

JINGDEZHEN WUXIKOU HYDRO-COMPLEX
PROJECT IMPLEMENTATION Co., JIANGXI
ENVIRONMENTAL IMPACT
ASSESSMENT EXECUTIVE SUMMARY

74634

**JIANGXI WUXIKOU INTEGRATED FLOOD
MANAGEMENT PROJECT
ENVIRONMENTAL IMPACT ASSESSMENT EXECUTIVE
SUMMARY**

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ABBREVIATIONS

CC	Construction Contractor
CSC	Construction Supervision Company
DRC	Development & Reform
DSRP	Dam Safety Review Panel
EIA	Environmental Impact Assessment
EIRR	Economic Internal Rate of Return
ESMP	Environmental & Social Management Plan
EPB	Environmental Protection Bureau
FSL	Full Supply Level
FSR	Feasibility Study Report
JWIFMP	Jiangxi Wuxikou Integrated Flood Management Project
MEP	Ministry of Environmental Protection
MOL	Minimum Operating Level
O&M	Operation & Management
PoE	Panel of Experts
PCRs	Physical Cultural Resources
PMO	Project Management Office
RAP	Resettlement Action Plan
RMB	Ren Min Bi
WB	World Bank

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INTRODUCTION

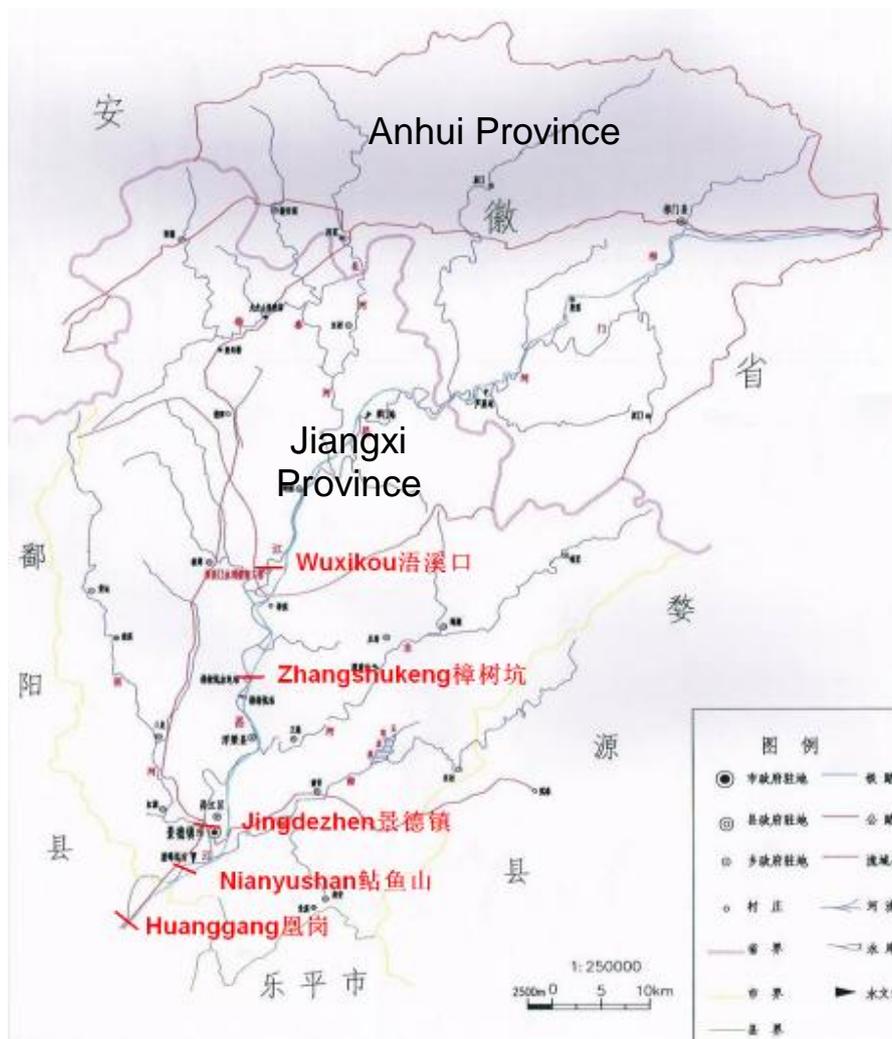
The proposed Jiangxi Wuxikou Integrated Flood Management Project (JWIFMP) in China will be built in the middle reach of the Changjiang River, about 40km upstream of Jingdezhen Municipality in Jiangxi Province. Changjiang River is one of the two major tributaries of Raohe River which flows into the largest freshwater lake of China, Poyang Lake. The water resource development of the Changjiang River was started in as early as 1987. According to the Raohe River Basin Development Plan dated 1993, five major hydraulic developments have been planned on the main stream of the Changjiang River (see Figure 1), in which three (Zhangshukeng, Nianyushan and Huanggang) have already been established and put into operation, and Wuxikou has been proposed under this project as the 4th cascade development facility. The development of Jingdezhen dam currently remains a pending issue without specific implementation plan. The existing and ongoing developments on the river are summarized below.

Table 1: Summary of Constructed/Ongoing Cascade Development Facilities on the Mainstream of Changjiang River in Jiangxi Province

No.	Technical /Economic Indicator	Unit	Name of Facility			
			Wuxikou	Zhangshukeng	Nianyushan	Huanggang
1	Major Functions	/	Flood control, also water supply and power generation	Only for power generation	Navigation, also power generation and road traffic	Only for river navigation
2	Location	/	40km upstream of Jingdezhen Municipality	17km downstream of Wuxikou dam site	60km downstream of Wuxikou dam site	80km downstream of Wuxikou dam
3	Time of Operation	/	/	2008	1987	1992
4	Catchment Area	km ²	2931	3311	5122	5428
5	Annual Mean Flow Rate	m ³ /s	85.1	95.3	NA	NA
6	Normal Water Level	m	56.0	34.0	21.5	17.3
7	Capacity					
7.1	Total Capacity	10 ⁶ m ³	427	6.97	NA	NA
7.2	Regulation Capacity		133	4.89	/	/
7.3	Flood Control Capacity		296	/	/	/
8	Max. Water Head	m	21.87	6.0	4.9	NA
9	Installed Capacity for Power Generation	MW	30.00	10.0	2.53	/
10	Annual Mean Power Generation	GWh	80.81	31.13	11	/
11	Design of Ship Lock	/	/	/	300t Grade 1 Ship Lock (135×15×2.5m)	300t Grade 1 Ship Lock (135×15×2.5m)
12	Annual Throughput	10000t	/	/	176	172

No.	Technical /Economic Indicator	Unit	Name of Facility			
			Wuxikou	Zhangshukeng	Nianyushan	Huanggang
13	Other	/	/	/	Road bridge: 8m wide, 254m long in total	/

Figure 1: Cascade Development Plan of Changjiang River in Jiangxi Province (1993)



As the only large reservoir in the planned cascade development, Wuxikou Dam will play a key role in the proposed cascade development plan, which will enable the functions of flood control, water supply and power generation for the Jingdezhen Municipality. It is designed with the maximum dam height of 46.8m and the normal water level of 56m, which will provide the total storage capacity of $4.27 \times 10^8 \text{ m}^3$. The Wuxikou Dam is expected to improve the flood control standard of the city from the current level of 1 in 20 years to 1 in 50 years (return period). Although the dam's purpose will be for flood management, a hydropower station will be integrated into the dam with a capacity of 32MW with the expected power generation of about 81GWh/year. The Wuxikou reservoir will be fully operated based on flood management while simply taking advantage of hydropower when there is water availability. The minimum flow from Wuxikou Dam of $15 \text{ m}^3/\text{s}$ is expected to meet demand from Jingdezhen Municipality, including industrial and agricultural water use both midstream and downstream. Short-term (2020) and long-term (2030) water supply demands, respectively $455,000 \text{ m}^3/\text{d}$ and $550,000 \text{ m}^3/\text{d}$, will be met. The project implementation will involve the total land acquisition of 33,009 mu for both reservoir inundation and establishment of new settlements outside the reservoir area and resettlement of 10,864 people of 2,926 households

in 20 villages in 5 towns/townships of Fuliang County , north of the city of Jingdezhen. The total project cost is estimated at 3.19 billion Yuan, which includes 698.00 million Yuan has been allocated for direct project investment, 2.42 billion Yuan for land acquisition and resettlement purpose, 9.38million Yuan for water and soil conservation, and 39.89 million Yuan for environmental protection. The project construction is planned to start in 2012, and the reservoir impoundment and power generation is proposed to begin in 2016.

Identified as a Category A project in accordance with the Bank’s safeguard policies, the Wuxikou Project EIA consists of the domestic EIA report, a Supplementary EIA report (ESIA, including a cumulative impact assessment report (CIA)), a social assessment report, a resettlement action plan, an Environmental and Social Management plan, and an EIA Executive Summary. The “Environment Impact Assessment Report of JWIFMP” (domestic EIA) was finalized by Yangtze River Water Resource and Protection Research Institute in December 2009 and approved by the Ministry of Environmental Protection (MEP) in January 2010. The supplementary EIA studies were instigated in November 2011 by Artelia China to meet the safeguard requirements of World Bank. The additional studies include the assessment of project impacts on natural habitats, pest management, forestry and physical cultural resources, the analysis of project alternatives, the assessment of environmental and social impacts resulting from associated projects including railway re-routing, roads and bridges, project resettlement and power transmission line, the due diligence assessment of ongoing Jingdezhen city dyke project, and the cumulative impact assessment in relation to the cascade development along Changjiang River. Based on the findings of the above studies, an Environmental & Social Management Plan has been developed to integrate all the environmental and social mitigation measures developed for both project construction and operation. Additional consultation with affected communities and relevant agencies has been undertaken during all of the above-mentioned studies. Comments and suggestions from the consulted communities and agencies have been incorporated into the final supplementary EIA and ESMP.

PROJECT OVERVIEW

The proposed JWIFMP is located on the midstream of Changjiang River and in Fuliang County, approximately 40km upstream of the urban area of Jingdezhen Municipality in the province of Jiangxi, China (see the two following figures), consisting of the following components.

Table 2: Composition of Wuxikou Integrated Flood Management Project

No.	Name of Component	Component Description	Project Investment (10000yuan)
1	Main Works of Wuxikou Dam	A Large(II)-type ¹ reservoir, using gravity dam, with the normal water level of 56.0m and the total capacity of 427million m ³ . With an integrated hydropower station with an installed capacity is 32MW with the annual power generation of 81GWh.	318,596.74
2	Borrow Areas for the Dam	Luoxi Borrow Area (2.13ha). A 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	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 camp	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

¹ With the storage capacity between 100million m³ and 1billion m³.

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No.	Name of Component	Component Description	Project Investment (10000yuan)
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 8410 people will be resettled in 60 resettlement sites (26 relocated and 34 near the existing locations). Zhitan Town will be relocated with a population of 1394 people by 2015 and the land use about 21.02ha. For the implemented and ongoing Phase 1 Jingdezhen City Dyke Project, a linked project, the total land acquisition of 1041.77mu and the resettlement of 2575 people has been implemented.	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	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
11	Jingdezhen City Dyke Project	The city dyke project has been 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 to remaining to be implemented in the near future.	34,000

Jiangxi Jingdezhen JWIFMP Implementation Company is the project developer managing project preparation, planning, implementation and future operation of the main dam and related ancillary works. The components of railway re-routing and associated power transmission lines will be implemented and operated respectively by the Ministry of Railway and the local power grid company.

Figure 2: Project Layout of Wuxikou Hydro-complex

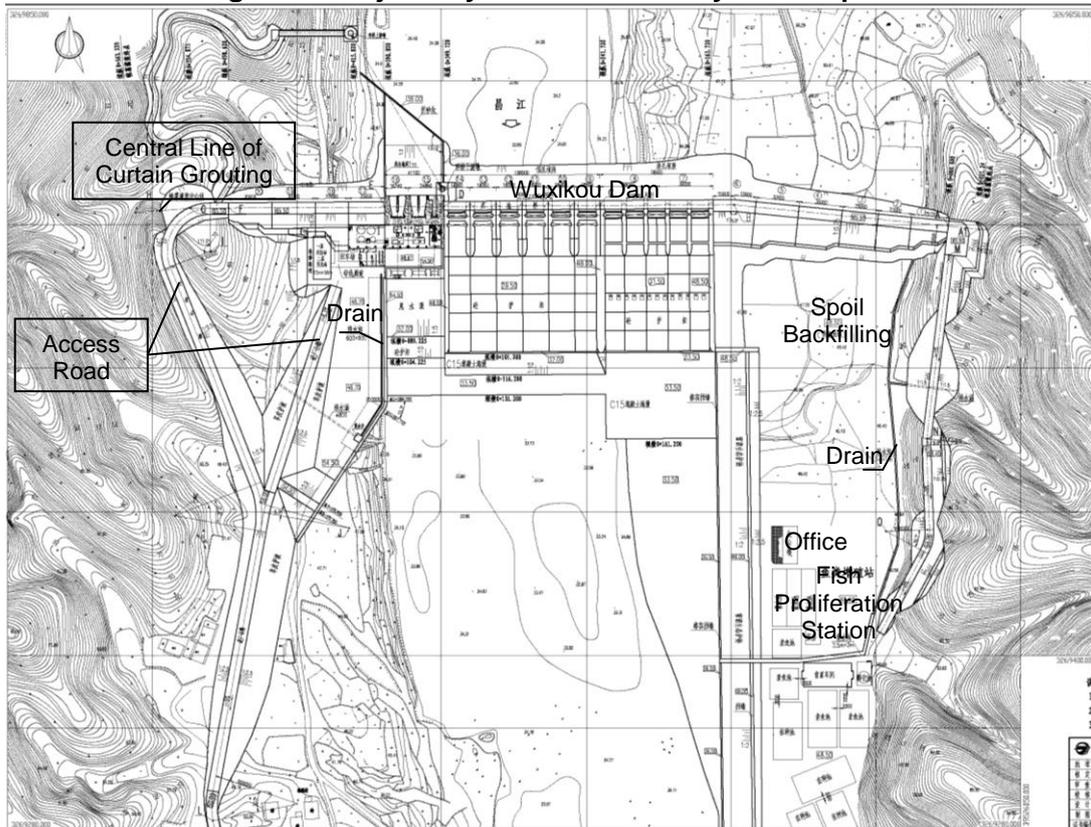
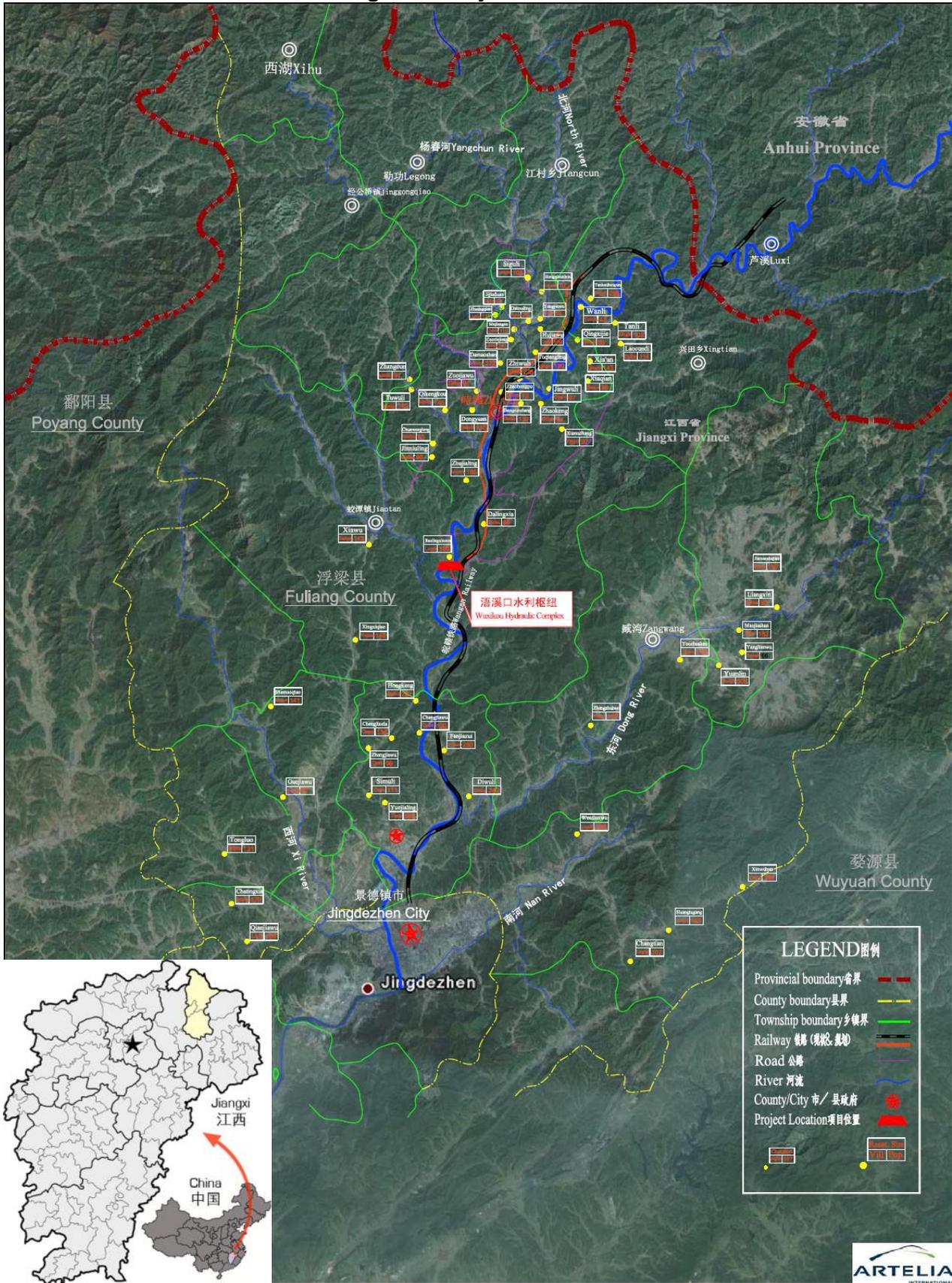


Figure 3: Project Location



SUMMARY OF ENVIRONMENTAL AND SOCIAL IMPACTS

In the proposed project components, major environmental and social impacts will be expected from the construction and operation of dam and reservoir, as presented below.

Impacts on hydraulic regime: Wuxikou reservoir will play a key role in the changes of hydraulic regime for Changjiang River. The reservoir operation will not change the inter-annual runoff distribution but will to some extent equalize the natural stream flow process in a year. The proposed seasonal regulation of Wuxikou dam 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 dam and reservoir area, but not for the other downstream sections. As the only large reservoir with regulation capacity on the river, Wuxikou Reservoir will play a key role in the river basin. Since it is designed with seasonal regulation, it will not change the inter-annual runoff distribution but to some extent equalize the natural stream flow process in a year.

Impacts on water quality: Based on currently good water quality and predictable development trends, the proposed JWIFMP 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 extensive survey data needs to be carried out to verify current conclusions. Further surveys are included in the Environment and Social Management Plan.

Impacts on Aquatic Ecology: According to the investigation carried out for the preparation of domestic EIA in 2008, no rare, endangered and vulnerable species and critical natural habitat will be adversely affected by the project. 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 such as blue-green algae and green algae, which will improve the feeding conditions of zooplankton, benthonic organism and fish populations that are adapted to these types of conditions. The deeper water area in the reservoir area (about 5~8m deeper than before) should 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, based on the existing downstream cascade development on Changjiang River (one hydropower station and two ship locks), the construction of Wuxikou dam will lead to further fragmentation aquatic habitats. The major negative impacts on local fishery resources are the impacts on the some fish species that require short-distance migration for their 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. Accordingly, the mitigation measures, such as joint operation of cascade development, habitat protection, artificial fish pass, strengthened fishery administration, artificial fish multiplication, have been proposed in the project ESMP to minimize the negative impacts on these species. 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 be limited to the construction period. After reservoir impoundment, the significant increase of water surface will increase the suitable habitat for otters, which means the project will provide positive impacts for otters. With the stabilization of local aquatic habitats after reservoir impoundment, the project operation is expected to have limited or 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 will be monitored during implementation and correctives measures will be taken as needed.

Impacts on terrestrial flora and fauna: About 30% of the areas affected by the project-related permanent land acquisition are forestland, which amounts to 662.4ha in total and only accounts for about 0.2% in total forest volume of Fuliang County according to 2011 statistics data. The affected forests mainly consist of secondary and regenerated forests which are of relatively low ecological value. There is no precious and rare vegetation in the project-affected area except 6 ancient trees in the inundated area (Significance of impacts and mitigation measures have been covered by the PCR management plan). The impact of project construction on terrestrial wildlife will be limited to around the dam site. The animals affected are common species in the region, and the impacts are temporary which will disappear with construction completion. Although the habitats might be partly occupied by

project implementation there are still quite a lot similar habitats available and suitable for wildlife in the region; therefore, the impacts of project implementation on wildlife biodiversity are considered limited. The project will not flood any established natural reserve. The locations of resettlement sites has been carefully selected to avoid the existing nature reserves. Currently only one resettlement site is located near the existing nature reserve, namely Huangzihao Muntiacus Crinifrons Nature Reserve, for which attention should be paid to patrol inspection and public education on wildlife protection.

Impacts on local PCRs: The protection of physical cultural resources is another concern during project implementation. The project will flood one county-level cultural relic site (Site of Workers, Peasants and Soldiers' Congress for Eight Counties in Anhui and Jiangxi province), three ancient ancestral temples of the Ming/Qing Dynasty, one small Christian church, six ancient trees and 4623 villagers' graves, but none of them is identified as having high cultural heritage values. The expected impacts are considered insignificant with the implementation of pre-defined PCR management plan. (See PCR Management Plan in the ESMP)

Land acquisition and resettlement: The reservoir inundation and project construction will lead to the permanent land acquisition of 2200.6ha (including 1063.1ha of farmland) and the resettlement of totally 9964 residents. Therefore, the project has the potential to interfere with local residents' livelihood, affect cultural and social structure of local communities, create additional pressure on community infrastructure and services, and increase the risk of spreading infectious diseases. An extensive social assessment was carried out covering all the project components, and a detailed RAP has been developed to ensure that residents affected by project land use and resettlement will be adequately compensated and that livelihood will be restore as needed.

Cumulative impacts: As one of the five planned hydraulic developments on the main stream of Changjiang River, together with the other existing and proposed dams on the river, the implementation of JWIFMP is expected to result in cumulative impacts on local hydraulic regime, water quality, aquatic ecology and so on. A cumulative impact assessment study has been implemented during project preparation to assess the significance of such impacts and to prepare for corresponding mitigation measures. Based on the preliminary findings from the study, a Phase 2 CIA study has been further proposed during the early stage of project implementation for more in-depth findings and more specific mitigation measures to be taken throughout the project implementation.

To address the above proposed project impacts, the Environmental & Social Management Plan (ESMP) and the Resettlement Action Plan (RAP) have identified the appropriate and detailed mitigation measures.

PROJECT REGULATORY AND LEGAL FRAMEWORK

The Environmental Protection Law of The People's Republic of China (effective since 1989.12.26) provides an umbrella framework for environmental management and protection in China. The prime authority for this law is the Ministry of Environmental Protection (MEP). The provincial and municipal Environmental Protection Bureaus (EPBs) are respectively the operating units for overall environmental management. Additional national laws and regulations related to environmental management of the project area include: Land Administration Law of the P.R.C. (1998.8.29), Water Law of the P.R.C. (2002.8), Law of the P.R.C. on Water and Soil Conservation (2010.2), Law of the P.R.C. on Prevention and Control of Pollution From Environmental Noise (1996.10.29), Law of the P.R.C. on Prevention and Control of Atmospheric Pollution (1995.12.29), Law of the P.R.C. on the Prevention and Control of Environmental Pollution by Solid Waste (1995.10.30), Law of the P.R.C. on Environment Impact Assessment (2003.9.1), Regulations on the Administration of Environmental Protection for Construction Projects (1998.11.18), Law of Forestry of the P.R.C. (1998), Law of Wildlife Protection of the P.R.C. (2004.8), Law of Fishery of the P.R.C. (2004.8), Law of the P.R.C. on Protection of Cultural Relics (2007.12), and Law of the P.R.C. on Prevention and Control of Infectious Diseases (2004.8). Other provincial-level regulations or ordinances on project environmental protection, pollution control, wildlife and forestry protection are also applicable to the project.

To meet specific requirements of World Bank policy on involuntary resettlement (OP/BP 4.12), the domestic RAP has been improved to clearly define the measures on resettlement planning and implementation including criteria for compensation and other forms of assistance, legal and institutional framework guiding project management, compensation payment, public consultation and procedures for pursuing grievances.

In addition, Wuxikou Dam must also comply with applicable environmental policies of the World Bank Group. Since the project is identified as a Category A project, a full environmental impact assessment was carried out following the Terms of Reference from the World Bank. Seven WB policies were triggered, as summarized in Table 3. The relevant Environment, Health and Safety Guidelines of the World Bank Group have also been taken into account were applicable.

Table 3: World Bank Environmental Safeguard Policies

Safeguard Policies	Summary of Actions Taken
Environmental Assessment (OP/BP 4.01)	<ul style="list-style-type: none"> • Category A project. The EA safeguards document package will include the domestic EIA, a Supplemental EIA, a stand-alone ESMP for the entire project, and an Executive Summary. The cumulative impact assessment is prepared as part of the Supplemental EIA. • A Panel of Experts (PoE) on Environmental and Social issues has participated in project preparation.
Natural Habitats (OP/BP4.04)	<ul style="list-style-type: none"> • Assessment of induced impacts on terrestrial natural habitats (illegal hunting and logging) stemming from additional pressure from nearby resettlement sites on protected areas was carried out and adequate mitigation measures (strengthening management of natural reserves and relevant education campaigns) were incorporated in the ESMP. • Investigation and impact assessment on aquatic habitat show that no rare, endangered and vulnerable species and critical natural habitat will be adversely affected by the project. After reservoir impoundment, both positive and negative impacts are expected on local aquatic habitats. The negative impacts specific to some species will be minimized by the mitigation measures proposed in the ESMP.
Pest Management (OP4.09)	<ul style="list-style-type: none"> • The use of pesticides will be induced by the project because: (i) mosquito and rodent control activities will be undertaken during reservoir clearing process and resettlement; and (ii) resettled families will be provided with plots to plant tea, ginseng and bamboos etc. • Mitigation measures including integrated pest management have been included in the EMP. In addition, the use of pesticide is subject to the Criteria for Pesticide Selection and Use.
Physical Cultural Resources (OP/BP 4.11)	<ul style="list-style-type: none"> • A PCR survey has been conducted by qualified specialists and a summary of results of this survey is included in the supplementary EIA. • A PCR management plan has been developed as part of the ESMP to detail the mitigation measures for different types of affected PCRs identified during the survey. • The PCR management plan proposes investigation, salvage, documenting (e.g. photo, video), and public display of any types of PCRs found in the project intervened areas, as part of the capacity building component. • Chance finding procedures during construction have been prepared and will be included in the project bidding documents and contracts.
Involuntary Resettlement (OP/BP 4.12)	<ul style="list-style-type: none"> • A RAP has been prepared; • A broader social assessment considering upstream and downstream livelihood of affected residents has been conducted.
Dam Safety (OP/BP 4.37)	<ul style="list-style-type: none"> • A Dam Safety Review Panel has been established ; • The Panel has reviewed all designs and emergency plans ; • A dam safety report has been issued by the Panel confirming that the design and plans meet international standards.
Information Disclosure (BP 17.50)	<ul style="list-style-type: none"> • Extensive public consultation has been undertaken in all of the affected communities between 2008 and 2012. • Safeguards documents including domestic EIA, ESIA, CIA and ESMP will be posted in English at the InfoShop and at local sites frequented by locals in the project affected area prior to project appraisal.

ENVIRONMENTAL AND SOCIAL SETTINGS

CHANGJIANG RIVER BASIN

The Changjiang River is one of two major tributaries of the Raohe River, and the Raohe River finally flows into Chinese largest freshwater lake of Poyang Lake. The mean annual runoff of Changjiang River is about 2.8 billion m³ at Wuxikou dam site, which accounts for only 2% in the annual runoff of Poyang Lake. The Major tributaries of the Changjiang River include Dabeishui River, Yangchun River, Donghe River, Xihe River and Nanhe River. Within its total stretch of 219.3km, the river has a total fall of 100.43m. The river has atonal catchment area of 6222km², which administratively falls into two provinces, namely Anhui (30.8%) and Jiangxi (69.2%).

WATER QUALITY

The water quality of Changjiang River is generally Class II². Water quality of the upstream tributaries (for example, Yangchun River) is Class I. However, due to non-point source pollution from rural areas and urban wastewater discharge the water quality for the sections near Qimen County (Anhui Province, upstream) and downstream of Jingdezhen urban area has been deteriorating in the last decade, and are now considered to be Class III, according to Jingdezhen EPB.

FLOODS IN CHANGJIANG RIVER BASIN

Floods in the Changjiang river basin are generally formed by storms. Thus the flood season are generally consistent with the local rainy season. During July and August, short-duration floods may occur due to local typhoons. Therefore, the floods mostly occur between April and August, 73.2% between April and June and approximately 44.6% in June. There is currently no large-scale hydro-complex for flood control in the basin, and the regulation capacity in the river channel is small. The flood duration for lower reach can reach 5-7 days. With the backwatering effects of Poyang Lake, the flood duration in the lower reach can be even longer.

Major floods in this region were recorded in 1955, 1996, 1998 and 1999, which have resulted in significant economic loss for Jingdezhen Municipality. For example, in 1998, the urban area of Jingdezhen was flooded twice for up to 94 hours in total. The maximum water depth at low-lying urban areas was 10m. Approximately 31.4km², or 94.6% of the total urban area in the Jingdezhen municipality was flooded. Up to 271,800 people were affected by the disaster, accounting for 88% of the urban population.

TERRESTRIAL FLORA AND FAUNA

The abundant rainfall and loamy soil supports high vegetation coverage in Changjiang river basin. The upstream mountainous area is mainly covered by forests together with shrubs at a lower elevation. The plains in the mid- and down-stream areas are the main grain-producing areas in the river basin. The flora of project area (including dam site, reservoir inundation area and resettlement area) is dominated by temperate vegetation, which mainly consists of coniferous forests (70%), evergreen and subtropical deciduous broad-leaved forests (3.5%), forests of moso bamboo on the hills below the elevation of 1000m or near villages (2.14%), shrubs and shrub grassland (7.55%), economic forests (2.11%) and crops (11.75%). According to the 2009 forest resource investigation for Fuliang County, the total area of forestland in Fuliang County is 211,882ha with the standing volume of 12.35m³ and the forest coverage is up to 79.80%.

There are 10 kinds of nationally protected plants in the river basin, 3 of which are Class 1 (gingko, metasequoia and taxus mairei). The other 7 are Class 2. However, none of these will be inundated by the proposed Wuxikou project except the five ancient camphor trees (Class II national protected tree species) aged 280~500 years old. There is also a 200-year-old liquidambar formosana (not classified as a protected tree) in the inundated area.

Given the high percentage of vegetation cover in the basin, it is not surprising that 121 species of terrestrial wildlife have been observed in the region, including 12 species of amphibians, 17 kinds of reptilia, 67 kinds of

² Environmental Quality Standard for Surface Water, GB3838-2002.

birds and 25 kinds of mammals. There are 4 kinds of Class I nationally protected wildlife (clouded leopard, panthera pardus, muntiacus crinifrons and symmaticus ellioti) and 11 kinds of Class II national protected wildlife. 42 kinds of provincial protected wildlife in the basin.

Accordingly, there is currently 1 provincial nature reserve and 6 county-level nature reserves in theregion, namely: (1) Jiangxi Yaoli provincial level nature reserve; (2) Fuliang Huangzihao county level muntiacus crinifrons nature reserve ; (3) Fuliang Qinglongjian Clouded Leopard County-level Nature Reserve ; (4) Fuliang Chabao mountain county level macaque nature reserve; (5) Fuliang Daling County level symmaticus ellioti nature reserve; (6) Fuliang Bazinao county level panthera pardus nature reserve; and (7) Fuliang Huangniuxin county level black bear nature reserve. However, the project construction and operation will have no direct impact on these nature reserves and thei wildlife. The potential impacts of increasing hunting activities and interference by construction workers and nearby resettlers have been considered in the environmental impact assessment and the ESMP.

AQUATIC ECOLOGY

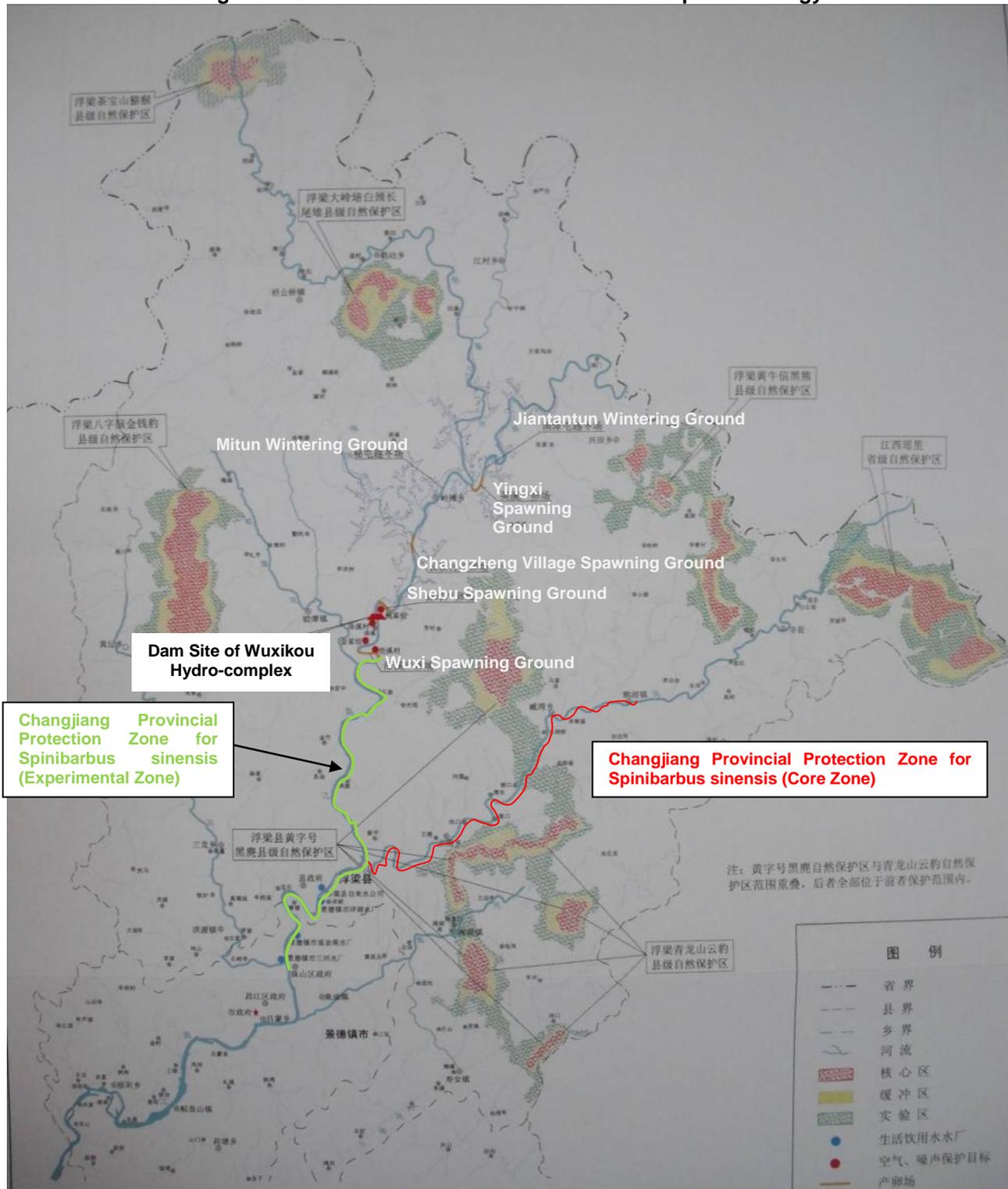
Changjiang River has a gentle slope with a low flow rate (averagely $88.0\text{m}^3/\text{s}$ at the proposed Wuxikou dam site). With decades of cascade development, the river has been largely modified, with rapid-flow habitat only on the upper reach and at some river bends. In terms of aquatic habitats, based on the 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 4). The typically overwintering ground are in the areas with the water depth over 20m deep, such as Mitun, Jiantantun, and Zhangshuikeng Reservoir downstream of the proposed dam.

Except the limited presence of otters (Class II nationally protected wildlife), there are no protected aquatic wildlife in the project influence area of the main river.

According to the survey carried out in 2009 for the preparation of the initial EIA, there are 15 families and 88 species of fishes found in the Changjiang River, 65.9% of which are of Cyprinidae. Most of these species have acclimated to both riparian and tranquil-flow habitats. However, due to overfishing, sand excavation and cascade development since the 1980's, the fishery resource has declined in recent decades with decreasing quantities of species and smaller size of fish individuals. The annual catch from Changjiang River has dropped from the historic 200~300t (in 1950's) to the current 30~50t (in 2010's). Due to physical barriers and related flow change caused by existing cascade developments, there has been generally no long range migratory fish found in Changjiang River in recent years. However, certain fish species still require short-distance migration between tranquil and rapid-flow habitat for spawning and feeding.

In May 2008, a provincial protection zone has been established in Changjiang River for the restoration of economic fish resources in Changjiang River. The key protected fish species are mainly economically valued species including *Spinibarbus hollandi*, *Opsariichthys bidens*, *Pelteoagrus fulvidraco*, *Culter alburnus*, *Siniperca chuatsi* and *Cyprinus carpio*. The protection zone involves no rare, vulnerable or endangered species. Among others, *Opsariichthys bidens*, *Pelteoagrus fulvidraco*, *Culter alburnus* and *Cyprinus carpio* have strong adaptability to changes of local habitat conditions; although *Spinibarbus Sinensis* and *Xenocypris microlepis* can adapt to both running water and tranquil water habitat, they still need short-distance migration for spawning and feeding. In July 2009, the protection zone was adjusted. 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 . The core zone is located approximately 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. The project implementation will not have any significant impacts on the core zone. An experimental zone is located about 0.6km downstream of the proposed Wuxikou dam and upstream of the existing Nianyushan Ship Lock. However, with the stabilization of local aquatic habitats, the project operation is expected to have limited or no adverse impacts on the spawning sites downstream of the dam and to have positive impacts on the existing aquatic habitat, feeding grounds and wintering grounds. This will be monitored during project implementation and correctives measures are in the ESMP to address any adverse impacts.

Figure 4: Sensitive Areas for the Protection of Aquatic Ecology



ARCHAEOLOGICAL, CULTURAL AND HISTORICAL RESOURCES

Investigation of physical cultural resources has been undertaken by qualified specialists to identify and study potential areas of high physical cultural value. Through the survey, only one officially recognized county-level

cultural relic was found within the project-affected area, that is, the site of Workers, Peasants and Soldiers' Congress for Eight Counties in Jiangxi and Anhui Provinces. This is a revolutionary site symbolizing the establishment of Anhui-Jiangxi Soviet Government and military sub-sector and the prosperity of Anhui-Jiangxi Soviet Power.

Additionally, there are three historic buildings of the Ming/Qing Dynasty in the reservoir inundation area, all of which are ancestral temples located in Jiaotan Town or Zhitan Township. Due to the lack of regular maintenance, these buildings are currently in poor conditions. Although not recognized as reserved cultural relics by the authorities, they still merit appropriate protection for their traditional cultural value.

There are 92 ancient trees in the project county aged between 100 and 1000 years, including camphor trees, ginkgo, *taxus chinensis* and *liquidamba formosana* according to the detailed survey carried out together with Fuliang County Forestry Bureau for the preparation of domestic EIA. Among others, five camphor trees and one *liquidamba formosana* will be flooded with the project implementation.

SOCIO-ECONOMIC SETTING

The Wuxikou Hydro-complex reservoir and supporting facilities are located in Fuliang County of Jingdezhen Municipality. According to the Jingdezhen Statistic Yearbook (2010), Jingdezhen Municipality has a total land area of 5256km² and a total population of 1.60 million people of which about 40% living in the 48km² urban areas. Jingdezhen is well known as the capital of porcelain. Now it has become an industrial city with industries including porcelain, automobile, machinery, electronics, construction materials, medical chemicals and food processing. The gross output value of industry and agriculture for Jingdezhen Municipality in 2009 was 36.4billion Yuan, and the gross revenue was 3.56billion Yuan. The per capita disposable income for urban residents was 14996yuan per year (2010), and the farmer's net income is 5705.3 Yuan per year (2010).

The total land area of the Fuliang County is 2851km² and its total population is 282,966 people, 77.3% of which live in a rural setting. The natural population growth rate is 10.63%. In 2009, the gross output value of industry and agriculture for the whole county was 4.6billion Yuan. The per capita disposable income for urban residents was 7836yuan, and the farmer's net income was 3492yuan.

LAND USE PATTERN

Fuliang County mainly consists of middle to low hills with the following land uses: 209.3km² of farmland (7.34%), 64.7km² of garden plot (2.27%), 2349.0km² of forest land (82.40%), 63.7km² of construction land (2.24%), 35.0km² of unused land (1.23%) and 129.1km² of other kinds of land (4.52%).

LIVELIHOOD OF THE AREA

Residents income within Jingdenzhen Municipality are generated from the following sources: fixed salary (37.4%), agriculture (26.67%), livestock industry (8.31%), wholesale, retail and catering bussinesses (5.9%), construction industry (3.14%), and forestry (2.47%) and other industry (3.02%). It is noticed that only 0.39% of the income is from fishery. In general, the rural population net annual imcomes are around Y5705 on average, and the urban residents' around Y14996. About 106,000 poor people, accounting for 6.8% of total local population, are categorized in the Dibao Program receiving monthly life subsidies from the government.

In comparision with the whole municipality, the residents' income from Fuliang County is more from agriculture (39.12%), forestry (4.43%) and fishery (0.98%), but less from fixed salary (35.56%), construction industry (2.01%) and industry (0.10%).

FISHERY

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.

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 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 lower part of 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 lack of adequate 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 implementation of cascade development in recent decades has also caused impacted fish spawning, feeding and migration. The size of caught fish is getting smaller and smaller, and some famous economic fish species such as *Spinibarbus Sinensi*, *Opsariichthys bidens* and mandarin fish have become almost depleted shown the depletion of resources. In this context, the artificial raising and release into the river of aquatic resource has increased in the recent years, which has allowed significant increase in different species such as grass carp, chub, carp, bream fish and bighead carp in the river.

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.

ALTERNATIVE ANALYSIS

WITH/WITHOUT THE PROJECT

The Wuxikou Dam was proposed mainly for flood control, water supply and power supply for the Jingdezhen Municipality. With project implementation, the flood control standard of Jingdezhen will be improved from a 20 year flood return period, to a 50 year flood return period. The 15m³/s discharge flow from the implemented project will guarantee the water supply and various water uses for industrial or agricultural purposes downstream of the dam. The Wuxikou hydro component is projected to increase the annual power supply capacity of Jingdezhen region by 81.3GWh and relieve the tension of local power consumption.

If the project is not implemented, additional flood control initiatives will need to be undertaken. According to the Jingdezhen Urban Development Master Plan, the flood control standard of the Jingdezhen urban embankment must be improved to a 50 years' return period. Even so, non-urban areas along Changjiang River will remain unprotected from floods. Without the project implementation, new water supply sources will need to be found to secure the city's water supply, particularly in the dry season. In this case, about 450,000m³/day will probably have to rely on groundwater availability, which is technically difficult and environmentally risky. Electricity will need to be purchased externally with a cost of about 65million RMB per year.

DAM LOCATION

During FSR preparation, two alternatives for the location of dam site have been considered, namely the upstream dam location (upstream of Luoxi Village) and the downstream dam location (0.6km upstream of Wuxikou Village and about 2.9km away from the upstream dam location) (see Figure 5). The comparison shows that although the downstream option excels in excavation depth, required quantities of seepage prevention works and installed

capacity (by additional 4MW), the upstream option is still preferred with significantly lower environmental and social impacts resulting from reservoir inundation, lower investment and better traffic conditions. Therefore, the upstream location was recommended as the preferred alternative in the project FSR.

Figure 5: Upstream and Downstream Dam Locations Sites during FSR Preparation



In the preliminary study, two alternatives for the dam axis were further analyzed based on the dam location identified in the FSR. The downstream dam axis option is the dam location identified in the FSR (the above-mentioned upstream option; while the other alternative is about 200m further upstream (see the figure below).

Figure 6: Locations of Upstream and Downstream Dam Axis Identified during Preliminary Design



The results of this comparison are summarized below.

Table 4: Alternative Analysis of Dam Axis in Preliminary Design

Element for Comparison	Alternative 1: Upstream Dam Axis	Alternative 2: Downstream Dam Axis
Topographic Conditions	The valley is about 470m wide and the length of dam axis is shorter.	The valley is about 500m wide and the length of dam axis is longer.
Excavation Depth	Shallower	Deeper
Potential Risk of Seepage	On the left and right abutment	Only on the left abutment.
Environmental Impacts	Farther away from Luoxi village. Concrete dam for both banks with less environmental impact in relation to borrow areas during construction.	Luoxi Village is right downstream of the dam with greater environmental and social impacts expected. Earth rock dam on both banks, and a larger scope is environmentally affected by borrow areas during construction.
Construction Conditions	The access road has to pass through the downstream dam axis which makes it 210m longer than Alternative 2.	The access road is 210m shorter than that of Alternative 1.
Reservoir inundation Impacts	Compared with Alternative 1, Alternative 2 will flood 30.10mu additional woodland and 45.93mu additional farmland, resulting in 3.18million Yuan additional inundation compensation.	
Land Acquisition	For land acquisition, Alternative 1 will acquire 32.27mu additional farmland compared with Alternative 2, but its acquisition of woodland will be 35mu less, which make the total investment of land acquisition 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.	

Alternative 1 is the preferred option due to environmental impacts, inundation impacts, land acquisition and total investment.

RESERVOIR WATER LEVEL

The area of inundated land is directly linked to the proposed project capacity, and thus the normal water level of the reservoir. During initial project planning, four normal water levels were compared; 70m, 66m, 60m and 55m. Preliminary results favored a normal water level of 60m. To reduce inundation loss and related environmental and social impacts, five options of normal water level were further analyzed from both technical and economic point of view, respectively 54m, 55m, 56m, 58m and 60m. Based on the preliminary analysis, three options (55m, 56m and 57m) are further compared, as shown below.

Table 5: Alternative Analysis of Normal Water Level for Wuxikou Reservoir (Preliminary Design Phase)

Item	Unit	Result of comparison		
		55.0	56.0	57.0
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 ⁸ m ³	2.964	2.964	2.964
Regulating capacity	10 ⁸ m ³	1.200	1.330	1.490
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

Item	Unit	Result of comparison		
		55.0	56.0	57.0
Normal water level	m	55.0	56.0	57.0
Installed capacity	MW	31	32	33
Annual average power generation	10 ⁴ kW.h	7868	8121	8364
Population resettled	/	9668	9680	9899
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
Total investment	Million Yuan	3057.67	3069.38	3165.91
EIRR	%	8.8	8.81	8.68
EIRR Difference	%	11.65		-0.86

The selection of a normal water level attempts to minimize the land inundation and resettlement while satisfying the needs for flood control, water supply and power supply. As shown above, the three options have comparable benefits in terms of flood control and water supply, therefore, the alternative analysis of normal water level for the project finally comes down to the evaluation between expected power generation profits and reservoir inundation. The EIRRs of all the options are over 8%, which means that all the options are economically feasible. However, the EIRR difference between Option 1 & 2 and Option 2 & 3 are respectively 11.65% and -0.86%. The EIRR difference from positive to negative indicates that Option 2 is better than both Option 1 and Option 3 in terms of comprehensive economic return. Furthermore, according to the indicators of population resettled and flooded farmland, the impacts of Option 2 is moderate among the three options. In conclusion, the option of 56m was chosen as the preferred option.

FISH PASS OPTIONS

To reduce the impacts of the proposed dam on habitat fragmentation and strengthen the exchange of biological resources between upstream and downstream, the fish pass measures should be taken to allow fish circulate pass the dam. Different fish pass options widely applied internationally and in China (include fishway, fish lock, fish lift, fish carrier and fish trapping and transportation) have been considered. Considering the context of Changjiang River (limited water head, construction difficulties and navigation capacity), the options of fishway and fish trapping and transportation was also compared for the project. The fishway option is featured by the possibility of continuous fish pass without artificial interference and low operation cost; however, considering the limited project impacts on fishery resources based on the data available of environmental impact assessment and cumulative impact assessment, it will not be economical to construct permanent fishway (costs 300,000-400,000\$ or more). In comparison, the option of fish trapping and transportation is featured by high efficiency and flexibility and relatively low investment. It is suitable for fish protection in cascade development with low fish production between different dams, which is the case for Changjiang River. However, this option will impose high operation requirements and require higher operation cost which is estimated at 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 capture and 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. Accordingly, the detailed fish capture and release plan has been developed targeting at the fishes accommodating to torrent and riparian habitat but spawning and breeding in riparian habitat, such as *Spinibarbus caldwelli*, *Spinibarbus sinensis*, *Gobiobotia filifer*, *Hemibarbus labeo*, *Hemibarbus maculatus*, *Acrossocheilus fasciatus*, *Plagiognathops microlepis*, *Cobitidae* fishes and so on. The plan will be implemented by local professional fishery science research agency and supervised by the Agricultural Bureau of Fuliang County. The amount of fish trapping is about 0.5-1.0t/year starting from the first year of reservoir impoundment and for ten consecutive years.

However, current available data studies are unable to provide sufficient justification for the preference of trapping and transportation option to other others based on the specific data/conditions of local aquatic habitat. 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 fish pass option will be decided. In the project design, the project owner has agreed to reserve space for the possible installation of permanent fish pass facilities. Furthermore, the possible incremental budget as a result has been considered in the contingency of current ESMP cost.

ENVIRONMENTAL AND SOCIAL DUE DILIGENCE OF URBAN EMBANKMENT PROJECT

According to the approved Jingdezhen Urban Flood control Development Plan and Jingdezhen Flood Control Project Proposal, flood control in Jingdezhen is a “Combination of dyke (floodwall) and reservoirs with step-by-step implementation of dyke (floodwall) before reservoirs” which is proposed with zoning protection of urban area using different flood control standard. It is agreed to firstly construct Jingdezhen flood control system with return period of 20 years and then improve it the return period of 50 years with the completion of Wuxikou reservoir and the joint regulation of city dyke and Wuxikou reservoir. Considered as the first phase of the overall flood control project for Jingdezhen Municipality, an environmental due diligence has been carried out for the already constructed and ongoing urban embankment project of Jingdezhen to review its environmental management and the implementation of environmental mitigation measures in compliance with national and local environmental laws and regulations as well as its consistency with the objectives of the Bank safeguards policies. The parts of Phase 1 flood control works that have yet to begin construction are covered by the ESMP (four sections of 9.12km that remain to be implemented).

The urban embankment project has been in implementation since 2000. In the project design, the 4 major drainage areas of Jingdezhen City are protected by seven sections of floodwall, three of which have been officially included in the implementation plan to satisfy the target of flood control for central urban area, namely the dykes of Eastern City (15430m), Western city (2870m) and Sanhedi (1890m) (see the figure below). Among others, Nanhe dyke of Eastern city area was completed in 2001, and the other dyke projects are included in the One-River-Two-Bank Rehabilitation Project for Jingdezhen City. 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, another 2.53km of dyke in the Eastern city area will be completed in 2012, and four sections of 9.12km remain to be implemented in the future.

Figure 7: Progress of Jingdezhen Urban Embankment Project



The due diligence was undertaken mainly by document review and site investigation. Since the implementation plan of the remaining four dyke sections is not yet determined, the due diligence focuses on the environmental management of constructed sections during operation and ongoing sections during construction. The remaining four dyke sections not yet determined are covered by the EMP. The results of the due diligence can be summarized as follows::

- The project has been prepared with a detailed EIA which has been approved by Jingdezhen EPB on 9/4/2004. The report proposed the investment of 96.35million for environmental management for ecological restoration, noise control, air pollution control and mitigation of social impacts. It is expected that the local ecological environment will be restored in 3 years with significant improvements compared with original conditions.
- During project construction, the contractors are responsible for implementation of an Environmental & Social Management Plan under the supervision and guidance of construction supervisors, Office of Jingdezhen One-River-Two-Bank Project (before 2007), Jingdezhen River Embankment Administration (after 2007) and Jingdezhen Municipal Government. During operation, Jingdezhen River Embankment Administration is responsible for the maintenance of constructed sections and the implementation of environmental management.
- Constructed sections: There is no unexpected environmental impacts or complaints detected during construction. The project implementation complies with national/local environmental laws and regulations and is consistent with World Bank applicable safeguards policies. The dyke completion has significantly improved the infrastructure of flood control and roads along Changjiang River. Vegetation restoration measures have been implemented as per project design. The changes have improved the riverside landscape which has driven the development along Changjiang River and improved the life quality of local residents.
- Sections under construction: Environmental mitigation measures related to land acquisition and resettlement, ecology, soil erosion, air pollution control and noise control are being implemented in accordance with national/local laws and regulations and is consistent with World Bank applicable safeguards policies. Up to now, there is no unexpected environmental impacts or complaints detected

during construction. Although 3 dyke sections have been completed, the project acceptance permit on environmental protection (compulsory procedure for project completion in China) will only be issued by the local EPB upon the completion of all the dyke sections under Jingdezhen Flood Control Project.

Based on the due diligence results, the following recommendations have been made and agreed upon to further improve environmental management protocols for the Phase 1 of the project, all of which have been integrated into the project ESMP:

- Further strengthen soil conservation work of construction sites especially in recent rain season.
- Strengthen environmental management recording and archiving during construction.
- 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 the environmental quality of construction site, and the mitigation measures can be strengthened accordingly as necessary.

In addition, in view of the linked Jingdezhen City Dike Project, a Due Diligence Review of the related resettlement was also conducted to ensure the quality of resettlement work. The Dike has a nine parts of construction and the first five were done before the Wuxikou Dam, while the four remaining parts are not yet determined for their start time. The first five parts requisitioned 1041.77 mu of land (468.8 mu from collectives and 572.97 from state), resettling 527 rural farmers in 130 households and 2048 urban residents in 526 households. They also relocated 279 shops and 23 enterprises. Relocation of 413 urban households caused by two of the five parts started last year has not been completed as yet.

The DDR reviewed the resettlement management organization, and the resettlement implementation and compensation processes in accordance with the national laws/regulations and the Bank policy requirements, through document review, official interviews and field surveys and PAP consultation. It confirmed the due efforts and work quality made by the Dike Project entity for the land acquisition and house demolition for the first five of the nine parts of the Dike construction work. The DDR recommended that the Bank keep monitoring the outcomes of the Dike resettlement implementation, which was also highlighted in the RAP.

In the meantime, with regard to the remaining parts of the Dike construction work, a Resettlement Policy Framework (RPF) was also developed in compliance with OP4.12 requirements. The RPF aims to guide RAP preparation when the remaining parts of the Dike construction are designed and approved,

ANTICIPATED ENVIRONMENTAL AND SOCIAL IMPACTS AND MITIGATION MEASURES

The analysis of anticipated environmental and social impacts has incorporated all the key findings of the initial EIA and supplementary EIA (including a cumulative impact assessment). The initial EIA mainly covers the direct environmental and ecological impacts of proposed project, while the supplementary EIA further analyzes the project impacts on local PCRs, social impacts, cumulative impacts of Changjiang River cascade development and the impacts of all the associated components such as the railway re-routing, transmission power line and project resettlement. The major environmental and social impacts and their mitigation measures are summarized below.

IMPACTS DURING CONSTRUCTION

DIRECT IMPACTS OF CONSTRUCTION ACTIVITIES

The dam construction will entail potentially significant negative impacts on the local environment and communities. The project will generate 297700m³ of spoil soil from the construction of open channel diversion, demolition of coffer dam, excavation of earth dam and spillway dam and all the other associated project activities including access roads, resettlement sites and so on. It is estimated that the project construction will lead to the

incremental 5.64×10^4 t soil erosion. The proposed soil borrow area will be about 80m from Luoxi Village; and there are concrete batching plant and sand processing system planned within 500m from Luoxi Village and Baojia Village; Also with the access roads passing by, the villages of Wuxi, Luoxi and Jinjia will be affected by the air pollution and noise caused by passing vehicles. Therefore, the proper management of excavation and spoil disposal, vegetation clearance and restoration, reduction of nuisance such as dust, noise, increased traffic, pedestrian safety concerns and the presence of a large work force in or near small rural communities will require careful engineering planning, close supervision and a continuous and intense community information program. Traffic management during construction will require strict controls.

A workforce that will peak at 816 workers is expected during construction. Potential impacts arising from the workforce and spontaneous development include pressure on land and natural resources (logging and hunting), generation of domestic wastewater and solid waste and increased public health risks. The interaction of the workforce with the local population may also pose a threat to local family structure and traditional customs.

Mitigation and management measures: Appropriate management of construction activities include sediment and erosion control, quarry and spoil disposal site management, wastewater management, nuisance (dust and noise) reduction, solid waste management and traffic management. A detailed soil erosion control plan has also been developed in the ESMP for both the dam and ancillary facilities covering inundated area, access roads, resettlement sites, borrow areas and spoil sites. The proposed structural measures in relation to drainage system, slope protection, vegetation restoration and surface greening have been included in the overall investment and the Bill of Quantities for the project and will be implemented together with non-structural measures by the construction contractors during project construction.

A detailed Environmental & Social Management Plan for all construction activities has been developed and will be strictly enforced. The environmental procedure for contractors during construction (Appendix 3 of ESMP) has also been developed as an appendix to the project ESMP, which will be included in all bidding documents and contracts together with the specific ESMP for the project construction period. The procedures specify the code of conduct/set of rules for the contractors to implement during construction, including construction camp management, construction impact management, waste management, pollution prevention, reservoir clearing and salvage, health management, safety management, environmental training for construction workers, community safety and relationship, camp follower management and environmental supervision during construction.

IMPACTS ON FOREST RESOURCES

The project implementation will lead to the permanent acquisition of 6352.8mu timber forest, 122.8mu economic forest and 3460.3mu shrubbery, which only accounts for about 0.2% of the existing forest resources in Fuliang County. It is estimated that as a result, the natural productivity will only decrease by about 0.6%. 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. In the hills between the elevation of 60m and 1000m above the reservoir storage level there is mainly pines and firs which are common in the subtropical monsoon climatic zone. Therefore, the project impacts on local forestry resources are considered to be minor.

Mitigation and management measures: Sufficient budget has been allocated to local forestry bureau for reforestation in accordance with relevant Chinese policies. In the construction area, in particular, in the temporarily occupied area, the reforestation will be implemented based on local conditions. The soil erosion control plan also covers the revegetation measures to mitigate the project impacts on local forests. In addition, as specified in the environmental procedure for contractors during construction, logging activities for any reason outside the approved construction sites are forbidden. The small owners of concessions will have opportunity to recuperate their forest resources before reservoir impoundment.

TERRESTRIAL WILDLIFE

The anticipated project impacts on terrestrial wildlife will be limited to the area around dam site during construction since most of the construction activities are around the dam site. The animals directly affected are common species in the region, and the impacts are temporary which will disappear with construction completion.

In addition, for terrestrial wildlife in the national protective directory such as mandarin duck, pangolin, large Indian civet and civet cat, during project construction their habitat might be partially occupied; however, since there are a lot similar habitat suitable in the region; therefore, the impacts of project construction on them will be minor and temporary. In the project design, the locations of relocated resettlement sites have been selected with the consideration of avoiding existing nature reserves in the region. 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 activities of construction workers during construction and the daily activities of resettlers during operation may interfere with the habitat of terrestrial wildlife and increase the hunting activities. With the impoundment of Wuxikou Reservoir, the water surface area will significantly increase. This will be favorable for amphibious wildlife. The quantities of wildlife such as snakes, lizards and birds will increase dramatically. The original habitat of terrestrial wildlife will be inundated. This would force them to move to a higher place. However, such impact is considered as insignificant since there is a lot similar habitat around.

Mitigation and management measures: The above-mentioned expected impacts will be mitigated by the following measures:

- Strengthen environmental management during construction: Implement strict environmental management of construction activities and construction sites by following relevant regulations of Environmental Procedure for Constructors during Construction (Appendix 3 of ESMP), such as forbid blasting in the morning, at noon and in the evening to minimize potential impacts on local wildlife; implement a hunting ban; quick restoration of local vegetation by following the soil erosion control plan (Appendix 1 of ESMP);
- Publicawareness program: Carry out information campaigns among construction workers, resettlers and operators about wildlife protection;
- For the national and provincial listed protected animals, information brochures shall be distributed among construction workers and resettlers for awareness enhancement of wildlife protection including relevant wildlife protection laws and regulations.

AQUATIC WILDLIFE

According to the construction methods proposed in the preliminary design, the diversion channel will be implemented to maintain the flow rate downstream of Wuxikou dam. Only 4 hours of no downstream flow is expected during the interception of Phase 3 open channel in the whole construction period (42 months). Even in this case, with the regulation of the downstream Zhangshukeng Hydropower Station, a minimum 4m water depth can be maintained downstream of Wuxikou Dam. Therefore, no significant impact is expected on the aquatic wildlife during construction. However, high noise and increased human activities from construction sites may interfere with the living of otters, the listed Class II national protective animals with limited presence in this region, and lead to their migration.

Mitigation and management measures: The management of construction activities will be strengthened as per the regulations in the Environmental Procedure for Constructors during Construction (Appendix 3 of ESMP) to prevent any hunting activities.

IMPACTS ON PCRS

Based on the investigation results of the initial EIA and the supplementary EIA the local PCRs possibly affected by JWIFMP include one county-level cultural relic site (Site of Workers, Peasants and Soldiers' Congress of 8 Counties in Jiangxi and Anhui Province), three ancient buildings (ancestral temples) of Ming/Qing Dynasty, one small Christian church built by local residents, some ancient trees and 4623 villagers' graves. A detailed Physical Cultural Resource (PCR) management plan has been developed as part of the ESMP, in which the level of cultural

value for affected PCRs has been evaluated and ranked with specific mitigation measures proposed as summarized below.

Table 6: Affected PCRs and Mitigation Measures

Name of Affected PCRs	General Description	Level of Cultural Value	Proposed Mitigation Measures
Cultural Relic	One county-level protected cultural relic in Qingxi Village of Zhitan Township will be inundated by the proposed reservoir, namely the site for the Congress of Workers, Peasants and Soldiers from 8 counties of Anhui and Jiangxi provinces.	High	The site will be integrally moved and rehabilitated as original for off-site protection before project implementation. Since it is recognized as the county-level cultural relic, its movement will be implemented by Fuliang County Cultural and Broadcasting Bureau (local authority for cultural relics) in accordance with the requirements and procedure of Cultural Relics Protection Law.
Ancestral temples	There are three ancestral temples built in Ming/Qing Dynasty in the inundation area, respectively, Zhang's Ancestral Temple in Shebu Village of Jiaotan Town, Wu's Ancestral temple in Maowu Village of Zhitan Township and Yu's Ancestral Temple in Qingxi Village of Zhitan Township (consisting of upper temple and middle temple). Although they are not classified as recognized cultural relics by local authority and are in relatively poor conditions due to lack of recent use and maintenance, they still carry considerable cultural and traditional value.	Medium	To move and rebuild the above-mentioned ancestral temples of Ming/Qing Dynasty. 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 is recommended that it should take the opportunity of movement and reconstruction to combine the general ancestral temple and the upper ancestral temple. The costs for the movement and rehabilitation of these ancestral temples has been included in the RAP and referenced in the PCR Management Plan in the ESMP.
Ancient Trees	There will be five camphor trees and one liquidambar formosana to be inundated by the project, which are aged between 100-500 years.	Medium	The camphor tree on Zhitan Street in Group 1 of Zhitan Village in Zhitan Township will be removed due to its poor growth conditions. All the other five ancient trees will be transplanted as part of the greening works within the project owner's camp. The detailed transplantation plan will be developed and implemented under the guidance of the county forestry bureau.
Church	A two-storey Christian church in Zhitan Village will be inundated, which is a cement building constructed by local villagers 5-6 years ago. The total area of this church is 295.4m ² . It provides divine service to parishioners from nearby Zhitan Township and Liukou Village.	Low	There shall be further public consultation in order to identify the location of resettled church. New church shall be completed with the original size, standard and functions before the demolition and with the public being informed.
Graves	There will be 4623 inundated villagers' graves to be relocated in 21 villages of 5 towns under this project.	Low	The grave relocation shall be compensated based on local price level by giving respects to the willingness of local villagers and local customs.

In addition to the above-mentioned PCRs, the investigation done by the PCR specialist also indicates that there is still possibility to discover additional cultural relics during project construction. Careless excavation might cause damage to these sites. To avoid potential damage to valuable PCRs, chance-finding procedures have been included in the ESMP. When there is a cultural heritage site discovered during construction, the construction shall

be suspended, and protection measures will be taken as specified in the Physical Cultural Resource (PCR) Management Plan.

During the site investigation, some ancient relics with relatively low cultural value or in poor conditions were found within the project-affected areas. For example, a small stone arch bridge built in Qing Dynasty was found. Due to their limited cultural value, these relics will not be fully conserved or moved. Instead, for these types of relics, an archeological archiving program will be carried out within the whole project-affected area during project implementation to conserve the valuable structural components or to keep some graphic records by photography or the making of a television documentary. This program will be implemented as one of the technical assistance components under the project and included in the Physical Cultural Resource (PCR) Management Plan.

PUBLIC HEALTH

Although there is no industrial polluting source found in the reservoir area, the bottom clearance of Wuxikou Reservoir will possibly result in a higher public health risk due to the inundation of existing tombs, latrines, domestic solid waste storage site, etc.

Mitigation and management measures: These potentially contaminated areas will be disinfected covering a total area of 31,566m².

During construction, the workforce on site will reach a peak of about 816 workers. Most of construction workers and camp followers come from different locations and they can potentially bring other diseases to the area. The increase of population density and presence of limited sanitation facilities on site will increase the risk for the spreading of diseases such as Sexually Transmitted Infections (STIs), HIV/AIDS, typhoid, dysentery and hepatitis. Common health issues that can come with these groups are: tuberculosis, respiratory infections, diarrhea, helminth, vector-borne diseases such as malaria, alcohol abuse, drug addiction, zoonoses, schistosomiasis, leptospirosis, etc.

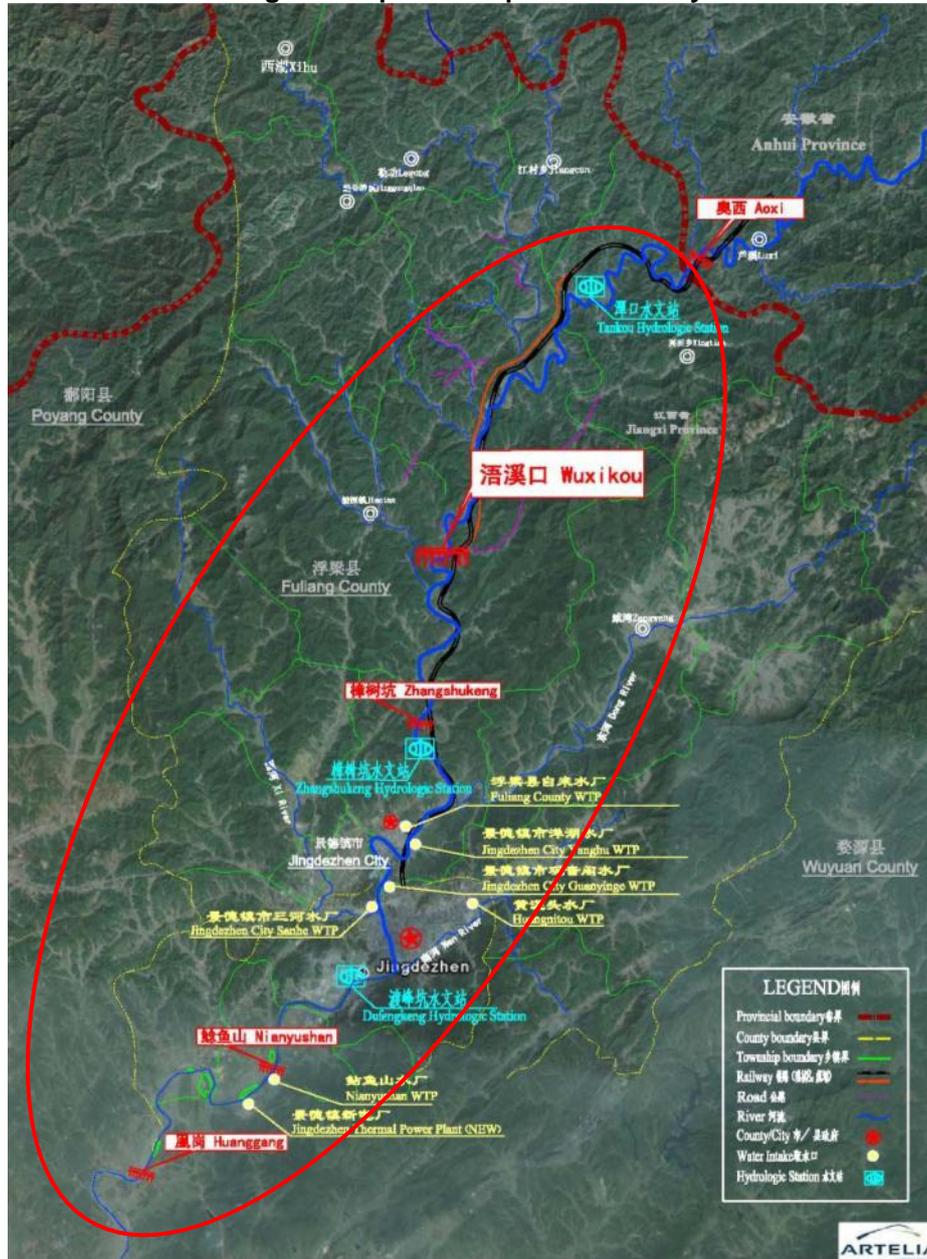
To minimize the potential impacts to public health within and around construction sites, a series of mitigation measures have been proposed in the environmental procedure for contractors during construction (Appendix 3 of ESMP). The key measures include vector control (regular killing of rats, mosquitoes and flies), implementation of an epidemic prevention plan, physical examination and immunization of all the construction workers, hygiene education and management and provision of public hygiene infrastructure like temporary latrines.

IMPACTS DURING OPERATION

CUMULATIVE IMPACT ANALYSIS

The key impacts during operation will be related to the hydraulic regime, water quality, downstream water use, aquatic ecosystem and livelihood recovery of affected residents. However, since the proposed Wuxikou Dam is proposed as the 4th project in 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 to evaluate the combined impacts in the river basin. The study has taken into consideration all pertinent environmental issues that have been raised in the original EIA for JWIFMP. The focus and priority of the study has been given to the cascade development of the 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 (as shown in the figure below).

Figure 8: Spatial Scope of CIA Study



Based on the available development plans of the 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:

Table 7: Short-term and Long-term Scenarios for CIA Study

Name of Scenario	Short-term Scenario (2020)	Long-term Scenario (2030)
Development Activities	<ul style="list-style-type: none"> - 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. 	<ul style="list-style-type: none"> - 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.

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 Dam Project considering the positive project impacts such as further reduction of flood risk, improvement of fish reproduction, promotion of economic development and consequent potential 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 significant irreversible negative environmental impact are foreseen on the key VECs due to the implementation of Wuxikou Dam 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 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 water quality and predictable development trends, the proposed Wuxikou Dam project with other identified projects/activities in the Changjiang River Basin it is not foreseen that the project will have significant impacts in terms of water quality. However, more specific water quality modeling based on more extensive 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::

- **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 shall 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;
- **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.

ADAPTIVE MANAGEMENT APPROACH TO RESERVOIR MANAGEMENT

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 will be carried out during project implementation. A Comprehensive Reservoir Management Plan will be developed to provide more detailed information on the overall management of proposed Wuxikou Reservoir. The Comprehensive Reservoir Management Plan (CRMP) will also identify specific needs related to future monitoring and adaptive management. The study should be completed during dam construction period.. The detailed reservoir

management study outcome should be reviewed and approved prior to reservoir inundation. The Terms of Reference for the detailed CRMP study is included in the ESMP.

More detailed data and analysis will be further carried for the cumulative impacts out so that the impact analysis can be further quantified and more specific and effective mitigation measures can be incorporated in the project implementation. The Terms of Reference of the additional for the cumulative impacts data collection and analysis study has been developed and included in the report.

An adaptive management approach will be adopted for the implementation of relevant environmental and social management components and is included in the ESMP. Different mitigation measures will be managed and implemented 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. Necessary capacity building program will be developed based on the key findings of studies. Staffs of project operator and relevant officials in the involved authorities should be covered by the program to give them a better understanding of their critical responsibilities in the environmental management for the proposed project and cascade development

RESERVOIR DRAWDOWN AREA

The reservoir operation will create large area of inundation and drawdown areas. In particular, the drawdown area of 1724ha between flood control limited level (50m) and normal water level (56m) is important to protect the reservoir from sediment inflows along a much longer shoreline. Therefore, a vegetated buffer zone should be well managed.

According to the project RAP, besides the area that will be flooded by the 56m normal water level designed for the project, the land acquisition for the reservoir has also covered the farmland and garden plots expected to be inundated by 1-in-5-years' floods, and the project resettlement for rural residential areas has considered the inundation of 1-in-20-years' floods. By applying the criteria, the elevation for the acquisition of farmland and garden plots under this project varies between 56.5m and 60.14m, and that for the resettlement of rural residence varies between 57.0m and 60.07. All the acquired land will be owned and managed by the project owner, Jiangxi Province Jingdezhen Wuxikou Hydraulic Complex Project Development Company for soil erosion control. The corresponding compensation and the assessment of resulting social impacts have been covered by the current RAP and social assessment.

In the catchment of Changjiang River, Fuliang County has put great efforts on water and soil conservation and forest protection in the last decade made by taking the following measures:

- 1) Strictly implement the logging permit and quota system issued by Jiangxi Province Forestry Department;
- 2) Since 1998, implement forest reservation for 1million mu forestland, in particular for the existing large areas of natural broad-leaved forests in Fuliang County;
- 3) Advance the projects of "returning farmland to forests";
- 4) Promote the establishment of protection forests upstream of Yangtze River Basin;
- 5) Since 2008, implement the extensive afforestation and grass planting project in Fuliang County covering the county town, township central area, rural villages and the ground surface exposed by the construction of infrastructure, industrial zones and mining areas.

All these efforts have contributed to the over 80% vegetation coverage and good soil and soil conservation status in Changjiang River Basin. According to the statistics, currently the area with soil erosion in Fuliang County is 173,53km², only accounting for 5.27% of its total land area. The region is only classified as the soil erosion prevention and monitoring zone in Jiangxi Province.

In addition to this soil and water conservation plan specific to the project prepared by the client and approved by the government, a Comprehensive Reservoir Management Plan (CRMP) study proposed as part of the ESMP, will further study and make recommendations on this topic. For any mitigation measures possible to be proposed by

the CRMP in the near future, the budget will be covered by the contingency of ESMP cost, and it will then be modified based on the findings of the CRMP.

ENVIRONMENTAL IMPACTS OF RESETTLEMENT

Under the project, a total rural population of 8483 people will be resettled in 60 small resettlement sites (26 relocated and 34 sites near the existing locations) and a Zhitan Town will be also relocated. In order to address environmental impacts of the resettlement activities, a standalone Environmental & Social Management Plan (Section4 of ESMP) has been developed and included in the project ESMP. The standalone ESMP includes the actions, responsibilities and measures for both rural resettlement sites and relocation of Zhitan Township to guarantee that the impacts from resettlement are minimized.

All the rural resettlement sites and relocated Zhitan Township have been planned with sufficient environmental infrastructure, as presented below.

ENVIRONMENTAL INFRASTRUCTURE OF RURAL RESETTLEMENT SITES

The locations of resettlement sites for the project have been identified based on good natural and traffic conditions, sufficient land carrying capacity and relatively high development potential. It is noticed that during the design three of the potential resettlement sites have been relocated to avoid the nearby natural reserve. Each resettlement site will be provided with adequate traffic, water supply, power supply, wastewater and solid waste management infrastructure which will be designed and implemented during the resettlement process. The proposed environmental infrastructure includes:

- Water supply: Based on local conditions, the water supply of proposed resettlement sites will come from nearby streams or a water tower. The total length of required water pipes is estimated as 43.9km;
- Wastewater management: A combined sewage system will be implemented in all the proposed resettlement sites;
- Green area: The resettlement sites with the population over 400 people will be designed with greening area to provide the venue for public communication and outdoor activities of resettlers.

ZHITAN TOWNSHIP RELOCATION INFRASTRUCTURE

The development plan of the relocated Zhitan Township has been prepared with an expected population of 1481 persons by 2015. This plan will be implemented during project implementation covering the following environmental infrastructure facilities:

- Water supply: A 3000m³/d water treatment plant will be installed with 3.04km of water supply pipes;
- Drainage system: The combined sewage system has been planned with a length of 2.82km, and a wastewater treatment plant has been proposed in the west of the township for the treatment of domestic wastewater;
- Solid waste management: The solid waste management system will be established for the new township, consisting of one solid waste transfer station, solid waste collection points for each block and garbage cans every 80~100m along the streets;
- Greening: The town is planned with a forest coverage rate of over 60%.

ENVIRONMENTAL IMPACTS OF ANHUI-JIANGXI RAILWAY RE-ROUTING PROJECT

As part of the Anhui-Jiangxi Railway Electrification Project, the environmental impacts for the re-routed section of Anhui-Jiangxi Railway within the inundation area of Wuxikou project have been reviewed based on the EIA report for the whole Anhui-Jiangxi Railway Electrification Project. The existing Anhui-Jiangxi Railway goes through the ecological protection area where any development activity is forbidden by the plan of the ecological functional zone; after re-routing, the railway will go through its ecologic economic area where development activities are permitted. That is, the re-routing project will reduce the environmental impacts of the railway operation on the Raohe River Origin Ecological Functional Zone. In 2011, the approval has been given to the proposed re-routing project by Jiangxi Provincial Environmental Protection Bureau. Potential impacts of this component during construction include resettlement, soil erosion, forest occupation, dust, noise, construction wastewater, solid waste and traffic safety risks. During operation, the expected impacts are mainly the nuisance of noise and vibration for residents living along the railway. However, none of these impacts are considered significant. The standalone Environmental & Social Management Plan for this component has been developed as part of the ESMP for the Wuxikou project.

ENVIRONMENTAL IMPACTS OF SUPPORTING POWER TRANSMISSION LINE PROJECT

About 24km of 110kV power transmission line will be built for the proposed Wuxikou Hydro-Complex. The project implementation will possibly lead to the impacts of resettlement, soil erosion, air pollution, noise, water quality pollution and construction safety risks. A standalone Environmental & Social Management Plan has been developed for the component as part of the ESMP for WuxikouDam..

CLIMATE CHANGE

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 are limited. 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 CO₂ emission by 89100t/a.

OTHER SAFEGUARD ISSUES

PEST MANAGEMENT (OP4.09)

According to project design, during the implementation of Wuxikou Hydro-Complex, pesticide will be used to control mosquitoes and flies during the sanitary cleaning of construction sites. Rodenticide will be used for centralized deratization in the resettlement sites, and in the livelihood restoration of migrants. The cultivation of *Radix Pseudostellariae* and *Camellia oleifera* may also involve pest management. Since the chemicals used have been identified for the first two activities, the supplementary EIA considers 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 a special Pest Management Plan (PMP, Appendix 7 of ESMP) and introduced the concept of integrated pest management to minimize the pollution of chemicals to the natural environment by capacity building and long-term monitoring. In addition, during the implementation of reforestation as an

ecological compensation measure, attention will be paid to avoid the introduction of single or exotic invasive tree species to reduce the risk of diseases and insect pests.

SAFETY OF DAMS (OP4.37)

Since Wuxikou Dam is the only reservoir with a large storage capacity in the cascade development of the Changjiang River, a Dam Safety Review Panel (DSRP) has been established for Wuxikou Dam which has undertaken preliminary project design. It has reviewed the quality assurance, O&M, instrumentation and emergency preparedness plan prepared and found them satisfactory. All the other recommendations of the DSRP have been met.

IMPLEMENTATION ARRANGEMENTS

ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN

The management of environmental and social impacts and measures for mitigation are mainly organized into two key plans, respectively Environmental and Social Management Plan (ESMP) and the Resettlement Action Plan (RAP). Their scope and objectives are summarized below.

Table 8: Scope and Contents of ESMP and RAP

Name of Plan	Objectives	Contents
Environmental and Social Management Plan (ESMP)	<p>The Environmental and Social Management Plan (ESMP) for Wuxikou Integrated Flood Management Project (WIFMP) identifies the principles, approach, procedures and institutional arrangements that will be applied to control and minimize the environmental and social impacts of all the construction and operational activities associated with project development based on the findings of all the EIA studies and social assessment study.</p> <p>The ESMP contains guiding environmental principles and procedures for communication, reporting, training and monitoring which all the staff of Jingdezhen JWIFMP Implementation Company, contractors, subcontractors and construction supervisors are required to comply with throughout the preconstruction, construction and operation phases of the Wuxikou Hydro-Complex.</p>	<p>ESMP for pre-construction phase – measures to mitigate potential negative environmental and social impacts of the proposed project before construction;</p> <p>ESMP for main construction sites – measures to minimize negative environmental and social impacts of construction and operation activities on local communities and the natural environment within the main construction sites including dam site, inundated reservoir area, workers’ camp, access roads, spoil disposal sites and borrow areas;</p> <p>ESMP for resettlement sites – measures to minimize negative environmental and social impacts of construction and operation activities on local communities and the natural environment within planned resettlement sites;</p> <p>ESMP for ancillary facilities – measures to minimize negative environmental and social impacts of construction and operation activities on local communities and the natural environment for ancillary facilities including city dyke project, Jiangxi-Anhui Railway Re-routing Project and power transmission line project;</p> <p>Soil erosion control plan – measures to minimize the negative impacts related to soil erosion; Reservoir bottom cleaning plan – measures to guarantee the proper cleaning of reservoir bottom;</p> <p>Environmental procedure for contractors during construction – environmental specification for contractors to minimize any negative</p>

Name of Plan	Objectives	Contents
		environmental impacts related construction activities; Hazardous materials and waste management plan – measures for proper storage and handling of hazardous materials and waste within construction sites; Physical cultural resource management plan – measures for the conservation of local PCRs in the project-affected areas; Pest management plan – measures to control negative impacts related to pest management; Social management plan – measures to minimize or mitigate negative social impacts related to the project implementation based on the findings of social impact assessment.
Resettlement Action Plan (RAP) Resettlement Policy Framework (RPF)	The project owner, through the RAP&RPF, commits to fully compensate resettlement impacts, to improve or at least restore livelihoods of local residents.	Measures related to losses of houses, land and other livelihood assets. The plan makes provisions for full compensation and relocation of all the affected residents. Community livelihoods improvement measures for all the villagers affected by resettlement under the main project.

The ESMP also contains a series of additional activities to improve the baseline of the project area and support decision making through adaptive management. These studies include:

- A further Cumulative Impact Assessment at the basin level to acquire data and further analyze the potential impacts of Wuxikou and future development activities in Changjiang River Basin;
- Comprehensive Reservoir Management Plan to inform and enhance the mitigation action plan, adaptive management approach, instream flow needs and reservoir operation planning;
- An archeological archiving program during project implementation in order to conserve additional valuable structural components or keep graphic records of these relics by photography or producing a television documentary.

ROLES AND RESPONSIBILITIES FOR ESMP IMPLEMENTATION

All environmental obligations detailed in this ESMP apply to the Project Management Office (PMO) under Jiangxi Province Jingdezhen Wuxikou Hydraulic Complex Project Development Company, to the Construction Supervising Companies (CSCs), to the Construction Contractors (CCs) and their Sub-Contractors. During the decision process, PMO is the main body responsible for following the environmental issues related to the Wuxikou Project and coordinating with other Chinese Government Agencies and the World Bank. The PMO will nominate dedicated, trained and qualified Environmental Management Staff (EMS) to undertake environmental management activities during construction and operation, in order to ensure the effective implementation of the mitigation measures decided in the ESMP.

For construction period, the Environmental Management Unit (EMU) will be implemented under the CSC to deal on site and on a day-to-day basis with all the environmental matters related to project construction activities. Each EMU manager and its staff (environmental engineers, field inspectors) will be appointed by the CSC. Each main CC will be required to set up an environmental structure including an Environmental Coordinator, engineers and field inspectors. Environmental staff in both CSC and CC is intended to be independent of construction staff. Environmental staff will work alongside and in close coordination with construction staff.

For both the construction and operation phases, independent consultants will be hired by the PMO as part of TA components to provide necessary assistance throughout the project implementation.

The overall organization for the implementation of this ESMP is shown in the following table and figure.

Table 9: Responsibilities for ESMP Implementation

Organization	Responsibilities
Local Governments and Relevant Authorities	<ul style="list-style-type: none"> - The local governments of different levels and relevant authorities under them, including Jiangxi Provincial Government, Jingdezhen Municipal Government and Fuliang County Government, shall take part in the supervision of ESMP implementation during construction and operation phases where applicable, in particular, in the implementation of attached sector management plans under this ESMP, as presented in Table 10.
Project Management Office (PMO) under Jiangxi Province Jingdezhen Wuxikou Hydraulic Complex Project Development Company	<ul style="list-style-type: none"> - Provide approval of this ESMP prior to its implementation; - Coordinate with the Bidding Company to ensure i) the ESMP is attached to the tender documents, ii) the technical specifications make clear reference to the ESMP and iii) the ESMP is eventually part of the Contractual documentation; - Appoint or nominate an Environmental Director (PMO-ED) for the Wuxikou Project plus required supporting staff; - Coordinate and manage communication with relevant Chinese Agencies; - Coordinate and manage communication with the WB on environmental issues; - Participate in a formal ESMP review every year, in line with ISO14001 principles. - Coordinate, through the CSC-EMU the efficient implementation of the ESMP on the construction sites; - Ensure non-compliances detected by the CSC-EMU are expeditiously resolved by the concerned CC; - Review and comment the monthly environmental progress report from CSC-EMU and prepare monthly, semi-annual and annual environmental reports; - Supervise the preparation of training programs and materials for CC and CSC staff by a specialized company.
Construction Supervision Company (CSC)	<ul style="list-style-type: none"> - Supervise construction activities and ensure that the ESMP is adhered to at all times and taking action if the specifications are not followed; - Carry out routine inspections of construction sites and report non-compliance detected as detailed in the ESMP; - Review weekly and monthly environmental reports submitted by the CCs; - Ensure non-compliance detected are quickly corrected by the CCs; - Participate to the weekly construction meeting; - Prepare monthly reports submitted to PMO-EMS; - Ensure communication with and diffusion of environmental guidelines including this ESMP to all CCs; - Coordinate awareness training with the CCs and report training status to PMO-EMS through the Training Register; - Perform environmental awareness training to PMO-EMS; - Review when justified CC method statements and specific environmental control procedures and ensure this documentation complies with all requirements of the ESMP; - Ensure that CC develop specific environmental controls deemed necessary even if not addressed in the ESMP; - Contribute to the yearly Management Review of this ESMP; - Follow up the grievance register and provide expeditious answer to any environmental complaints registered; - Manage documentation and establish environmental data base in accordance with the requirements of the EMP; - Facilitate when required site inspections by representatives of the project owner upon request from PMO.

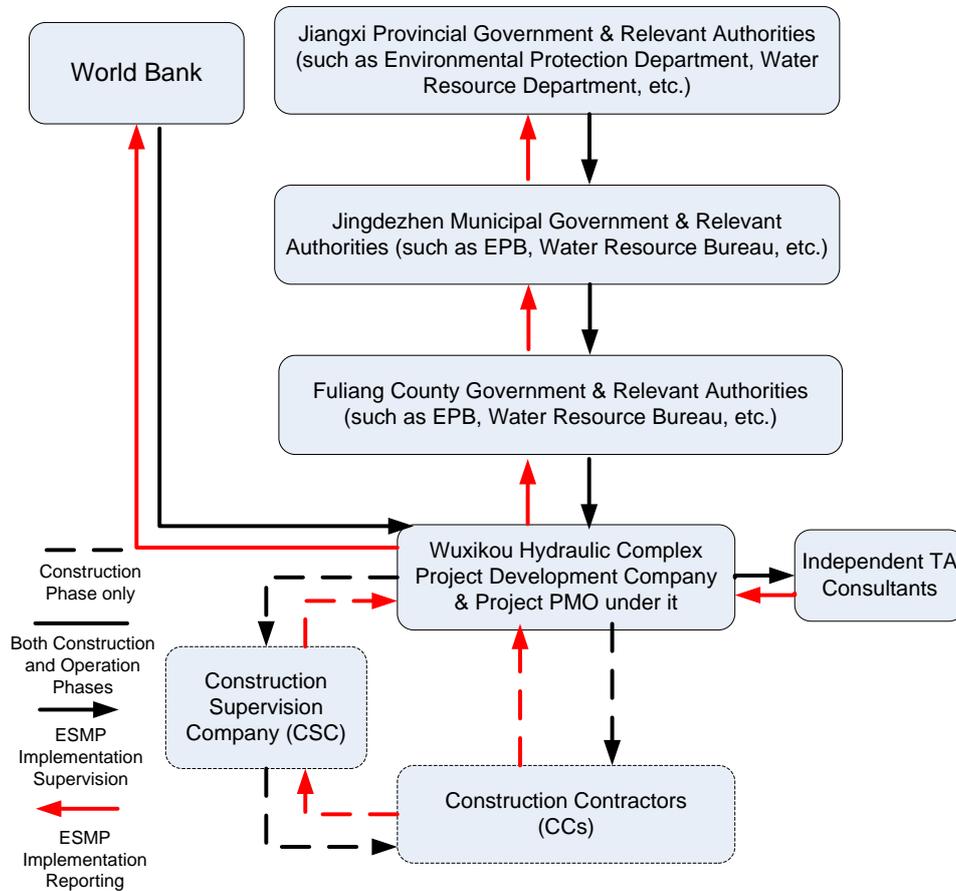
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Organization	Responsibilities
Construction Contractor (CC)	<ul style="list-style-type: none"> - Ensuring this ESMP objectives and requirements are met; - Ensuring all environmental procedures and best practices detailed in this ESMP are adhered to at all times; - Developing specific method statements and environmental plans to be reviewed by CSC-EMU for non-objection; - Ensuring all CC and sub-contractor staff understand their environmental responsibilities related to the requirements of the ESMP; - Preparing environmental awareness training programs to be reviewed by EMU and performing training of the CC staff and of its sub-contractors; - Ensuring all staff on site have completed environmental induction training and that staff with specialized jobs (environment sensitive activities) have received appropriate training; - Identifying any additional activities or impacts not anticipated in this ESMP and developing related specific environmental procedures and method statements; - Performing daily inspections of construction activities in order to correct expeditiously any non-compliance observed; - Ensuring the non-compliance detected and reported by CSC-EMU are expeditiously corrected; - Preparing the weekly and monthly reports to be submitted to CSC-EMU; - Managing environmental documentation and data base during the whole duration of the project construction.
All Personnel on Site	<ul style="list-style-type: none"> - All the staffs on site will have to attend inductions presenting the environmental obligations detailed in this ESMP. All site staffs are required to report any environmental incident to their supervisor.

Table 10: Institutional Organization for Sector Environmental Management Plans under Jiangxi Wuxikou ESMP

Name of Sector Environmental Management Plan	Implemented by	Monitored by	Supervised by
Soil Erosion Control Plan	CCs and CSCs	Jingdezhen Municipal Water Resource Bureau	PMO, Jingdezhen Water Resource Bureau and Jingdezhen EPB
Reservoir Bottom Cleaning Plan	Project operator, CCs and CSCs	Jingdezhen EPB	PMO and Jingdezhen EPB
Environmental Procedure for Contractor during Construction	CCs and CSCs	Jingdezhen EPB	PMO and Jingdezhen EPB
Hazardous Materials and Waste Management Plan			
Emergency Response Plan for Hazardous Materials			
Physical Cultural Resource Management Plan	PMO, Fuliang County Culture and Broadcasting Bureau, village stakeholders, CCs and CSCs	Jingdezhen Municipal Cultural Relics Bureau/Fuliang County Culture and Broadcasting Bureau	Jingdezhen Municipal Cultural Relics Bureau/Fuliang County Culture and Broadcasting Bureau, relevant village stakeholders
Pest Management Plan	Town-level agricultural technology promotion stations, relevant project-affected resettlers	Jingdezhen Municipal Agriculture Bureau	PMO and Jingdezhen Municipal Agriculture Bureau
Mitigation Measures based on the Cumulative Impact Assessment (CIA) Study	CCs and CSCs, project operator	Jingdezhen EPB	PMO and Jingdezhen EPB
Reservoir Management Plan(RMP)	Project operator	Jingdezhen EPB and Jingdezhen Municipal Water Resource Bureau	PMO, Jingdezhen EPB and Jingdezhen Municipal Water Resource Bureau

Figure 9: Overall Organization for Wuxikou Project ESMP Implementation



PANEL OF EXPERTS

A Panel of Experts (PoE) consisting of environmental, social and dam safety specialists has been established to provide independent review and guidance on the treatment of environmental, social and dam safety issues associated with the project. Among other duties, the PoE will provide reports to the project owner on the status and compliance with ESMP, RAP and dam safety report. The recommendations from the panel will be incorporated in the adaptation of these documents. The Panel will be called upon to provide advice twice a year the first three years of project implementation.

PUBLIC CONSULTATION AND INFORMATION DISCLOSURE

Since the completion of project proposal for JWIFMP in 2008, the in-depth and extensive public consultation has been carried out for JWIFMP during the preparation of:

- Domestic EIA report for JWIFMP
- Supplementary EIA report for JWIFMP
- Resettlement Action Plan for JWIFMP

- Social Impact Assessment for JWIFMP
- Cumulative EIA report for the related cascade development

Necessity of project construction, process of project planning and justification, project objectives, project capacity, potential environmental impacts and corresponding mitigation measures have been presented to the public. The major concerns of identified key stakeholders have been fully taken into account during the public consultation at different phases, including: resettlement policies and project impacts on livelihood for the villagers from five town/townships within the reservoir inundation area; impacts of relocating ancestral temples for affected villagers; impacts of church relocation for parishioners served by the Christian Church in Zhitan Township; relocation and resettlement of related township and villages for county and township governments and village committees within the project-affected areas; impacts on inundated cultural relics and forestry for relevant local authorities; and cumulative impacts of Changjiang River cascade development on livelihood and daily life for residents living upstream and downstream of the proposed Wuxikou project.

CONSULTATION METHODS

The public consultation has been carried out respectively by the environmental and social team employed by the project developer during the preparation of domestic EIA, supplementary EIA, RAP and social impact assessment report. The details are presented in the tables below. In the public consultation for environmental purpose, the initial public consultation was for the identification of key environmental factors, and the public consultation of Phase 3 was implemented by targeting at the identified key VECs based on the findings of earlier public consultation and desk review.

Table 11: Environmental Public Consultation for JWIFMP during Preparation of Domestic EIA

	Method	Organizer	People 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	5 th to 28 th December 2008; 8 th to 27 th 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 opinions during site interview	13 th January 2009	Zhitan Township of Fuliang County
Information Disclosure	Online information disclosure of project summary, way and channels for public participation	Project owner, Yangtze River Water Resource Protection Science and Research Institute	/	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

Table 12: Supplementary Environmental Public Consultation for JWIFMP (by June 2012)

No.	Method	Organizer	People met	Date	Location	Key Issues
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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; relevant 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
			Relevant governmental officials	2012.3.13	Fuliang County Forestry Bureau	Project impacts on local forestry resources
			Relevant 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
			Relevant 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 government	Key concerns of potential project environmental impacts for EIA, including physical cultural resources, livelihood recovery of migrants, ecological impacts, etc
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

Table 13: Social Public Consultation for JWIFMP (by June 2012)

No.	Method	Organizer	People met	Time	Location	Key Issues
1	Villagers' congress and group discussion	PMO	Town/township/village officials, villagers	2009-2012	Project-affected Villages	Disclosure of basic project information
2	Villagers' congress and public hearing meeting	PMO	County/Town/township/village officials, villagers	2011	Project-affected Villages	Define policies of land acquisition and resettlement and develop RAP
3	Villagers' congress and group discussion	PMO, villages' officials	Village officials, resettled villagers	2012	Project-affected Villages	Disclosure of resettlement policies and detailed implementation rules
4	Household interview	PMO, village committees	Village officials, resettled villagers	2011	Project-affected Villages	Willingness survey among resettled villagers to understand their needs

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No.	Method	Organizer	People met	Time	Location	Key Issues
5	Questionnaire survey and interview	PMO, village committees	Village officials, resettled villagers	2011	Project-affected Villages	Socioeconomic survey in the project area
6	Villagers' congress, group discussion and site visit	PMO, design institute	Village officials, resettled villagers	2011~2014	Project-affected Villages	Define the locations of resettlement sites

Figure 10: Public Consultation for Supplementary EIA



KEY FINDINGS OF PUBLIC CONSULTATION

PUBLIC CONSULTATION FOR DOMESTIC EIA

Public consultation showed strong support of 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. The primary public concern during project implementation is resettlement, then the impacts of project activities on surrounding traffic and environment. The public hope to strengthen the project environmental management to ensure the minimization 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 are outlined in the domestic EIA. The project owner also made the commitment to strictly implement various environmental protection measures during project implementation with the active cooperation of local government.

PUBLIC CONSULTATION MEETING

In the first public consultation meeting, the participants expressed their strong support to the implementation of JWIFMP. 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 participants have 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 smoothly and that they can earlier get back to normal production and life.

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 14: 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	2012-10-29	Official website of Jingdezhen Municipal Water Resource Bureau : www.jdzol.com

GRIEVANCE MECHANISM

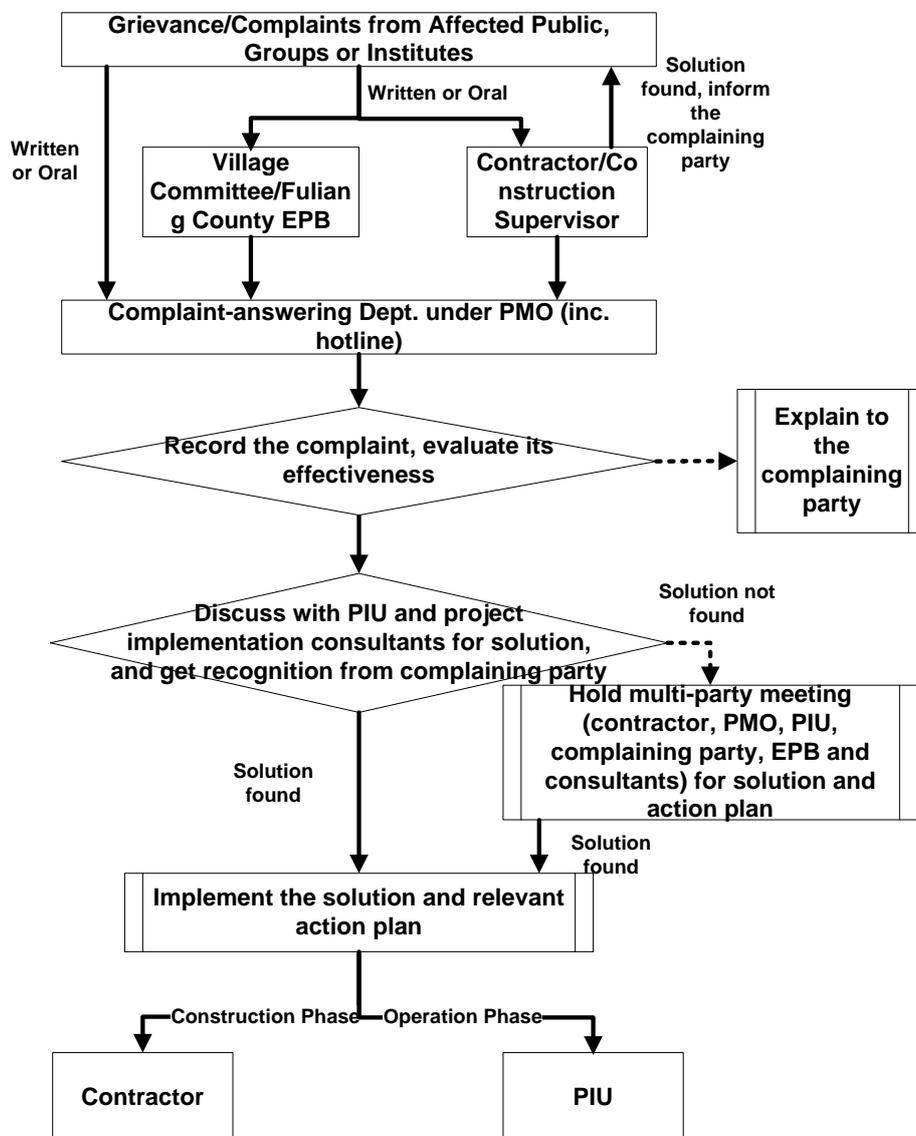
In order to detect and deal with the may arise unconsidered public complaints about environmental and social problems of the project, reduce project risk, and maximize the environmental and social benefits the project brings. The environmental and social grievance mechanism will be set up respectively under the Environmental Management Department of PMO and the county resettlement implementing agency.

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.

For environmental complaints, the Environmental Management Department of PMO will establish a tracking and recording system to the public complaints mechanism, including: (1) establish the tracking table and procedures by collecting information from the project staff and other complainant; (2) develop professionally trained staff update the database regularly; (3) 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; (4) establish inform procedures to notify the related parties to deal with the situation; (5) report the complainant handling situation to PMO, the project implementation units and the World Bank regularly.

Figure 11: Environmental Grievance Mechanism for Jiangxi Wuxikou Integrated Flood Management Project

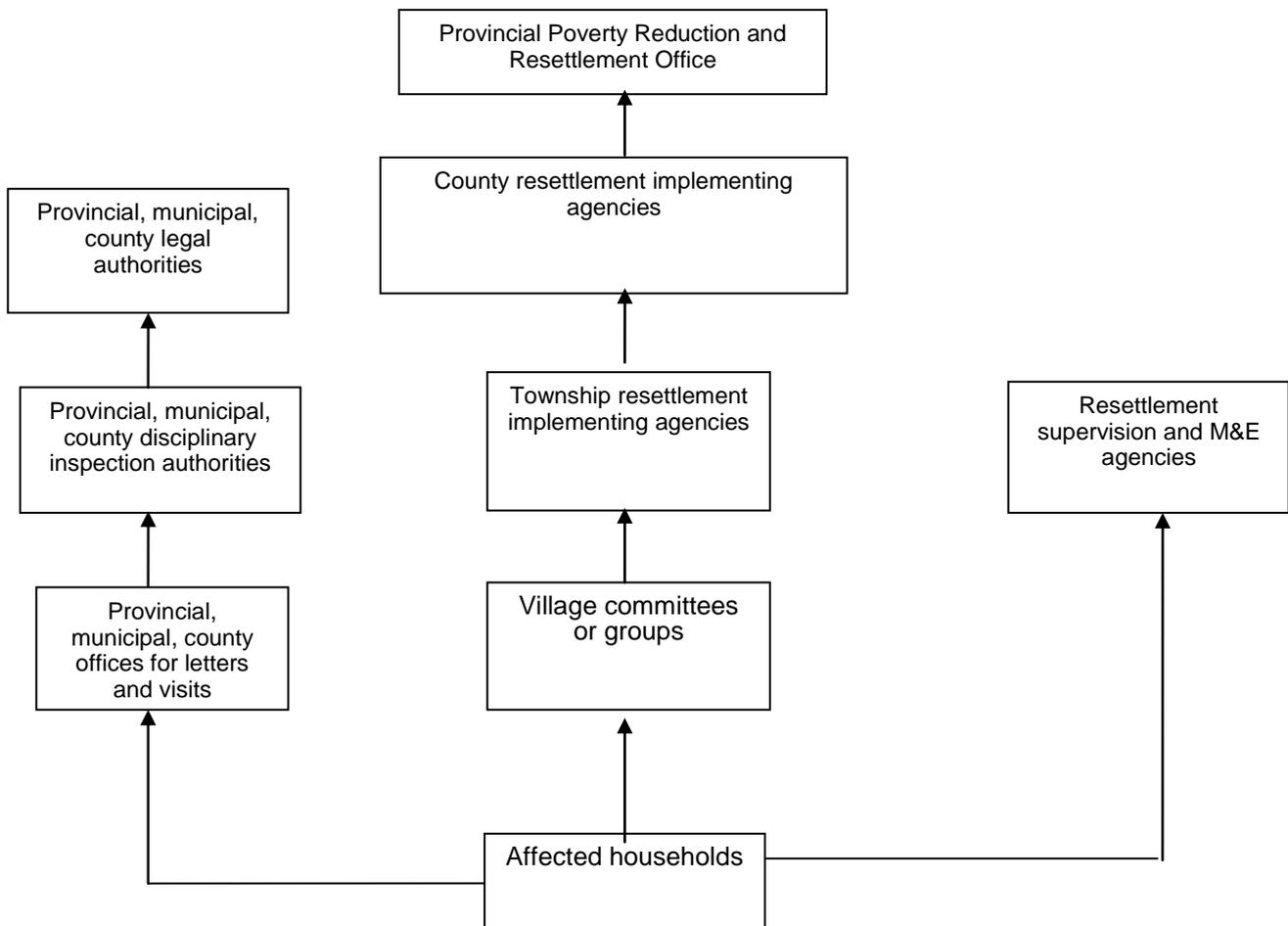


For the complaints related to resettlement and social impacts, the migrants can take the following steps of social grievance redress mechanism established for the Project:

- Stage 1: 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.
- Stage 2: 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.
- Stage 3: 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.
- Stage 4: 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.

In addition, migrants may also make complaints directly with the resettlement supervision and M&E agencies, who will handle the complaints in coordination with the project owner.

Figure 12: Social Grievance Mechanism for Jiangxi Wuxikou Integrated Flood Management Project



ESMP BUDGET

Estimated costs for the implementation of the ESMP are presented in the tables below.

Table 15: Breakdown of EMP Cost for Jiangxi Wuxikou Integrated Flood Management Project

No.	Item	Unit	Quantities	Unit Price (RMB)	Total (10000RMB)	Source of Fund
A	Engineering Measures for Environmental Protection				2217.92	/
A.1	Water Quality Protection				179.1	/
A.1.1	Domestic Wastewater Treatment Facilities for Zhitan Town	Unit	1	552,000	55.2	Project Investment
A.1.2	Domestic Wastewater Treatment Facilities for Centralized Resettlement Sites	m ³	861.3	1,438.52	123.9	Project Investment
A.2	Ecological Protection				1901.75	/
A.2.1	Protection of Aquatic Lives				1765.71	/
A.2.1.1	Public Education on Aquatic Habitat Protection for Main Stream and Tributaries	Year	3	50000	15	For 10 years, first 3 years from Project Investment, and following 7 years from operation cost
A.2.1.2	Fish Proliferation and Releasing				1494.71	/
A.2.1.3	Artificial Fish-passing	Year	3	100000	30	For 10 years, first 3 years from Project Investment, and following 7 years from operation cost
A.2.1.4	Fishery Administration				210	Project Investment
A.2.1.5	Public Education on Precious and Rare Aquatic Animals				16	/
A.2.2	Protection of Terrestrial Animals				17.5	Project Investment
A.2.2.1	Public Education	Year	3.5	30000	10.5	/
A.2.2.2	Management of Wildlife Habitat	Year	3.5	20000	7	/
A.2.3	Protection of Terrestrial Plants				45	/
A.2.3.1	Transplanting of Ancient and Rare Trees		6	75000	45	Project Investment
A.2.3.2	Revegetation Cost					Included in RAP Budget
A.2.4	Natural Reserves				23.54	Project Investment
A.2.4.1	Public Education and Warning Board	Number	22	200	0.44	/
A.2.4.2	Tour Inspection	month	42	3000	12.6	/

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No.	Item	Unit	Quantities	Unit Price (RMB)	Total (10000RMB)	Source of Fund
A.2.4.3	Public Education	Year	3.5	30000	10.5	/
A.2.5	Management of vegetated buffer zone for reservoir drawdown areas				50	Project Investment, budget to be further modified based on the outcomes of CRMP study
A.3	Ecological Water Demand				50	/
A.3.1	Small Unit for Ecological Flow Rate				/	Project Investment
A.3.2	Ecological Flow Rate Monitoring Station				50	Project Investment
A.4	Solid Waste Treatment (Domestic Solid Waste)	t	5442	160	87.07	Project Investment
B	Environmental Monitoring				108.5	
B.1.	Water Quality Monitoring				15.32	Project Investment
B.1.1	Water Pollution Sources				6.4	/
B.1.2	Surface Water Monitoring during Construction	Point-times	16	1000	1.6	/
B.1.3	Surface Water Monitoring during Operation	Point-times	24	2000	4.8	/
B.1.4	Water temperature monitoring	Point-times	252	100	2.52	/
B.2	Ambient Air Quality	Point-times	8	5000	4	Project Investment
B.3	Noise	Point-times	8	1500	1.2	Project Investment
B.4	Hygiene and Disease Control Monitoring				16.98	Project Investment
B.4.1	Construction Sites				6.5	/
B.4.2	Resettlement Areas				10.48	/
B.5	Ecological Monitoring				63	/
B.5.1	Monitoring of Aquatic Ecological Environment				48	/
B.5.2	Observation of Terrestrial Ecology	Times	3	50000	15	Project Investment
B.6	PMP Monitoring	Year	4	20000	8	Project Management Cost
C	Environmental Protection Facilities and Installation				70	/
C.1	Oily Wastewater Treatment System	Unit	2	50000	10	Project Investment
C.2	Domestic Wastewater Treatment System for Main Project Site	Unit	2	100000	20	Project Investment
C.3	Dust Collector for Concrete Batching System	Unit	4	100000	40	Project Investment
D	Temporary Environmental Protection Measures				346.61	/

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No.	Item	Unit	Quantities	Unit Price (RMB)	Total (10000RMB)	Source of Fund
D.1	Production and Domestic Wastewater Treatment				107.4	Project Investment
D.1.1	Wastewater treatment system for Aggregate Processing System	unit	4	120000	48	/
D.1.2	Operation Cost of Wastewater Treatment System for Aggregate Processing System	Year	3.5	60000	21	/
D.1.3	Oily Wastewater Treatment System	Unit	2	2000	0.4	/
D.1.4	Operation Cost of oily Wastewater Treatment System	Year	3.5	30000	10.5	/
D.1.5	Wastewater Treatment System for work camps	Unit	2	120000	24	/
D.1.6	Operation Cost of Wastewater Treatment System for work camps	Year	3.5	10000	3.5	/
D.2	Ambient Air Quality Control				44.6	Project Investment
D.2.1	Sprinkling	Month	42	8000	33.6	/
D.2.2	Greening				10	/
D.2.3	Dustproof Enclosure	m ²	200	50	1.00	/
D.3	Noise Control				82.6	Project Investment
D.3.1	Acoustic Shield	m ²			20	/
D.3.2	Acoustic Screen	m ²	1560	400	62.4	/
D.3.3	Warning Board	Number	8	150	0.1	/
D.3.4	Speed Restriction Board	Number	8	150	0.1	/
D.4	Solid Waste Treatment				12.6	Project Investment
D.4.1	Clearing and Treatment of Solid Waste during construction	Month	42	3000	12.6	/
D.5	Human Health Protection				99.41	Project Investment
D.5.1	Human Health Protection for Construction Sites				26.41	/
D.5.1.1	Hygiene Management of Construction Sites	10,000m ²	3.16	4000	1.26	/
D.5.1.2	Vector Control	10,000m ²	2.41	2000	0.48	/
D.5.1.3	Health Quarantine & Examination				20.16	/
D.5.1.4	Sanitary Toilet		15	3000	4.50	/
D.5.2	Human Health Protection for Resettlement Areas				73	/

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No.	Item	Unit	Quantities	Unit Price (RMB)	Total (10000RMB)	Source of Fund
D.5.2.1	Establishment of Medical and Health Care System				14	/
D.5.2.2	Hygiene Management of Resettlement Areas	10,000m ²	91.25	4000	36.5	/
D.5.2.3	Health Quarantine				16.5	/
D.5.2.4	Sanitary Toilet	No.	20	3000	6.0	/
Subtotal of A to D					2743.03	/
E	Miscellaneous Fee for Environmental Protection				1055.79	
E.1	Environmental Protection Construction Management Fee				260.59	Project Investment
E.1.1	Overhead of Management Staff		3%		82.29	/
E.1.2	Environmental Protection Completion Acceptance Fee		5%		137.15	/
E.1.3	Cost of Public Education and Technology Training	Year	1.50%		41.15	/
E.2	Environmental Supervision Fee				84	Project Investment
E.3	Research, Survey, Design and Consultation Fee				665	/
E.3.1	Environmental Impact Assessment Fee				70	Project Investment
E.3.2	Environmental Protection Survey and Design Fee				75	Project Investment
E.3.3	Special Studies				520	/
E.3.3.1	Assessment of Fish Proliferation and Releasing Effects				250	Operation cost
E.3.3.2	Phase 2 Cumulative EIA Study				150	Project Management Cost
E.3.3.3	Comprehensive Reservoir Management Plan (CRMP) Development Study				100	Project Management Cost
E.3.3.4	PCR Investigation and Salvage Program				20	Project Management Cost
E.4	Independent Environmental Specialist				40	Project Management Cost
E.5	Pest Management Plan Training				6	RAP Budget
Total of A-E					3798.82	/
Contingency			5%		189.94	Project Investment
Total Investment on Environmental Protection					3988.76	/
Cost of Reservoir Bottom Cleaning					517.80	RAP Budget

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No.	Item	Unit	Quantities	Unit Price (RMB)	Total (10000RMB)	Source of Fund
	Cost of Water and Soil Erosion Control				938.18	Project Investment
	Total				5444.74	