insufficient fishery administrative management, the illegal fish catching activities such as poison fishing, dynamite fishing and electric fishing and overfishing have resulted in the severe reduction of fishery resources in the river. In addition, the fish spawning, feeding and migration has also occurred adverse impacts with the implementation of cascade development in recent decades. The size of caught fish is getting smaller and smaller, and some famous economic fish species such as Spinibarbus Sinensis，Opsariichthys bidens and mandarin fish has shown the depletion of resources. According to the local fishermen, there are over ten kinds of fish not being caught for many years, such as luciobrama macrocephalus, zacco platypus, pseudolaubuca engraulis, coreius heterodon, etc. The annual fish catch has dropped to 1024 tons for the whole Jingdezhen Municipality, in which 545 tons for Changjiang District and 479 tons for Fuliang County.

According to the fish-farming water area development plan for Jingdezhen Municipality (2005~2015), there were 550 fishermen in Fuliang County in 2004. Among others, only 183 are full-time and the other 367 are part-time. In the 183 full-time fishermen, 28 are living on fish-catching, 144 are living on fish-farming, and the other 11 are responsible for logistic activities. The total area of fish farms in 2004 was 12494mu. With 787 tons of conventional aquatic products (including grass carp, silver carp, bighead carp, carp, crucian and bread fish) and 314 tons of special aquatic products (red purse carp, eel, loach, rice field eel, catfish, salmon, crab, etc.), the output value of fishery was 12.93million yuan, accounting for 2.34% in the total output value of local agriculture.

In relation to the project development, the following detailed investigation has been further carried out specific to the project-affected villages.

1) Demographic Information of Village Collectives

The Changjiang River begins with Daohu and ends at Yushanzha, and runs through 22 administrative villages of 6 townships (Xingtian Xiang, Jiaotan Town, Zhitan Xiang, Fuliang Town, Jingcheng Town and Nianyushan Town) in Jingdezhen City. There are fishermen in 8 villages, which are Maowu, Mingxi, Qingxi, Tankou, Jiucheng, Fenggang, Yushan and Lumeng Villages. It has been found through a population analysis of these 8 villages that there are 57 fishermen in total, accounting for 0.35% of the total population of these villages, including 9 females, accounting for 0.056% of the total female population of these villages. All these fishermen are part-time ones as shown in the table below.

Table 35: Basic Information on Collective Population of Upstream and Downstream Fishing Villages

District / county	Township	Village	Total number of households	Total population	In which females	Part-time fishermen	In which females	Proportion of fishermen	Proportion of female fishermen
Fuliang County	Zhitan Xiang	Maowu	152	621	281	1	0	0.16	0
		Mingxi	345	1481	729	2	0	0.14	0
		Qingxi	355	1410	684	4	2	0.28	0.29
	Xingtian Xiang	Tankou	281	1069	514	4	0	0.37	0
	Fuliang Town	Jiucheng	440	1762	842	2	1	0.11	0.12
Changjiang District	Nianyushan Town	Fenggang	734	3200	1400	8	2	0.25	0.14
		Yushan	1315	5296	2448	32	4	0.60	0.16
		Lumeng	430	1281	633	4	0	0.31	0

District / county	Township	Village	Total number of households	Total population	In which females	Part-time fishermen	In which females	Proportion of fishermen	Proportion of female fishermen
Total			4052	16120	7531	57	9	0.35	0.056

2) Main Income Sources of Village Collectives

The main income sources of villagers in the above 8 villages are industry, employment, agriculture, forestry and crop cultivation, and fishery is not a main income source. In addition, the annual fishery income of the fishermen is 1,500-4,500 yuan, averaging 2,723.38, and the annual income of the fishing households is 3,000-7,000 yuan, averaging 4,787.5 yuan; fishery incomes accounts for 5.79% of gross household income, as shown in the table below.

Table 36: Main Sources of Collective Income of Upstream and Downstream Fishing Villages

District / county	Township	Village	Main income sources of villagers						Annual fishery income of fishermen	Annual fishery income of fishing households	Percentage to gross household income (%)
			1st place	%	2nd place	%	3rd place	%			
Fuliang County	Zhitan Xiang	Maowu	Employment	63	Farming	19	Business	17.6	4500	4500	4.76
		Mingxi	Employment	80	Farming	15.5	Other	0.5	1500	3000	6.54
		Qingxi	Forestry	47	Employment	35	Farming	18	2875	5750	7.54
	Xingtian Xiang	Tankou	Crop cultivation	64	Forestry	15.7	Stock breeding	10.3	2500	5000	7.8
	Fuliang Town	Jiucheng	Industry	60	Tertiary industries	30	Crop cultivation & stock breeding	10	3500	7000	5.27
Changjiang District	Nianyushan Town	Fenggang	Industry	58.6	Farming	39.1	Forestry	2.3	2000	4050	4.56
		Yushan	Industry	62.2	Farming	35.7	Forestry	2.1	3000	5000	5.05
		Lumeng	Industry	62	Farming	36	Forestry	2	2000	4000	4.83

3) Basic Information of Sampled Fishermen

8 of the 57 fishermen were sampled, and analyzed for gender and age of their household population. There are 35 persons in the 8 fishermen's households in total, including 20 men and 15 women, 8 aged 16 years or less, 13 aged 17-39 years, 10 aged 40-59 years and 4 aged 60 years or more.

Table 37: Distribution of Sample Fishermen by Gender and Age

District / county	Township	Village	Head of household	Household population	Gender		Age			
					Male	Female	≤16	17-39	40-59	≥60
Fuliang County	Xingtian Xiang	Tankou	SYS	4	2	2	0	2	2	0
		Tankou	SYB	4	2	2	0	2	2	0
	Fuliang Town	Jiucheng	PGY	6	4	2	2	1	1	2
	Zhitan Xiang	Qingxi	ZJS	6	3	3	2	2	0	2

		Qingxi	CQF	3	2	1	0	2	1	0
		Maowu	WXP	5	3	2	1	2	2	0
Changjiang District	Nianyushan Town	Fenggang	ZJB	3	2	1	1	2	0	0
		Yushan	ZLS	4	2	2	2	0	2	0
Total				35	20	15	8	13	10	4

The sample fishermen's households were analyzed for educational level and marital status. 10 persons have received primary school education, 22 junior high school education, two senior high school or secondary technical school education, and one junior college or above education, and 24 married and 11 unmarried.

Table 38: Educational Level and Marital Status of Sample Fishermen

District / county	Township	Village	Head of household	Household population	Educational level				Marital status	
					Primary school	Junior high school	Senior high / secondary technical school	Junior college or above	Married	Unmarried
Fuliang County	Xingtian Xiang	Tankou	SYS	4	1	2	1	0	4	0
		Tankou	SYB	4	1	3	0	0	4	0
	Fuliang Town	Jiucheng	PGY	6	2	4	0	0	4	2
	Zhitan Xiang	Qingxi	ZJS	6	2	4	0	0	4	2
		Qingxi	CQF	3	0	2	1	0	2	1
		Maowu	WXP	5	1	3	0	1	2	3
Changjiang District	Nianyushan Town	Fenggang	ZJB	3	1	2	0	0	2	1
		Yushan	ZLS	4	2	2	0	0	2	2
Total				35	10	22	2	1	24	11

4) Income and Expenditure of Sample Fishermen

households were analyzed for annual income and expenditure:

The annual per capita gross income of the sample fishermen's households is 17,148.57 yuan, in which agricultural income is 1,248.57 yuan, accounting for 7.28%; sideline income 5,042.86 yuan, accounting for 29.41%; fishery income 1,085.71 yuan, accounting for 6.33%; employment income 8,742.86 yuan, accounting for 50.98%; and other income 1,028.57 yuan, accounting for 6%.

The annual per capita gross expenditure of the sample fishermen's households is 16,614.28 yuan, productive expenses 534.29 yuan, accounting for 5.69%; nonproductive expenses 3,457.14 yuan, accounting for 36.81%; fishery expenses 600 yuan, accounting for 6.39%; and other expenses 4800 yuan, accounting for 51.11%.

Annual household net income is 16,614.28 yuan, and the balance of receipts and expenses 7,757.14 yuan.

Table 39: Composition of Annual Household Income of Sample Fishing Households

Item		Per capita (yuan)	Percentage (%)
Annual household income	Agricultural income	1248.57	7.28
	Sideline income	5042.86	29.41
	Fishery income	1085.71	6.33
	Employment income	8742.86	50.98
	Other income (including subsidies, etc.)	1028.57	6.0
	Gross income	17148.57	100.0

Item		Per capita (yuan)	Percentage (%)
Annual household expenditure	Productive expenses	534.29	5.69
	Nonproductive expenses	3457.14	36.81
	Fishery expenses	600	6.39
	Other expenses (including tuition, etc.)	4800	51.11
	Gross expenditure	9391.43	100.0
Net income (income – productive expenditure)		16614.28	
Balance (gross income – gross expenditure)		7757.14	

5) Impacts on Fishermen

Fishery resources in the Changjiang Riverwatershed are already decreasing. After the Wuxikou hydro-junction is put into operation, hydrological and temperature factors will affect upstream and downstream fishery resources relatively slightly; all fishermen along the Changjiang Riverare part-time ones who do not live mainly on fishing, and have rich land and forest resources, and their main income sources are employment, crop cultivation and forestry. In addition, such fish conservation measures as fishing ban, artificial proliferation and artificial fish pass are good to the restoration of fishery resources. Therefore, fishery resources of the Changjiang Riverwill affect fishermen's livelihoods slightly in generals. The specific reasons include:

First, the total volume of fishery resources of the Changjiang Riveris small and decreasing. Since development, over-fishing and illegal fishing activities, and extensive sand extraction and panning operations along the Changjiang Riverin the past decades have resulted in the serious destruction of fishery resources and fish habitats, fishery resources have decreased sharply, and the amount of fishing has dropped from 200-300t/year to 5-10t/year. Currently, fish in the Changjiang Riverfeature reduced number of species and variety, smaller individuals and lower age, and large fish can rarely be captured.

Second, the Changjiang Riverdam and the dispatching of the reservoir affect fishery resources to a small extent. It is known from the Environmental Impact Assessment Report of the Jiangxi Wuxikou Integrated Flood Management Project that after the Project is put into operation, the obstruction of the dam and the dispatching of the reservoir will result in some changes in regional aquatic ecology, and affect the living, feeding and breeding conditions of fish to varying degrees. Generally, after inundation, with the increase of plankton, some fish species will increase, thereby creating a new reservoir community ecosystem; fish species needing high dissolved oxygen content and rapid flow conditions will decrease significantly due to the reduction of habitats in the reservoir area, while fish species living in static water or slow flow habitats will grow significantly; with the gradient development of the watershed, the operation of the Wuxikou hydro-junction will further reduce the flowing water habitat for fish, which is adverse to the expansion and diversification of fishery resources; due to the gradient development of the watershed and combined operation, hydrological and temperature factors will have slightly adverse impact on fishery resources. Therefore, the hydro-junction will affect upstream and downstream fishery resources relatively slightly in general.

Third, fishermen deal with fishery on a part-time basis, as indicated in the survey, and their fishery income accounts for 5.79% of gross household income on average only, while their main income sources are employment, crop cultivation and fishery.

Finally, the implementation of a variety of artificial measures will reduce the impact on fishery resources. Since there have been geographic and temporal fishing restrictions in the Changjiang Riverwatershed before the commencement of construction of the Project, where all fishing operations are prohibited from April 14 to June 30 every year, these measures are good to the conservation and rational utilization of fishery resources of the Changjiang River, and the maintenance of the ecological balance of the Changjiang River. After the completion of the Project, such fish conservation measures as artificial proliferation and artificial fish pass will be taken to reduce the impact of the Project on fishery resources, accelerate the rebuilding and restoration of the

fish population structure in the reservoir area, promote regional ecological balance, and reduce the impact of the variation of fishery resources on fishermen.

15.2.2.2. IMPACTS ON VULNERABLE GROUPS

Vulnerable groups include the disabled, elderly widows, orphans, chronic invalids, low-income people and the poor. According to the survey, 623 persons among the migrants of the Project fall into vulnerable groups. During resettlement, these vulnerable migrants may be faced with greater risks than the others. First, these migrants are often neglected in resettlement activities due to poor physical conditions or weak ability to make a living. Second, these migrants can hardly maintain their livelihoods due to the shortage of labor, and relocation and house reconstruction will undoubtedly increase their pressure and expose them to greater risks of impoverishment. In addition, vulnerable groups can hardly complete the task of relocation and resettlement on their own, but they do not have sufficient social relations and support for this purpose.

15.2.2.3. IMPACTS ON WOMEN

Generally, women are one of social vulnerable groups. In the Project, women have a low educational level, in which those have received primary school or junior high school education account for 70%. Women deal with farming and housework at home mainly, and few are working outside. Due to the traditional household labor division pattern in which "the husband is in charge of external affairs and the wife in charge of internal affairs", women undertake more housework, which is often an unmeasurable part of household wealth, so that people generally think that most of household income is created by men. This is a main reason why women have lower economic and social status, and participate in public affairs at a low level.

In some way, women's impacts and risks during relocation and resettlement are very likely to be neglected. These impacts include: After land inundation, women will undertake less farm work and have more opportunities to participate in other productive activities, such as tealeaf cultivation, thereby maintaining the sustainability of their livelihoods. During livelihood restoration and subsequent support, migrants will be subject to skills training in order to promote the transfer of labor and increase the income of farmers. However, due to the low participation level of women, these training activities are very likely to be dominated by men, and women will be marginalized and become more disadvantaged. In addition, due to the low participation level and ability, and the poor ability to acquire and apply information of women, their true needs and ideas are likely to be neglected during project preparation, implementation, operation and maintenance. Since the traditional village structure is tied up with patrilineal relations, patrilineal relatives almost live in the same village. Once the village is inundated, all these relatives will have to be relocated, so that women will be faced with a greater lending pressure during house reconstruction.9 Women-headed households will be faced with greater difficulty during relocation, resettlement and house reconstruction due to the lack of male labor.

15.2.2.4. IMPACTS ON COMMUNITY ORGANIZATIONS

A. Integrity of village collectives: After reservoir impoundment, a lot of fertile and mature land on both sides will be inundated, creating numerous natural lakes. Some village infrastructure will be inundated and become "isolated islands". According to the survey, there will be 224 affected persons living on such isolated islands, whose production and living conditions will be irrecoverably damaged. The population affected by land or house inundation will be regarded as migrants. In some village collectives, most villagers will be relocated due to inundation, leaving a small population not

[9] Generally, houses rebuilt by migrants are better in quality and standard than former houses, e.g., masonry timber or concrete ones vs. earth ones, and two-storied or multi-storied ones vs. one-storied ones.

affected by inundation that is not included in resettlement. Since these villagers are unable to move with their former village collectives, the integrity of such collectives is damaged indirectly.

B. Structural changes of community organizations: During resettlement, the population and organizational structure of the village committees in the servoir/junction area and resettlement area will change to some extent.

Migrants subject to backward resettlement will be relocated locally, and will have lower difficulty of adaptation after resettlement.

Migrants subject to outward resettlement will be relocated in units of village groups during resettlement, and village groups separated from the reservoir/junction area will become independent production teams that have to be integrated into new village committees, which will be a difficult process due to cultural involution. These production teams will be marginal and disadvantaged in activities of new village committees, and their rights and interests will often be neglected, making integration a longer-lasting process.

Village committees in the outward resettlement area will receive a large number of migrants, so their population, organizational structure and workload will change. Migration is not only a flow of population and materials, but will also bring a series of coordination, organizational and management issues. Indigenous residents in the resettlement area will experience a mental adaptation process with the introduction of migrant population.

15.2.2.5. IMPACTS OF CONSTRUCTION

The access road and the dam will be constructed in Luoxi Village, Jiaotan Town mainly. Site excavation, land leveling, material transport and construction will generate considerable flying dust, tail gas, noise and domestic waste pollution, affecting the daily life and physical health of nearby residents; in addition, construction will also affect traffic and transport activities of nearby residents, resulting in congestion.

During construction, the sudden influx of substantial population and materials will promote the development of local catering, accommodation and other tertiary industries, increase local residents' income, and strengthen their communications with the outside, and highway construction will benefit local residents. On the other hand, this will affect local public security and order; the reduction of the local environmental and community bearing capacity may increase incidences of sexually transmitted diseases and AIDS, and lead to marital and household instability.

15.2.2.6. IMPACTS OF INUNDATION, LAND OCCUPATION AND RESETTLEMENT

According to the RAP, land acquisition and house demolition involve 4,423 households with 16,104 persons in 39 village committees of 13 townships (e.g., Zhitan Xiang, Jiaotan Town, Xingtian Xiang, Jiangcun Xiang, Jinggongqiao Town and Fuliang Town) of Fuliang County, the acquisition and reallocation of 33,008.9 mu of land, including 15,946.5 mu of cultivated land, the temporary occupation of 190 mu of land, and the demolition of residential houses with a total area of 553,030.17 m2. Fuliang County is a traditional farming county. The inundation of a lot of cultivated land will reduce local land resources and villagers' agricultural income, and affect their livelihoods, and the demolition of a large number of houses will add to their living burden. Moreover, during this process, villagers' cultural traditions and social networks will change accordingly.

15.2.2.7. IMPACTS ON INDIGENOUS RESIDENTS

A. Changes of land resources: For migrants subject to resettlement with land, land will be reallocated from indigenous residents in the resettlement area. According to principles 1, 5 and 6 for the selection of resettlement sites, the prerequisites to land reallocation are that "there are rich land

resources available for readjustment or development, and the per capita cultivated area of a resettlement site is higher than the county's average", "the amount of cultivated area reallocated from village groups in the resettlement area will not affect the production and lives of indigenous residents", "indigenous residents in the resettlement area are willing to accept migrants", and reallocated land will be compensated for at location-based land prices. Therefore, though some indigenous residents will have less land resources, their regular production and lives will be affected slightly.

B. Allocation of public resources: During resettlement, indigenous residents will be subject to the reallocation of personal interests and public resources in addition to land resources. For example, the growth of the population in the resettlement area will impose greater pressure on existing water and power supply, traffic facilities, schools and hospitals, thereby affecting lives of indigenous residents to some extent. Different villages in the resettlement area will be faced with different issues after resettlement. For example, migrants in Chada Village will be faced with the issue of how to share the general preferential welfare treatment of their former village.

15.2.2.8. IMPACTS ON TRADITIONAL CULTURE

A. Traditional civil residences and ancestral temples: Rural residences in the reservoir/junction area are of Anhui-style architecture mainly, and some characteristics such as black tiles, whitewashed walls and corbel gables have been kept, while interior structures have changed. Buildings constructed in recent years are mostly modern-style two-storied buildings. After reservoir inundation, in order to maintain traditional attractions and develop tourism, houses of migrants in the backward resettlement area will be of Anhui-style architecture mainly. Therefore, the Project will affect local residences to some extent but not greatly. In addition, 3 ancestral temples in the reservoir area will be rebuilt. These temples are of traditional Anhui-style architecture, and in timber and masonry-timber structures mainly. They are already out of repair and rarely used by clansmen. Due to reservoir inundation, the cultural implications carried by them will possibly disappear.

B. Familial relations: Familial relations are an important social network for local families. Due to the migration of population and the reduction of familial events, these relations are weakening. After reservoir inundation, familial relations of those subject to backward resettlement will change slightly; familial relations of those subject to outward resettlement and self-employment migrants will be affected to some extent, and they will have to be integrated into new social networks in new resettlement sites.

15.2.2.9. OPENNESS AND TRANSPARENCY OF PARTICIPATION

Resettlement requires the whole-course participation of migrants, so participation is an important aspect that runs through the whole resettlement process from the disclosure of project information and policies at the project preparation stage to land reallocation, house reconstruction and compensation disbursement at the implementation stage to subsequent support at the post-implementation stage. Therefore, during the resettlement process, the open and transparent participation of migrants is an important prerequisite to successful project construction and resettlement implementation.

Since there are many deficiencies in the means, capacity and effectiveness of public participation, especially in rural areas where feedback and consultation from the bottom up is neglected, the participation rights of rural residents are often neglected. During the resettlement process, if open and transparent public participation cannot be carried out properly, and an effective grievance redress mechanism for stakeholders, migrants, indigenous residents and other stakeholders will be unable to acquire project and resettlement information effectively and timely, thereby hindering or delaying project and resettlement implementation.

15.3. MITIGATION MEASURES

Targeting at the above-mentioned expected social impacts, corresponding social management plan has been developed for the project, as detailed in Table 40.

15.3.1. MEASURES TO ENHANCE POSITIVE EFFECTS

(1) Improving the urban flood control capacity of Jingdezhen City

At the checked flood level, the gross storage capacity of the Wuxikou Reservoir 475 million m³, 2.7 times that at the normal pool level, so that it can regulate and intercept floods, reduce the peak discharge of the downstream river channel, and mitigate the risk of flooding and water-logging effectively.

Through combined operation with urban embankment works in Jingdezhen City, the city's flood protection standard will be increased from every 20 years to every 50 years, thereby reducing flood losses.

(2) Meeting water and power supply demand, and promoting sustainable economic development

After its completion, the Wuxikou hydro-junction will provide a regulated discharge of 16.45m3/s (95%) to the downstream river channel, and meet the demand of urban water supply, and ecological and environment water utilization of Jingdezhen City.

The hydropower station of the Wuxikou Reservoir has an installed capacity 32MW, an annual power output of 8,121×104kWh and a guaranteed output of 2,234kW. When completed, the Project will play the role of peak regulation in the regional power grid, and provide necessary funding sources for the regular operation and management of the hydro-junction, and sufficient electric power to the locality.

Water resource development features high investment intensity, high return and strong industry promotion effects. Rich water resources will provide great potential for regional economic development, reduce air pollution from thermal power generation and coal burning, and protect regional air quality.

(3) Improving infrastructure, and the production and living environment of migrants

The access road built for the reservoir has improved the highway traffic of Jiaotan Town, and connects nearby villages and townships through a developed traffic network.

Traffic facilities that will be inundated, such as roads, wharfs and ferries, will be reconstructed to the original function, size and standard. The more perfect infrastructure, and the "three supplies and one leveling" in resettlement communities will help improve migrants' production and living environment.

In the subsequent support stage, financial support will be provided for the construction of basic farmland, water, electricity, housing, medical, educational and other infrastructure in the resettlement area in order to improve production and living conditions.

(4) Promoting the development of tourism and related industries

After reservoir impoundment, many artificial lakes will be created, and the broad, wandering reservoir will become a new scenic spot.

A tourism development plan will be prepared for the reservoir area to develop Red tourism and eco-tourism sites. Local products, such as bamboo, tea-oil tree, tealeaf, fungi, fruit, chestnut, and other farm and sideline products, will be further processed to realize a transition from traditional grain-oriented agriculture to diversified eco-agriculture.

(5) Promoting new countryside building, and improving urbanization level

After resettlement, houses will be reconstructed under unified planning based on the requirements of new countryside building and the goal of developing local tourism resources, so as to improve the living environment, develop the rural economy, and promote new countryside building.

The Zhitan market town will be re-planned, reconstruction, and expanded in size and function, thereby attracting more people to the market town and promoting the urbanization process.

Subsequent support will further promote regional economic development, and the living standard of migrants will reach or exceed the local rural average, thereby setting an example for local socialist new countryside building.

(6) Increasing job opportunities, and improving villager income

The Project will drive investment in infrastructure construction, and the development of related industries, including construction, building materials, real estate, catering and accommodation, and generate considerable job opportunities for local residents.

Second, without affecting the water quality and ecological environment of the reservoir, the reservoir area may be used to develop aquaculture and tourism. Flexible-minded residents living around the reservoir area may develop agritainment, and use most of land in the drawdown area to grow late rice, potato, vegetables, etc. to generate additional income.

With the establishment of a new eco-tourism village cluster in the reservoir area, local residents' production and living conditions will be improved.

15.3.2. MEASURES TO REDUCE PROJECT NEGATIVE IMPACTS

(1) Reducing impacts on fishermen's livelihoods

Local fishermen do not live mainly on fishery, and the variation of fishery resources in the Changjiang Riverwatershed will affect their livelihoods slightly after the completion of the Project. The following suggestions have been proposed: a. Combined gradient dispatching below the dam will reduce the adverse impact of the supersaturation of discharged water from the reservoir on downstream fishery resources; b. Continue to enforce the existing fishing ban to maintain aquatic ecological balance and ensure the sustainable development of fishery resources; c. Take such measures as artificial proliferation and artificial fish pass for fish species affected greatly by reservoir inundation to preserve fishery resources; d. Conserve the aquatic environment and give publicity to conservation; e. Strengthen fishery management.

(2) Mitigating or avoiding adverse impacts on vulnerable groups

Take protective measures for vulnerable groups affected directly by resettlement. The following suggestions have been proposed: a. Grant special assistance to certain vulnerable groups or those impoverished due to relocation, such as establishing a special support fund together with the civil affairs bureau; b. Make vocational training, employment guidance and job opportunities first available to labor in vulnerable groups; c. Employ labor from vulnerable households for unskilled jobs first during project construction and operation; d. Provide house construction subsidies to vulnerable households, and make up the rate of compensation for house construction to 25 m2 of

masonry timber structure per capita; e. During relocation, local village collectives should assist in the selection of housing sites, and organize labor to assist in relocation and house reconstruction.

(3) Promoting women's development

In order to involve women in the Project to realize personal development, the social gender perspective will run through the whole process of the Project at the preparation, implementation and operating stages.

(4) Enhancing the cohesion of community organizations

It is advised that population living on isolated islands or inconvenienced by inundation be relocated along with villages and households.

Aiming at the impacts of relocation on community organizations, the following suggestions have been proposed: a. Migrants should participate in grass-root political life, and there should be at least one migrant representative in the committee and party branch of each village in the resettlement area; b. Provide convenience to migrants who with to move along with households and clans; c. Village committees treat migrants and indigenous residents equally, and promote the integration of villagers in cultural, recreational, training, employment and routine discussion activities; d. Treat the allocation of land, public services and other resources during resettlement fairly; e. Strengthen the capacity building of village committees, and assign prestigious persons to be responsible specifically for resettlement tracking; f. Respect the ownership of existing village collective assets, and eliminate inequitable treatment for migrants and indigenous residents.

(5) Reducing impacts of construction on villagers' lives

Traffic: a. During construction, the PMO should ask the construction agency to practice section construction to reduce traffic impacts; b. Disclose construction information to residents so that they can make preparations in advance; minimize the construction period without affecting construction quality; c. Set up road signs to limit driving speed, and communicate traffic safety knowledge.

Noise: a. The PMO should ask the construction agency to comply strictly with the noise standard, and take measures to reduce noise pollution; b. Prohibit high-noise overnight construction and avoid overnight work where possible.

Flying dust, tail gas and domestic waste: a. Sprinkle water on the access road regularly to prevent flying dust; b. Clean up domestic waste on the construction site timely and regulate the behavior of the construction staff.

Disease dissemination: a. Grass-root medical institutions should strengthen the communication and prevention of sexually transmitted diseases and AIDS; b. Education the construction staff on environmental and health awareness.

A grievance redress mechanism will be established to address the above problems (see the EIA Report of the Project).

(6) Risks of inundation, land occupation and resettlement

a. Prepare the RAP and the SA Report, conduct adequate public participation and consultation so that migrants are involved in the project design and their interest appeals are embodied; b. Make reasonable compensation and take livelihood restoration measures. Compensate for affected land and houses reasonably, and provide assistance in house reconstruction to women-headed households, five-guarantee households and other vulnerable households; implement resettlement in conjunction with skills training offered by local governments; make unskilled jobs first available to migrants during project construction; plan productive development projects rationally, such as tea garden development and pseudostellaria root cultivation, organize specialized farmers' associations based

on local characteristics, and allocate market resources rationally, including tealeaf and pseudostellaria root. c. Establish a grievance redress mechanism to solve problems arising from compensation and resettlement timely.

(7) Reducing the impact of land reduction and public resources reallocation on indigenous residents

Conduct land reallocation based on needs of indigenous residents in the resettlement area, and fully inform and consult with indigenous residents before land reallocation; make reasonable compensation in accordance with the new uniform average annual output value rates and area-based integrated land prices for land acquisition of Jiangxi Province.

a. Provide three supplies and one leveling for central resettlement sites in the resettlement area, and avoid or retard the deficiency of infrastructure and supporting services; b. The government should guide village collectives in the resettlement area to reallocate collective assets reasonably, and promote the integration of migrants and indigenous residents.

(8) Reducing impacts on traditional culture

Suggestions on the reconstruction of traditional civil residences: a. Compensate for traditional civil residences at replacement cost; b. Reconstruct traditional civil residences as migrants may wish; c. Give priority to the Anhui architectural style.

Suggestions on ancestral temple reconstruction: a. Demolished ancestral temples should be compensated for at replacement cost, and reconstruction costs beyond former size and structure will be borne by collectives; b. Ancestral temples should be reconstructed in consultation with collectives, and according to local customs for site, size and structure; c. Ancestral temples may be reconstructed in the form of village activity centers as migrants may wish.

Suggestions on promoting the social intercourse of migrants: a. During relocation and resettlement, special consideration should be given to migrants to be relocated along with family members in order to maintain their familial networks; b. Families in conflict should not be relocated to the same resettlement site or village group; c. Family members relocated together should be consulted adequately, especially prestigious elderly members; d. Village collectives in the resettlement area are encouraged to promote the intercourse between migrants and indigenous residents through recreational, intermarriage and other activities; e. Assist migrants in taking medical care, doing business and arranging schools for their children.

(9) Strengthening public consultation and participation

Develop a public participation plan and establish a grievance redress mechanism.

Table 40: Social Management Plan of Wuxikou Hydro-complex Project

Social factor	Potential impact	Mitigation measures	Time	Budget (0,000 yuan)	Implemented by	Supervised by	Monitoring indicators	Frequency
1-Positive benefits								
Flood control	Increasing the flood control capacity of Jingdezhen City	Positive impact, without need for mitigation measure	/	/	/	/	/	/
Water and power supply	Meeting water and power supply demand, promoting sustainable economic development	Positive impact, without need for mitigation measure	/	/	/	/	/	/
Infrastructure	Improving infrastructure and living environment	Positive impact, without need for mitigation measure	/	/	/	/	/	/
Tourism	Promoting the development of tourism and related industries	Positive impact, without need for mitigation measure	/	/	/	/	/	/
New countryside building, urbanization	Promoting new countryside building and improving urbanization level	Positive impact, without need for mitigation measure	/	/	/	/	/	/
Employment, income	Increasing job opportunities and income level	Positive impact, without need for mitigation measure	/	/	/	/	/	/
2-Potential impacts								
Fishermen	The obstruction of the dam and the dispatching of the reservoir will result in some changes in regional aquatic ecology and reduced fishery resources, thereby affecting fishermen's income to some extent.	a. Combined gradient dispatching below the dam will reduce the adverse impact of the supersaturation of discharged water from the reservoir on downstream fishery resources; b. Continue to enforce the existing fishing ban to maintain aquatic ecological balance and ensure the sustainable development of fishery resources; c. Take such measures as artificial proliferation and artificial fish pass for fish species affected greatly by reservoir inundation to preserve fishery	2012-2015	Included in the EIA budget	Design agency, PMO, fishery administration station, bureau of animal husbandry and aquatic products, agriculture bureau	PMO, EIA agency, fishery administration station	See the aquatic ecological monitoring indicators in the EIA Report.	See the aquatic ecological monitoring frequency in the EIA Report.

Social factor	Potential impact	Mitigation measures	Time	Budget (0,000 yuan)	Implemented by	Supervised by	Monitoring indicators	Frequency
		resources; d. Conserve the aquatic environment and give publicity to conservation; e. Strengthen fishery management.						
Vulnerable groups	Their interests are likely to be neglected during resettlement; the shortage of labor makes them difficult to complete the relocation and resettlement tasks; they are faced with a number of difficulties.	a. Grant special assistance to certain vulnerable groups or those impoverished due to relocation, such as establishing a special support fund together with the civil affairs bureau; b. Make vocational training, employment guidance and job opportunities first available to labor in vulnerable groups; c. Employ labor from vulnerable households for unskilled jobs first during project construction and operation; d. Provide house construction subsidies to vulnerable households, and make up the rate of compensation for house construction to 25 m^2 of masonry timber structure per capita; e. During relocation, local village collectives should assist in the selection of housing sites, and organize labor to assist in relocation and house reconstruction.	2012-2015	Included in the resettlement budget and special funds of the civil affairs bureau	PMO, construction agency, civil affairs bureau, human resources & social security bureau, agriculture bureau, tealeaf bureau, village committees	PMO, civil affairs bureau, supervising agency, external monitoring agency	Participation in key activities at all stages of the Project; number of persons employed for unskilled jobs in the Project; men-times trained; subsidies for vulnerable households; progress of relocation	Twice a year
Women	Their time for farm work will be reduced; tealeaf cultivation dominated by women will be sustained; they participate in training and employment at a low level; their true needs and ideas are often neglected; they are faced with a greater	See Table 8-3.	2012 – end of 2014	Included in the resettlement budget, and special funds of the	PMO, women's federation, village committees, agriculture bureau, tealeaf bureau, human resources & social	PMO, women's federation, external monitoring agency	See Table 8-3.	Twice a year

Social factor	Potential impact	Mitigation measures	Time	Budget (0,000 yuan)	Implemented by	Supervised by	Monitoring indicators	Frequency
	lending pressure than men; women-headed households are more likely to be impoverished during relocation.			women's federation and other agencies	security bureau, agriculture bureau			
Social organizations	The integrity of village collectives will be threatened; village collectives will change in population and organizational structure; they are a number of social adaptation issues; there will be a great pressure on infrastructure and public services in the resettlement area; the workload of village committees will be increased.	a. Migrants should participate in grass-root political life, and there should be at least one migrant representative in the committee and party branch of each village in the resettlement area; b. Provide convenience to migrants who with to move along with households and clans; c. Village committees treat migrants and indigenous residents equally, and promote the integration of villagers in cultural, recreational, training, employment and routine discussion activities; d. Treat the allocation of land, public services and other resources during resettlement fairly; e. Strengthen the capacity building of village committees, and assign prestigious persons to be responsible specifically for resettlement tracking; f. Respect the ownership of existing village collective assets, and eliminate inequitable treatment for migrants and indigenous residents.	From 2012	/	PMO, implementing agency, village committees	PMO, external monitoring agency	Relocation of those relocated along; percentage of officials in migrant villages; details of family relocation; participation of migrants in village collective activities; key issues in relocation	Twice a year
Construction	A lot of flying dust, tail gas, noise and solid waste will be produced during construction, affecting people's health	Traffic: During construction, the PMO should ask the construction agency to practice section construction to reduce	2012-2015	Included in the EIA budget	Implementing agencies, PMO, grass-root medical	PMO, project supervision, external	See the EIA Report for the flying dust, tail gas, noise and	Flying dust, tail gas, noise and

Social factor	Potential impact	Mitigation measures	Time	Budget (0,000 yuan)	Implemented by	Supervised by	Monitoring indicators	Frequency
	and traffic; construction will facilitate the development of accommodation, catering and other service industries; construction is likely to result in disorder and the outbreak of diseases.	traffic impacts; disclose construction information to residents so that they can make preparations in advance; minimize the construction period without affecting construction quality; set up road signs to limit driving speed, and communicate traffic safety knowledge. Noise: The PMO should ask the construction agency to comply strictly with the noise standard, and take measures to reduce noise pollution; prohibit high-noise overnight construction and avoid overnight work where possible. Flying dust, tail gas and domestic waste: Sprinkle water on the access road regularly to prevent flying dust; clean up domestic waste on the construction site timely and regulate the behavior of the construction staff. Disease dissemination: Grass-root medical institutions should strengthen the communication and prevention of sexually transmitted diseases and AIDS; education the construction staff on environmental and health awareness. Grievance redress mechanism (see the RAP and the EIA).			care agencies, disease control center	M&E agency, environmental protection bureau, disease monitoring	domestic waste indicators; grievances and handling	domestic waste: 3 times a year; disease dissemination: as required by disease control center; grievance redress: twice a year
Inundation,	Land acquisition and house demolition	Prepare the RAP and the SA Report,	2012-end	Included in	PMO, implementing	PMO,	Public participation,	Twice a year

Social factor	Potential impact	Mitigation measures	Time	Budget (0,000 yuan)	Implemented by	Supervised by	Monitoring indicators	Frequency
land occupation and resettlement	involve 4,423 households with 16,104 persons in 39 village committees of 13 townships (e.g., Zhitan Xiang, Jiaotan Town, Xingtian Xiang, Jiangcun Xiang, Jinggongqiao Town and Fuliang Town) of Fuliang County, the acquisition and reallocation of 33,008.9 mu of land, including 15,946.5 mu of cultivated land, the temporary occupation of 190 mu of land, and the demolition of residential houses with a total area of 553,030.17 m^2.	conduct adequate public participation and consultation so that migrants are involved in the project design. Compensate for affected land and houses reasonably, and provide assistance in house reconstruction to women-headed households, five-guarantee households and other vulnerable households; implement resettlement in conjunction with skills training offered by local governments; make unskilled jobs first available to migrants during project construction; plan productive development projects rationally, such as tea garden development and pseudostellaria root cultivation, organize specialized farmers' associations based on local characteristics, and allocate market resources rationally, including tealeaf and pseudostellaria root. Establish a grievance redress mechanism to solve problems arising from compensation and resettlement timely.	of 2014	the resettlement budget	agency, county resettlement bureau, agriculture bureau, land & resources bureau, forestry bureau, tealeaf bureau, township governments and village committees in the reservoir and resettlement areas	external M&E agency	resettlement, land reallocation, land and house compensation, skills training, employment on unskilled jobs, productive development, development of specialized farmers' associations	
Indigenous residents	Reduction of land resources, higher pressure on infrastructure and public services, allocation of public resources	Land resources: a. Fully inform and consult with indigenous residents before land reallocation; b. Make reasonable compensation in accordance with the new uniform average annual output value rates and area-based integrated land prices for	From 2012	/	PMO, design agency, implementing agency, village committees	External monitoring agency	Willingness survey of indigenous residents; land compensation; infrastructure and community supporting services;	Twice a year

Social factor	Potential impact	Mitigation measures	Time	Budget (0,000 yuan)	Implemented by	Supervised by	Monitoring indicators	Frequency
		land acquisition of Jiangxi Province. Public resources: a. Provide three supplies and one leveling for central resettlement sites in the resettlement area, and avoid or retard the deficiency of infrastructure and supporting services; b. The government should guide village collectives in the resettlement area to reallocate collective assets reasonably, and promote the integration of migrants and indigenous residents.					allocation of collective assets; grievance redress of indigenous residents	
Traditional culture	Some traditional civil residences and 3 ancestral temples will be inundated; traditional familial relations may be broken during relocation.	Civil residences: a. Compensate for traditional civil residences at replacement cost; b. Reconstruct traditional civil residences as migrants may wish; c. Give priority to the Anhui architectural style. Ancestral temples: a. Demolished ancestral temples should be compensated for at replacement cost, and reconstruction costs beyond former size and structure will be borne by collectives; b. Ancestral temples should be reconstructed in consultation with collectives, and according to local customs for site, size and structure; c. Ancestral temples may be reconstructed in the form of village activity centers as migrants may wish. Familial relations: a. During relocation	2012-2015	/	PMO, design agency, implementing agency, education bureau, health bureau, village committees, villagers	PMO, external monitoring agency	Compensation rates and reconstruction of civil residences and ancestral temples; relocation willingness survey; grievance redress of migrants; convenience of migrants in taking medical care, doing business and arranging schools for their children	Twice a year

Social factor	Potential impact	Mitigation measures	Time	Budget (0,000 yuan)	Implemented by	Supervised by	Monitoring indicators	Frequency
		and resettlement, special consideration should be given to migrants to be relocated along with family members in order to maintain their familial networks; b. Families in conflict should not be relocated to the same resettlement site or village group; c. Family members relocated together should be consulted adequately, especially prestigious elderly members; d. Village collectives in the resettlement area are encouraged to promote the intercourse between migrants and indigenous residents through recreational, intermarriage and other activities; e. Assist migrants in taking medical care, doing business and arranging schools for their children.						
Public participation	Feedback and consultation from the bottom up is neglected; migrants, indigenous residents and other stakeholders are unable to acquire project and resettlement information effectively and timely, thereby hindering or delaying project and resettlement implementation; interests of migrants, indigenous residents and other stakeholders are prejudiced, and their needs and suggestions cannot be expressed effectively.	Develop a public participation plan and establish a grievance redress mechanism.	From 2011	/	PMO, village committees, integrated management office, bureau for letters and calls	PMO, external monitoring agency	Implementation of the public participation plan; grievance redress	Twice a year

16. SUPPLEMENTARY PUBLIC CONSULTATION AND INFORMATION DISCLOSURE

16.1. PREFACE

As the key component of the project EIA, the public participation and information disclosure aims to present necessity of project construction, process of project planning and justification, project objectives, project capacity, potential environmental impacts and corresponding mitigation measures to the public to make them understand project general situation, and listen to their opinions on project construction in order to achieve the following purposes :

- Ensure that the concerns, experience and suggestions of all the stakeholders, especially affected people will be integrated into the design, planning and implementation of the project;
- Enhance the public's awareness and understanding about the project, in particular related to the mitigation measures against project negative impacts and for livelihood improvement of affected people;the awareness and understanding of affected people's livelihoods and mitigation measures;
- Promote scientific project decision-making with the support and direct involvement of affected people and communities to ensure the measures proposed in the EIA are practicable and feasible.

Since the completion of project proposal in 1998, the project preparation has lasted for over 10 years. During the preparation of original "Environment Impact Assessment Report in December 2011~January 2009, Yangtze River Water Resource Protection Science Research Institute (refer to the "domestic EIA consultants") has implemented the public consultation by the means of site interview, questionnaire survey and public consultation meeting (as listed below) among the affected people such as governmental officials, farmers, fishermen, teachers and self-employed people in the project-affected areas including Jiaotan Town, Zhitan Township, Xingtian Township and Jiangcun Township of Fuliang county. The result of questionnaire survey showed their strong support for the project (with the support rate of 100%) and sufficient recognition of positive effects on flood control, promotion of local economic development and improvement of local people's living standards. At the same time, the survey showed that for the project implementation, the primary public concern is resettlement which is followed by the impacts of project activities on surrounding traffic and environment. The public hope to strengthen the project environmental management to ensure the mininization of adverse environmental impacts. The domestic EIA consultants has timely passed the results of public consultation to the project owner and proposed mitigation measures based on the environmental protection measures chapter of domestic EIA. The project owner also made the committement to strictly implement various environmental protection measures during project implementationwith the active cooperation of local government.

Table 41: Prior Public Consultation and Information Disclosure of Wuxikou Hydro-complex Project EIA report

	Method	Organizer	Pelple met	Date	Location
Public Consultation	Questionnaire survey and site interview	Project owner, Yangtze River Water Resource Protection Science and Research Institute	200 affected persons (government officials, villagers, fishermen,self-employed people) living in the areas affected by project construction including Jiaotan Town, Zhitan Township, Xingtian Township and Jiangcun Township	5th to 28th December 2008; 8th to 27th January 2009	Areas affected by project construction including Jiaotan Town, Zhitan Township, Xingtian Township and Jiangcun Township
	Public consultation meeting		Resident representatives from the above project-affected areas, including the villagers with opponent opnions during site interview	13th January 2009	Zhitan Township of Fuliang County
Information Disclosure	Online information disclosure of project summary, way and channels for public participation		/	December 2008	Website of Jingdezhen Water Resource Bureau http://sw.jdzol.com Website of Jingdezhen EPB http://www.jdz65.gov.cn
	Online information disclosure of key environmental impacts and mitigation measures, key EIA conclusion etc.,		/	April 2009	Website of Jingdezhen EPB http://www.jdz65.gov.cn

Presently Wuxikou project has started the preliminary design. During the preparation of supplementary EIA report, with the further clarification of potential project environmental impacts, Artelia Consultants, the developer of supplementary EIA has carried out more targeted supplementary public consultation and information disclosure based on prior work with the help of project owner. This chapter will focus on the description of objects, methods and main conclusions of the supplementary public consultation and information disclosure.

16.2. PROJECT STAKEHOLDERS

For Jingdezhen Wuxikou Hydro-complex Project, according to the currently identified potential environmental impacts, the project-realted stakeholders and their potential key concerns are summarized as follows.

Table 42: Project Stakeholders and their Concerns

No.	Stakeholder	Key Concerns
1	The villagers from five town/townships within the reservoir inundation area (Zhitan township, Jiaotan township, Xingtian township, Jiangcun township, Jinggongqiao township) (including project migrants, fishermen etc.,)	Resettlement policies, project impacts on their livelihood and mitigation measures
2	Villagers of Shebu Village (Jiaotan Town), Qingxi village, Maowu village and Qingxi Village of Zhitan Township	Impacts of relocating ancestral temples on relevant daily activities of residents, for example, wedding ceremony, funeral and ancestor worship
3	Parishioners served by the Christian Church in Zhitan Township	With reservoir inundation, the impacts of relocating the church on the daily divine services of parishioners

No.	Stakeholder	Key Concerns
4	County and township governments and village committees within the project-affected areas	Relocation and resettlement of related township and villages
5	Local authorities related to main project impacts, such as the county culture and broadcasting bureau, the county forestry bureau	Confirmation of inundated cultural relics, forestland and requirements for rehabilitation of cultural relics and recovery of vegetation
6	Residents living upstream and downstream of the proposed project (from the upstream Tankou Village of Zhitan Township to the downstream Huanggang Town)	Cumulative impacts of Changjiang River cascade development on livelihood and daily life of local residents

The above key concerns and needs has been fully taken into account when developing the methodology of supplementary public concultation.

16.3. METHODOLOGY OF SUPPLEMENTARY PUBLIC CONSULTATION

The supplementary public consultation was mainly implemented in three phases, including interview of local affected people and related government authorities, public consultation meeting and public conslutation specially for CIA. By June 2012, the implemented public consulation activies have been are summrized below, and the key issues identified during public consultation and their solution will be presented in details in the subsequent sections.

Table 43: Public Conslutation for Supplementary EIA of Wuxikou Hydro-complex Project (by June 2012)

No.	Method	Organizer	People met	Date	Location	Key Issues
1	Phase 1: site interview and information collection	Project Owner, Artelia China	Village chief of Longtan village; relavant governmental officials	2011.12.15 ~ 2011.12.16	Longtan Village of Zhitan Township, Fuliang county Culture Broadcasting Bureau	Potential project impacts on local historic buildings and ancient trees
			Relavant governmental officials	2012.3.13	Fuliang County Forestry Bureau	Project impacts on local forestry resources
			Relavant governmental officials	2012.3.13	Fuliang county Culture Broadcasting Bureau	Further confirmation of project impacts on local cultural relics and the procedure for the relocation and rehabilitation of cultural relics
			Relavant villagers	2012.3.14	Qingxi Village and Maowu Village of Zhitan Township	Current use of Wu's and Yu's ancestral temples to be affected by the project, and villagers' concerns on potential project impacts
2	Phase 2: public consultation meeting	Project Owner, Artelia China, Zhitan Township Government	Government officials of Zhitan Township; Affected villagers	2012.3.14	Zhitan Township goverment	Key concerns of potential project environmental impacts for EIA, including physical cultural resources, livelihood recovery of migrants, ecological impacts, etc

No.	Method	Organizer	People met	Date	Location	Key Issues
3	Phase 3: Site interviews for CIA	Project Owner,Artelia China	Villagers living upstream, midstream and downstream along Changjiang River	2012.6.	Luxi village of luxi Township, Tankou Village & Xili village of Zhitan township, Maowu village, Maojialing Village, Yushan Town, Huanggang Town	Impacts of cascade development for main stream of Changjiang River on the livelihood and daily life of residents living along the river

16.4. KEY FINDINGS OF SUPPLEMENTARY PUBLIC CONSULTATION

16.4.1. PHASE 1: SITE VISIT AND INFORMATION COLLECTION

On the basis of previous public consultation for domestic EIA, a more targeted public consultation meeting will be adopted for the supplementary public participation. In order to improve the relevance and effectiveness of the public consultation meeting of Phase 2, Artelia Consultatns paid several visits to project sites and relevant local authorities beforehand in order to confirm the scope of environmental impacts for the project. During the visits, direct communication with local residents was carried out on potential environmental impacts.

Table 44: Site Visit Agenda

No.	Date	Location	People Met	Key Issues and Solution
1	2011-12-15	Longtan Village of Zhitan Township	Village chief of Longtan village	Through site visit and meeting with village chief, it is found that the existing houses in village were built after the foundation of P.R.C, which belong to common structure in the rural area of Jiangxi province. These old houses are in poor conditions. There are no people living there. There is a ginkgo tree in Longtan Village aged over 1000 years. This tree will not be inundated.
2	2011-12-16	Fuliang county Culture Broadcasting Bureau	Officials of Fuliang county Culture Broadcasting Bureau	Except County-level cultural relics protection units “Site of Anhui, Jiangxi eight counties workers, peasants and soldiers Congress”, survey done by cultural relics bureau to the inundated area of Wuxikou hydro-complex in 2009. Therefore, this is the only one ancient sites in the inundated area. People from cultural relics bureau of Fuliang County said the site will be removed to another place, and then rebuilt again with the original appearance and then be well protected in accordance with the requirements of the Protection of Cultural Relics. A bridge has been identified during the site visit together with people from Cultural Relics Bureau of Fuliang County. It was confirmed that this bridge was a concrete bridge built in 1970s. it should not be listed as cultural heritage.
3	2011-3-13	Fuliang County Forestry Bureau	Officials of Fuliang County Forestry Bureau	Confirm distribution situation of precious wild plants, ancient and famous trees within the inundated area,understand the transplant procedures and program implementation of different levels critical and protected plant and ancient and famous trees.

No.	Date	Location	People Met	Key Issues and Solution
4	2011-3-13	Fuliang county Culture Broadcasting Bureau	People from cultural relics bureau of Fuliang County	According to the latest data to further confirm the location of cultural relics and ancient buildings within the inundated area,and clearly the relics relocation program and the implementation of the main.
5	2011-3-14	Qingxi and Maowu Village of Zhitan Township	Villagers of Qingxi and Maowu village	Understand the actual statement and its impact to the villagers' daily life by the Wushi Ancestral hall and Yushi Ancestral hall,initiate preliminary communication with villagers about the other environmental impacts of the project; the villagers expressed their expection for the project implementation as early as possible.

Based on the information collected during the site visits, ARTELIA formulated a detail agenda for the public consultation meeting, which includes the list of participants, date and detailed agenda of the meeting, focusing on project impacts on the relocation of ancestral temples, church and villagers' graves which are directly related to the daily life of local residents in oder to hear from them about their specific requirements; the meeting is also about to make response to other environmental concerns of local public, including livelihood restoration, ecological impacts and the improvements of environmental infrastructure.

16.4.2. PHASE TWO: PUBLIC CONSULTATION MEETING

On March 14th 2012, the public consultation meeting was held by the project construction company, Jingdezhen Wuxikou Hydro-Complex Development Company, as scheduled. The meeting was for the preparation of Supplementary Environment Assessment Report for Wuxikou Hydro-Complex Project in Jiangxi Province. The meeting venue was in the office building of Zhitan Township Government in Fuliang County. The meeting was chaired by Mr. Wan, the director of Jingdezhen Wuxikou Hydro-Complex Development Company. Total 16 people were presented in the meeting, including the representatives of the consultants for supplementary EIA preparation (ARTELIA), the officials of Zhitan Township Government, representatives of project-affected villages (Daheli, Shebu, Qingxi, Maowu, Meihu, Yingxi, Liukou etc.,) and people in charge of Zhitan church. In the meeting, extensive communication were made on the key concerns of Supplementary Environment Assessment Report's, for example, project impacts on local physical culture resources, migrants livelihood restoration, ecological impacts and other so on. The main findings of the meeting are summarized below.

Figure 25: Public Consultation Meeting of the Supplementary Environment Assessment Report of Wuxikou Hydro-Complex Project in Jiangxi Province

Table 45: Summary of Supplementary Public Consultation Meeting

Date	2012.3.14
Venue	Meeting room of Zhitan Township Government in Fuliang County
Information Disclosed	Supplementary EIA report (1st Version, Feburary 2012)
Participants	Representatives of Jingdezhen Wuxikou Hydro-Complex Development Company, representatives of the consultants for supplementary EIA preparation (ARTELIA), the officials of Zhitan Township Government, representatives of project-affected villages (Daheli, Shebu, Qingxi, Maowu, Meihu, Yingxi, Liukou etc.) and people in charge of Zhitan church, 16 people in total

Question raised	Problem solution
Project Implement Progress: It has been fourteen year since the project's preparation 1998, it's slow in progress. With the resettlement costs rising year by year, the previous compensation standard is difficult to meet the requirements of resettlement. And delays of the project implementation affect the daily life of the villages, like newlyweds can not be naturalized etc.. Immigrants aspires the project can begin as soon as possible, so as not to further increase of costs due to time dalays.	According to the current prices, compensation standards of the project has been a corresponding increased, and is submitted for approval; At the same time, the project is actively seeking World Bank loan, the project expected begin in September 2012.
Ancestral hall relocation: The ancestral halls within the inundated area were built in the period of the Ming and Qing Dynasty with history over hundreds years. Although the buildings are wretched and don't meet the standard of cultural relics, but they remains a dinner meeting place for villagers holidays, weddings and funerals, with implement of the project the daily activities of villagers will be affected. So the villagers hope the ancestral halls can be rebuilt again with the original appearance,for those villagers of Qingxi village which need to backward resettled on site, considering only 10% of the villagers involved in, so the Yushi ancestral hall just need to reconstruction after resettlement.	Relocation of ancestral hall is already included in the Resettlement Action Plan, the project will pay appropriate compensation for ancestral reconstruction, the village committees will in charge of new location's seeking and reconstruction implementation.

Church relocation: The church of Zhitan township has been built for five to six years, the land was provided by township government by free, construction by congregation financed. At present,almost sixty to seventy congregation comes from Zhitan, Liukou and other surrounding townships. It is hope the new church could be relocated in a quiet, convenient transportation place, township government provide the land; no need compensation, but hope the daily worship and other activities won't be affected.	Relocation and reconstruction of the church is also included in the Resettlement Action Plan, the project project will pay appropriate compensation; and the church will be built new before the demolition, so that will not affect daily activities.
Nature Reserves and Wildlife: At present, wild boar and tufted deer are still sometimes found around the villages. The related protection rules for natural reserves have been publicized to the villagers by the township government through education compaigns and bulletins.	According to the layout of resettlement sites, there is only one nature reserve for clouded leopard close to the proposed resettlement site. The relevant measures will be included in the ESMP and implemented by each household and village.
Residents' livelihood: At present, the daily income of the villagers in the project area mainly rely on work away from hometown (60%), supplemented by forestry (20-30%) and agriculture, fisheries and other sideline (10-20%). There is almost no professional fisherman in Changjiang River Basin. Villagers normally own their own farmland and woodland. With the cascade development of Changjiang River Basin over years, the quantities and varieties of fish in Changjiang River have been significantly reduced. It is expected that implementation of Wuxikou project will not have significant impact on local fishery resources. Rice is the main economic crop for local agriculture, but its price is not high. According to local conditions, generally local people only grow one season to meet the self needs. With the project implementation, the decrease of farmland will affect the livehoods of those villagers living on crop plantation, but the impacts will not be significant.	In the RAP, the livelihood restoration measures have been considered for the villagers with farmland loss. During project implementation, the measures will be implemented for involved villagers.
Supporting environmental infrastructure The villages within the project areas, mainly use the spring water as general water supply, some villages lacks basic sewage treatment facilities.	During the process of resettlement, the project will provide septic tanks and other basic inftrastructures to improve the environmental conditionsof the resettlement villages.

In the meeting, the participants expressed their strong support to the implementation of Wuxikou Hydro-complex project. After this long period of project preparation, they hope the project can be put into implementation as soon as possible for earlier implementation of resettlement compensation works and fulfillment of expected project benefits. Meanwhile, the participatints has fully acknowledged the environmental benefits of the project and pay more attention to the social impacts caused by the project; and they hope with the support of the project, the resettlement work and the relocation of inundated ancestral temples, church, graves and other structures can be completed somoothly and that they can earlier get back to normal production and life.

16.4.3. PHASE THREE: PUBLIC CONSULTATION FOR CIA

Based on the previous site visits and public conslutation meeting, during June 7th~9th 2012, with the support of the project owner, the environment experts from the consultants visited the upper, middle and lower reaches of Changjiang River to interview the residents living along the river. The purposes of the intervies are to investigate the impacts of existing cascade development projects along the main stream of Changjiang River (including Zhangshukeng hydroelectric station, Nianyushan Ship Lock, Huanggang Ship Lock) on their livelihood and daily life and also

to understand their concerns on the potential environmental and social impacts resulting from the construction of recenty proposed Wuxikou Hydro-complex project. The key findings of the interviews are summarized as follows:

Table 46: Results of Interviews with Residents Living along Changjiang River in June 2012

No.	Interviewee	Village	Career/Age	Issues
1	ZHANG Genfu	Tankou village, Zhitan township, upstream Changjiang river	Farmer/77	In recent years, the fishes in Changjiang River keep decreasing together with flow rate. This is mainly because some people living along the river used to fishing by electricity; furthermore, the wide application of pesticides and chemical fertilizers also significantly affects the growth of fishes. My main concern is the inundation of fertile farmland due to the implementation of Wuxikou Hydro-complex and possible adverse impacts on local traffic during project construction.
2	SI Youshun, SHI Yanquan	Tankou village, Zhitan township, upstream Changjiang river	Certificated Fisherman	The water quality of Changjiang River is getting worse in recent years and the fish catch keeps decreasing. Even some originally common fish species are difficult to be found such as catfish and red drum. This is mainly because the installation of some water conservancy facilities in Changjiang River has resulted in the decrease of migratory fishes from Poyang Lake. Also the water pollution along the river is also a cause for the decrease of fishery resource. With the completion of Wuxikou Hydro-complex project, there will be a large reservoir formed, which bring great help to the development of local fishery resources; Such a large reservoir is also helpful for water purification and fish reproduction. At the same time, the construciton of hydro-complex project will a great drive for local economic development and is helpful for the increase of local residents' income.
3	REN Shenggen	Xili village, Zhitan township, midstream Changjiang river	Farmer/60	The water quality of Changjiang River has significant changes in the recently years. We no longer dare to swim in the river as we used to. If we did sometimes, there will be allergic reaction for the skin even after bathing. Now we can only to capture some carps and yellow catfishs from the river since they are more adaptive to the environment.
4	Mr.FANG	Xili village, Zhitan township, midstream Changjiang river	Farmer/66	Since the 1980s, due to the extensive use of pesticides and chemical fertilizers, Fish resources in the Changjiang River has significantly reduced. Now there are only a small number of crucians and grass carps caught, the latter of which are probably escaped from the nearby fish farms. In our village, the area of per capita farmland is 0.3 mu. We hope that with the completion of Wuxikou project, our life can at least be restored to the current level.
5	Ms.FU	Maojialing village, Fuliang county, midstream Changjiang river	Farmer/55	With the completion of Changjiang River water conservancy projects, especially the construction of the Zhangshukeng hydropower station, it is noticed that the flood risk has been effectively managed. The economic loss resulting from floods also decreased these years. Generally speaking, the construction of water conservancy projects has more advantages for local people than the disadvantages.

No.	Interviewee	Village	Career/Age	Issues
6	ZHANG Jieshui	Yushan town, Changjiang district, downstream Changjiang river	Farmer/58	The water quality of Changjiang River is getting worse in recent years. Now fish catching seems very difficult. Too much human activities on Changjiang River, in particular, the sand excavation near Huanggang Ship Lock on the lower reach has caused the decrease of fish resources. The use of pesticides and chemical fertilizers also threatens the survival of local fishes.
7	HU Shuigen	Huanggang town, Poyang county, downstream Changjiang river	Farmers/55	From my point of view, the construction of hydropower station is not the main cause for the decrease of fishery resources. I think it's more related to the macroscopical environment. The water quality is getting worse, and it is more difficult for fish to survive. Intensive human activities on Changjiang River, such as sand excavation aound Huanggang Ship Lock, has significantly affected the living space of fishes, and the use of pesticides and chemical fertilizers also causes great impacts to the growth of fishes.

Interview at Xili village, Zhitan township, midstream Changjiang river

Interview at Tankou village, Zhitan township, upstream Changjiang river

Interview at Maojialing village, Fuliang county, midstream Changjiang River

Interview at Yushan town, Changjiang district, downstream Changjiang river

Figure 26: Picture of Interviews for CIA Study

The interview shows that the local residents have already witnessed the environmental deterioration of Changjiang River and the decrease of fishery resources in the River. The long development of Changjiang river basin, overly intensive human activities and the wide application of pesticide and chemical fertilizer over years have jointly resulted in the pollution of Changjiang River. Except the adverse effects on migratory fish from Poyang Lake, the local people generally belives that the reduction of fish stocks has little relationship with the cascades development of Changjiang River.The interviewed villagers all held positive attitude towards the construction of Wuxikou Hydro-complex Project. The villagers belive that the construction and operation of the reservoir will further reduce the flood risk, improve the reproduction of local fishes, promote the development of local economy and consequently increase the imcome of local people. The key concerns of some farmers are related to the farmland occupation for project construction and the traffic during construction period. The consultants have explained to the interviewees that the proper mitigation measures have been included in the project RAP and ESMP against these potential concerns.

16.5. INFORMATION DISCLOSURE

Since the project preparation, the project information/documents including RAP and EIA documents have been made available to the public in the project-affected areas. The details are listed below.

Table 47: Information Disclosure for Jiangxi Wuxikou Integrated Flood Management Project

NO.	CONTENTS	ORGANIZED BY	DATE	LOCATION
1	Project description, procedure of public consultation, way of making complaints	Yangtze River Water Resource Protection Science and Research Institute and PMO	2008-12-1	Official Website of Jingdezhen Municipal Water Resource Bureau : www.jdzol.com
			2008-12-4	Official Website of Jingdezhen EPB : www.jdz65.gov.cn
2	Summary of domestic EIA	Yangtze River Water Resource Protection Science and Research Institute and PMO	2009-1-21	Official Website of Jingdezhen EPB : www.jdz65.gov.cn
3	Draft RAP, Draft Supplementary EIA, Draft Cumulative Impact Assessment and Draft EMP (all in Chinese)	Artelia China & PMO	2012-08-28	Official website of Jingdezhen Municipal Water Resource Bureau : www.jdzol.com
4	Notice of information disclosure for full sets of RAP and EA documents on the website	Artelia China & PMO	2012-08-29	Jingdezhen Daily
5	Final RAP, Final Supplementary EIA, Final Cumulative Impact Assessment and Final EMP (all in Chinese)	Artelia China & PMO	October 2012	Official website of Jingdezhen Municipal Water Resource Bureau : www.jdzol.com

16.6. GRIEVANCE MECHANISM

In order to detect and earlier solve the potentail unexpected public complaints about environmental and social issues related to the project and minimize project risk, the environmental and social grievance mechanism has been developed for the project. In the local context, the complaints related to environmental and social issues will go through the different routes as respectively presented in the figures below.

Environmentally it is agreed set up a public complaints department in the Environmental Management Department of PMO, and establish the following complaints mechanism for the environmental issues.

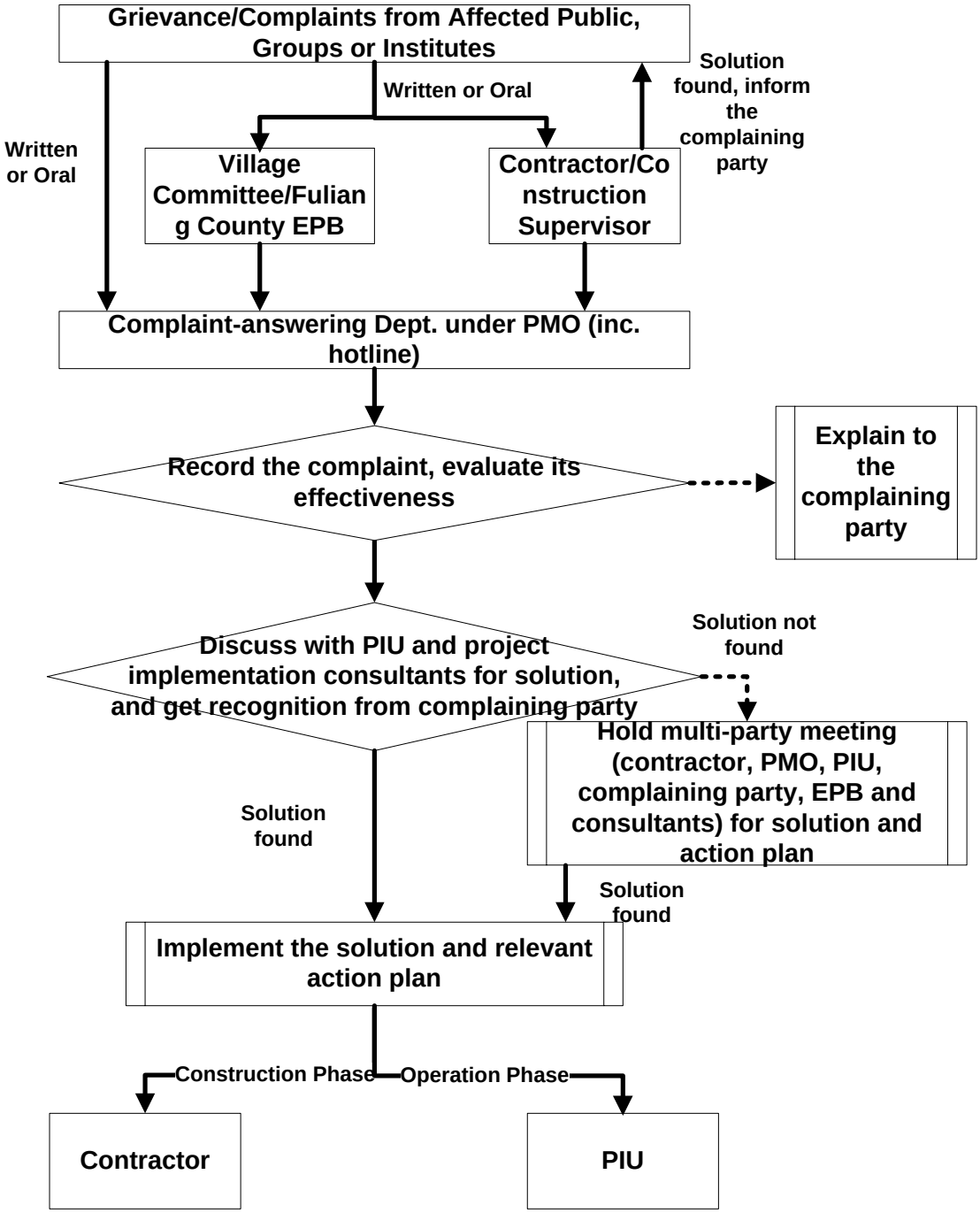


Figure 27: Environmental Grievance Mechanism for Jiangxi Wuxikou Integrated Flood Management Project

The complaints mechanism will open to all local residents, including women and other vulnerable groups. Any affected personnel, groups or institutions can appeal through telephone, letter, e-mail and other media. Before the project starts, the detail information of contract person of each public complaints office (such as village cadres, contractors, environmental managers of implementation unit, officials of local Environmental Protection Bureau, etc.), also their contact details (such as phone number, address, e-mail address etc.) will be posted on the information bar at the construction site or local government website.

The Environmental Management Department of PMO will establish a tracking and recording system to the public complaints mechanism, including:

a. Establish the tracking table and procedures by collecting information from the project staff and other complainant;

b. Develop professionally trained staff update the database regularly;

c. Establishment information analysis system to identify the complainant the reasons, to enhance the transparency of the complaints handling procedures, and periodic evaluation of the overall functioning of the mechanism;

d. Establish inform procedures to notify the related parties to deal with the situation;

e. Report the complainant handling situation to PMO, the project implementation units and the World Bank regularly.

For social complaints, When migrants' lawful rights and interests, they have the right to file an appeal. The special grievance redress mechanism has been established for the Project:

a. If any migrant is dissatisfied with resettlement, he/she can file an oral or written appeal with the village committee or township resettlement department. In case of an oral appeal, the village committee or township resettlement department should handle such appeal and keep written records. Such appeal should be solved within 2 weeks.

b. If the migrant is dissatisfied with the disposition of Stage 1, he/she may file an appeal with CRH after receiving such disposition, which should make a disposition within 2 weeks.

c. If the migrant is still dissatisfied with the disposition of Stage 2, he/she may file an appeal with the county stability preservation office or office for letters and visits, which should organize a coordination meeting with the migrant, CRH, land and resources bureau, housing construction bureau, social security bureau, civil affairs bureau and other functional departments to negotiate with the migrant and solve the appeal.

d. If the appeal is still not solved in Stage 3, the migrant may file a suit in the county court in accordance with the Civil Procedure Law of the PRC.

e. In addition, migrants may also file appeals with the supervising and M&E agencies, which will handle appeals in coordination with the project owner.

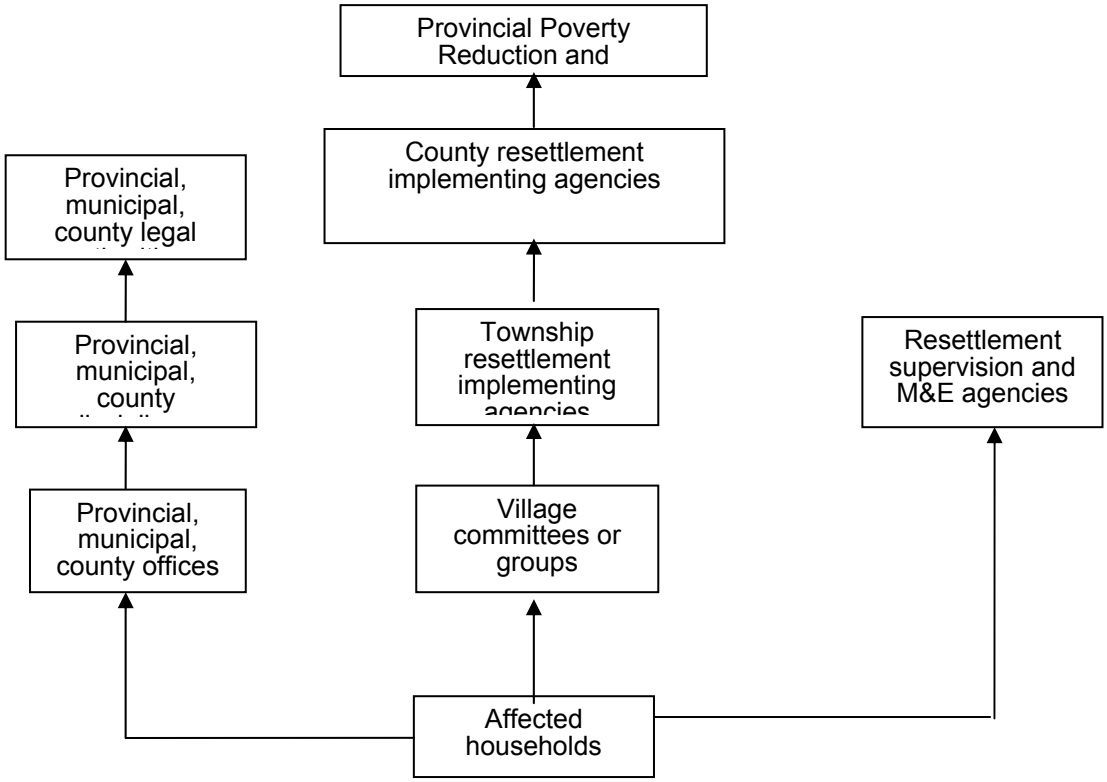


Figure 28: Social Grievance Mechanism for Jiangxi Wuxikou Integrated Flood Management Project

Besides that, a debriefing meeting will be held before any construction activities to inform all the affected residents about potential environemtnal and social impacts of the project.

17.CONCLUSIONS

Wuxikou Hydro-complex Project is located in Jiaotan Town of Jingdezhen City, which is the only reservoir with considerable storage capacity in the five-step cascade development on the main stream of Changjiang River. It is mainly designed for the purpose of flood control together with the functions of water supply and power supply. The project implementation is consistent with the "Urban Flood Control Plan Report for Jingdezhen City, Jiangxi Province". Based on the earlier implemented Jingdezhen urban embankment project, with the joint operation of Wuxikou reservoir and Jingdezhen urban embankment, the flood control standard of Jingdezhen city can be improvedf from current 20 years' return period to the specified 50 years' return period, which can effectively protect the safety of life and properties for the residents living in the urban area of Jingdezhen and the areas along Changjiang River and support the sustainable development of local national economy.

Considering the context of cascade development for main stream of Changjiang River and the project features of Wuxikou reservoir, the scope of assessment for the supplementary EIA covers the areas directly and indirectly affected by the project, including project construction area (dam site, project administration area, workers' camp, access roads, borrow areas and spoil disposal sites, and reservoir-inundated areas), resettlment sites and the sites of associated projects (i.e., the sites of Jiangxi-Anhui Railway Re-routing Project and associated power transmission line project). During the preparation of supplementary EIA, the project-affected PCRs were investigated; the environmental impacts and mitigation measures for resettlement sites, access roads, Jiangxi-Anhui Railway Rerouting Project and power transmission line project; the supplementary public consultation, cumulative impact assessment and environmental due diligence of Jingdezhen urban flood control project has been carried out; the pest management possibly involving in the cultivation of Radix Pseudostellariae and Camellia oleifera as the livelihood restoration measures against project impacts has been analyzed; and the key findings of supplementary EIA and social impact assessment have been integrated in the Environmental & Social Management Plan.

With the assessment and analysis, the main conclusions of the supplementary EIA are summarized below:

- **Alternative Analysis:** As part of the cascade development for main stream of Changjiang River, since the project has been proposed, the analysis of different alternatives has been fully considered throughout the project planning and design process. In terms of with/without project, flood control plan for main stream of Changjiang River, dam site, regional flood regulation plan, storage water level and fish pass measures, the alternatives have been compared technically, economically, environmentally and socially to identify the most cost-effective design with minimal environmental and social impacts.

- **Environmental Due Diligence of Urban Flood Control Project:** The consultants investigated the project implementation progress, environmental management organization, project EIA report and its approval, and the implementation of established ESMP. According to the investigation results, the preparation and implementation of Jingdezhen Urban Flood Control Project complies with the requirements of relevant national and local laws and regulations. With rich experience on the implementation of water conservancy project, the contractors have effectively implemented the established ESMP during project implementation. The built dyke sections have been well installed with greening works, which has significantly improve the surrounding environment, improved the life quality of local residents and achieved the expected environmental and social benefits.

- **Cumulative Impact Assessment:** As part of the supplementary EIA, based on the characeristics of the project and river basin development and current data availability, the CIA defines the section of main stream for Changjiang River in Jiangxi Province from the boundary between Jiangxi and Anhui provinces to Poyang County as the main scope of study, and the water quality, downstream discharge flow and fishery resource are defined as the Valuable Ecological Components (VECs) as the focus for the study. According to the assessment results, the construction of Wuxikou Hydro-complex will change the hydrological conditions of Changjiang River to some extent and lead to further fragmentation of local aquatic habitat based on the current cascade development; however, since the cascade development of Changjiang River has been long, and the future development plan also only include the Jingdezhen cascade for the maintenance of urban landscape water surface, the expected cumulative environmental impacts of the project area limited according to the qualitative analysis of current data. But it is still necessary to implement the measures of cascade joint operation, water quality monitoring, fishery resource conservatrion and river basin pollution control during project implementation and operaiton as included in the ESMP in oder to track and understand the impacts on river basin cascade development on the river and its aquatic ecology and to minimize the impacts on local fisherty resource. In addition, it is also suggested to supplement necessary measurements for key river cross-sections and monitor the hydrological conditions and water quality for the downstream of different cascade facilities on Changjiang River under current operation conditions so as to accurately quantify the cumulative environmental impacts with modelling analysis, to further elaborate corresponding environmental mitigation measures and provide more solid basis for project environmental management.

- **Pest Management:** According to project design, during the implementation of Wuxikou Hydro-complex, the Miehailing aerosol will be used to use to kill mosquito and flies during the sanitary cleaning of construction sites, the rodenticide will be used for centralized deratiziation in the resettlement sites, and in the livelihood restoration of migrants, the cultivation of Radix Pseudostellariae and Camellia oleifera may also involve the pest management. Since the chemicals used has been identified for the first two activities, the supplementary EIA will mainly consider the proper storage and use of hazardous materials such as pesticide and rodenticide; for the cultivation of Radix Pseudostellariae and Camellia oleifera, the project has developed special pest management plan and introduced the concept of integrated pest management to minimize the pollution of chemicals to natural environment and ecological environment.

- **Physical Curltural Resources:** By site visits, confirmation of local cultural relics authority and the field survey of cultural relic specialist, based on the current inundation line at the elevation of 56m, the project implementation will inundate four historic buildings. Among others, the site of workers, peasants and soldiers' congress of 8 counties in Anhui and Jiangxi provinces is listed as the county-level revolutionary historic relic, and the other three area the ancestral temples built in Ming/Qing Dynasty. The congress site will be integrally relocated and rehabilitated for off-site protection, and the affected ancestral temples are also recommended to be relocated and rehabilitated, in which for Yu's Ancestral House, the existing general temple and the branch temple are suggested to be combined during rehabilitation. In addition, the project will lead to the inundation of a local Christian church. According to the RAP, the church will be reconstructed at another location before demolition with the original function and standard to make sure that the activities of local parishioners are not affected. For the project-inundated ancient trees, according to their growth vigor, one will be removed and the others will be properly transplanted under the guidance of local forestry authority and their protection will be strengthened. The inundated villagers' graves will be sufficiently compensated for relocation with respect to local customs according to the RAP. In addition, for the archeological chance find during construction and corresponding protection of cultural relics, the project will strictly implement the related measures proposed in the ESMP to avoid the damage of valuable PCRs.

- **Resettlement:** With the implementation of this proposed project, there would be large amounts of resettlement. The potential social and environment impact related to the resettlement activities include ecological impacts, wastewater management, solid waste management and also public health issues. For these impacts, the domestic EIA report provides the mitigation measures including restoration of vegetation, provision of water supply, installation of wastewater treatment facilities, and collection and disposal of solid waste. There are also proposed measures to strengthen the sanitation and disease prevention in the centralized resettlement sites to effectively control the project potential environmental and social impacts.

- **Supporting Projects:** There are mainly three supporting projects for Wuxikou Hydro-complex Project, namely the construction of access roads, power transmission line and the re-routing of Anhui-Jiangxi Railway. The environmental impacts and mitigation measures for access road projects have been considered as part of the main works, the EIA report of Anhui-Jiangxi Railway Re-routing Project has been drafted, the contents of which have been referred by the report. For the construction of power transmission line, since i twill be implemented at a latter stage, the supplementary EIA only develops a generic environmental management framework based on project characteristics which could be the reference for the future EIA.

In general, as the key component of "Raohe River Basin Development Plan of Jiangxi Province", Wuxikou Hydro-complex complies with the master plan of river basin with significant benefits on flood control, power supply and water supply. It is the forth hydraulic cascade in the 5-step cascade development for the main stream of Changjiang River and as the only non-run-of-river hydropower station. Wuxikou Hydro-complex will bring both positive and negative impacts on local environment, especially on local aquatic ecosystem. This report has further supplemented the original ESMP provide guidance on the environmental management during the implementation and operation of the project in the future. With the implementation of relevant mitigation measures and monitoring plan, the above-mentioned negative impacts are expected to be controlled within an acceptable level.

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