Environmental and Social Impact Assessment

Executive Summary

For

Poyang Lake Basin Town Water Environment Management Project

(Draft)

Jiangxi Provincial Development and Reform Commission

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TABLE OF CONTENT

1. INTRODUCTION

1.1 Project Background

The Poyang Lake is in the north of Jiangxi Province, covering an area of catchment of 162,000 km^2. The lake of Poyang is renowned as the largest fresh water lake in China and the wetland of national and international significance.

Since 1980's, with the rapid economic development and population growth, the water quality of Poyang Lake has been deteriorated due to discharge of untreated wastewater from industrial, domestic and agricultural sources. As a result, the livelihood of 40 million people closely linked to the Poyang Lake is under threat.

The Government of China and Jiangxi Provincial government recognize the needs to protect the Lake. Series of measures have been triggered at national, provincial, and county levels to protect the value of the Poyang Lake as a unique resource and a national heritage, and to control the lake's pollution and to restore the vital water quality and its associated functions. The Government of China issued the Poyang Lake Ecological Economic Zone Development Plan (PLEDP) in 2009 focusing on ecological development of Poyang Lake. Under the PLEDP, there is an implementation plan and 18 specific sector plans, including water environment management, water resources, five river management plans, etc.. In 2014, Jiangxi government also issued a plan for establishment of ecological and civilization demonstration areas, stating actions and targets for industrial, domestic wastewater and solid waste management. Based on the plan, by 2020, COD would be decreased by 5% compared to the 2015 baseline; wastewater treatment ratio would reach 90% and urban solid waste treatment ratio reach 85%.

This proposed project is an integral part of the PLEDP and intends to employ an integrated approach to addressing the water quality issue through focusing on enhancement of ecological and institutional sustainability of water/environment and strengthening of domestic wastewater and solid waste management system.

This project has been classified into Category A, which requires EIA and EMP, collectively known as the EA documentation, An Environment Assessment (EA) and EMP was prepared for each project county by the CERI Eco Technology Co. Ltd.. Based on the project counties EAs and EMPs, a consolidated EA and EMP were prepared for the project. Social Impact Assessments (SIA) and Resettlement Action Plan have been prepared by Hohai University for this project with main findings and conclusions incorporated into the EA documentation. This document is a summary of the EA documentation and the SIA document.

1.2 Environmental Policies, Laws and Regulations

1.2.1 Laws and Regulations

The basis of the EIA Reports includes national and local environmental laws, regulations, policies, and the World Bank's environmental and social safeguard policies. The main applicable laws and regulations include:

- Environmental Protection law of the People's Republic of China, 1989
- The Law of the People's Republic of China on Prevention and Control of Water Pollution, 2008;
- The Law of the People's Republic of China on the Prevention and Control of Atmospheric Pollution, 2000
- The Law of the People's Republic of China on Prevention and Control of Pollution From Environmental Noise, 1996
- The Law of the People's Republic of China on Environmental Impact Assessment, 2003
- Technical Specifications for Environmental Impact Assessment; and various applicable standards for air, water, and noise.

1.2.2 Applicable Standards

The most important assessment criteria and environmental quality standards are the Ambient Water Quality Standard (GB3838-2002) which classifies the ambient water quality into five classes for areas zoned for different functions, as follows:

- Class I: waters for national natural reserves and water sources;
- Class II : waters for Class I buffer zone for concentrated drinking water source, habitats for rare species, and sites for breeding and pawning of fish;
- Class III: waters for Class II buffer zone for concentrated drinking water source, wintering sites and migratory routes for fish, aquaculture sites and swimming;
- Class IV: waters for use in ordinary industries and recreational activities; and
- Class V: waters for use in agriculture and scenery.

Other applicable standards are included in Table 1-1.

Table 1-1 Applicable Standards

Category	Ref.	Name of standard

Environment quality standard	1	Surface Water Quality Standard (GB3838-2002)
	2	Acoustic Environment Quality Standard (GB3096-2008)
	3	Ambient Soil Quality Standard (GB 15618-1995)
Pollutant discharge standard	3	Discharge Standard for Municipal Wastewater (CJ 3082-1996)
	4	Noise Limits on Boundaries of Construction Sites (GB12523-90)
	5	Noise Standard on Boundaries of Enterprises (GB12348-2008)
	6	Pollutants Limits for Agricultural Application of Municipal Sludge (GB4284-84)
	7	Quality Standard for Sludge Applied to Woods Land, Disposal of Municipal Sludge (CJ/T362-2001)
	8	Pollution Control Standard for Sites of Storage and Disposal of General Solid Waste (GB 18599-2001)

1.2.3 Safeguard Policies and EHS of the WBG

The safeguard policies triggered for this proposed project include:

- OP 4.01 Environmental Assessment: Category A and full assessment.
- OP 4.04 Natural Habitats: the Poyang Lake is a significant natural habitat of both national and international significance. The proposed project will reduce the water pollution loads into the Poyang lake, without leading to degradation or conversion of the Poyang lake.
- OP 4.12 Involuntary Resettlement: The project will involve land acquisition in the seven counties, both permanent and temporary.

The reasons for not triggering other Safeguards policies are:

- OP 4.11 Physical Cultural Resources: the site survey and information obtained during consultation with relevant government department confirm that there are no physical cultural resource in or near the proposed project;
- OP 4.36 Forests: The project will not have impacts on the health and quality of forests, nor affect the rights and welfare of people and their level of dependence upon or interaction with forests, nor aim to bring about changes in the management, protection, or utilization of natural forest or plantations.
- OP 4.37 Safety of Dams: The project will not finance construction or rehabilitation of any dams as defined under this policy, and there is no dam impact on the safety and operation of the project financed facilities.
- OP 4.10 Indigenous People: the proposed project does not involve the ethnic minority concentrated areas.

The EHS of the WBG considered in the preparation of the EA include the EHS General, EHS Waste Management Facilities, and EHS Water and Sanitation. The applicable standards of the EHS have been considered and compared with that of China and the good practice of the EHS have been adopted in the EA and ESMP.

1.3 Assessment Scope, Period and Key Issues

The scope and key objects of environmental assessment are shown in Table 1-2.

Table 1-2 Assessment Scope

No.	Environmental Factor	Assessment Scope	Protected Objects
1	Ambient air	• The surrounding area in a radius of 300m of the project	• The residential, education and working areas, e.g., government agencies, research and education institutions, schools, hospitals, sanitarium, resorts and office buildings, etc.

2	Surface water environment	• Water bodies to be directly affected	• Surface waters; • Drinking water intakes.
3	Acoustic environment	• Areas in 200m radius of project	• The residential, education and working areas, e.g., government agencies, research and education institutions, schools, hospitals, sanitarium, resorts and office buildings, etc.
4	Ecological environment	• Areas in a radius of 300m from boundaries of the sites	• Natural and artificial greens; • Poyang Lake National Wetland Park.
5	Social issues	• Area 100m from the pipelines • Areas in 100m radius of transfer stations	• Social and economic zones in affected areas, e.g. institutes, enterprises, residential areas, cultural sites and education areas, hospitals and commercial areas.

2. PROJECT DESCRIPTION

The proposed project development objective (PDO) is to reduce the pollutant discharge into key selected waterways in the Poyang Lake Basin and to improve management of water Quality.

Seven counties with total population of about 5 million - Duchang, Poyang, Yugan, Jishui, Fengxin, Jingan, Shangli, have been selected for project planning and implementation. These seven counties represent a mixed pattern of geographic distribution across the Poyang Lake Basin: three sites are in close proximity to the main Lake, one site along the mid-stream of a main river draining into the Lake, two sites adjacent to the tributary streams of a main river, and one site at the remotest distance from the Lake. The water quality of Poyang Lake is closely associated with the quality and environment of the water and land bodies in these contributing catchments, and vice versa.

- Component 1: Strengthening Institutional Capacity for Managing Water Environment in Poyang Lake Basin. This component will finance capacity building and awareness raising activities to improve participatory wastewater and solid waste management, enforcement of environmental regulations and creating pre-conditions for sustainability of project results.
- Component 2: Improvement of Lake and River Environmental Restoration and Enhancement of Domestic Wastewater Management System. This component will finance activities related to protection and restoration of the water environment of selected rural and urban water environments in Poyang Lake basin through collection of urban and rural wastewater; collection and safe disposal of storm water from both rural and urban watersheds; and implementation of integrated engineering and biological as well as Low Impact Development (LID) interventions in selected rural and urban waterways.
- Component 3: Construction of solid waste collection and transportation system. This component is to improve solid waste collection and transportation system in rural and urban areas to reduce solid waste disposal to river system of Poyang Lake Basin.
- Component 4: Project Implementation Support. This component is to support the effective and efficient implementation of the project activities. This component will finance project management, project implementation supervision, project social, resettlement and environmental monitoring, domestic and international training and study tours, and relevant project management equipment and facilities.

The subprojects of the project are listed in Table 2-1 below and location of the project is shown in Figure 1.

Table 2-1 Project Description

Subproject	Description
Duchang	• Component One: Construction of a water quality monitoring system; capacity building and awareness raising activities. • Component Two: dredging Zoujiazui Lake at a depth of 0.3 m and an amount of 8,000 m3; embankment of 0.8 km; construction of LID 17,000 m2; Installation of sewers 15.4 km, 4.0 km interceptors around the Zoujiazui Lake; storm water pipeline 10.44 km; collecting wastewater 30,000 m3/d for short term, and 52,000 m^3/d for long term. • Component Three: Construction of three solid waste transfer stations. 22.7 t/d at Beishan Town, 37.0 t/d at Wangdun Town, and 28.8 t/d at Dashu Town. • Component Four: Relevant project management equipment and facilities.

Poyang	• Component One: Establishing water quality monitoring system; promotion of scientific application of fertilizers; promotion of traditional fish farming method and prohibiting artificial feeding; phasing out diesel in the boating service in the Poyang Lake. • Component Two: setting up constructed wetland 154,765 m^2 and constructing bio-retention swales of 95.85 km; Constructing 35 small integrated wastewater treatment facilities with the capacity ranging from 250 t/d to 50 t/d, and associated sewers. • Component Four: Relevant project management equipment and facilities
Yugan	• Component One: Establishing water quality monitoring system, and canceling 22.0 ha. fish farm; capacity building and awareness raising activities; • Component Two: Constructing sewers 5,562.8 m, to collecting wastewater at 1,600 m^3/d at short term and 1,900 m^3/d at long term; dredging the outlet channel of Pipa lake at an amount of 30,000 m^3; lake embankment and greening works. • Component Three: Converting the existing solid waste transfer station into solid waste collection points, and purchasing compaction vehicles. • Component Four: Relevant project management equipment and facilities
Fengxin	• Component One: Establishing water quality monitoring system; capacity building and awareness raising activities • Component Two: Constructing 22.27 km sewers and 13.15 km storm water pipeline, constructing three pumping stations, to collect the wastewater 15,700 m^3/d in short term and 20,000 m^3/d in long term; dredging the Beizhizhen ditch, Nan ditch and Dazhai ditch, at the quantity of sediments of 3,480 m^3, 7600 m^3 and 2,400m^3 respectively. • Component Four: Relevant project management equipment and facilities
Jing'an	• Component One: establishing water quality monitoring system; conducting the studies on the Water Environment Vulnerability of the Poyang Lake Basin, and the Financing Mechanism for the Water Environment Management of Poyang Lake; capacity building and awareness raising activities • Component Two: Constructing sewers 28,063 m, combined sewers 1,269 m, and storm water pipeline 17,268 m, to the capacity of collecting wastewater at 10,000m^3/d at short term and 17,200 m^3/d at the long term. • Component Three: upgrading two solid waste collection points, by installing water tight dust bins at amount of 1,620, purchasing solid waste vehicles. • Component Four: Relevant project management equipment and facilities
Jishui	• Component One: establishing water quality monitoring system; capacity building and awareness raising activities • Component Two: constructing sewers 27,400 m, storm water pipeline 15,200 m, to collect wastewater 13,000m^3/d at short term and 20,000m^3/d at long term; constructing three pumping stations at the capacity of 1,500 m^3/d, 2,500 m^3/d and 5,000m^3/d respectively, and expanding an existing pumping station from current 10,000 m^3/d to 15,000 m^3/d. • Component Four: Relevant project management equipment and facilities.
Shangli	• Component One: establishing water quality monitoring system; capacity building and awareness raising activities. • Component Three: Constructing six solid waste transfer stations respectively in the six towns of Yangqi, Changping, Futian, Penggao, Dongyuan, and Chishan. • Component Four: Relevant project management equipment and facilities.

3. ENVIRONMENTAL BASELINE

3.1 Overview of the Poyang Lake Basin

The Poyang Lake is in the north of Jiangxi Province and to the south of the Yangtze River. The Poyang Lake is the largest freshwater lake in China with a maximum surface area reaching 5,050 km^2 and a storage capacity - 30 billion m3. The basin area of the lake is about 162,200 km^2 covering over 97 percent of the land area of Jiangxi Province. The lake plays many vital functions, such as hydro-morphologic, environmental, social, cultural and economic; the livelihood of more than 40 million people is closely linked to the water and environment of Poyang Lake. Poyang Lake connects to Yangtze River in the middle reach at Hukou, Jiujiang County. The dynamics of the lake water movement is governed by both the stages of the Yangtze River and the discharges from its five major tributaries (i.e. Gan, Xin, Fu, Rao and Xin Rivers). While the annual water level in the Poyang Lake has remained stable in the recent years, the area of the lake fluctuates dramatically between the wet and dry seasons. In normal years, the average lake area is about 3,200 km^2. The fluctuations are also affected by severe climate events, e.g., in early 2002, due to serious drought, the area of the lake reached a low of 200 km^2.

Poyang Lake is also a wetland of national and global importance, which provides a key habitat for half a million migratory birds. It has been recognized as one of the priority protection targets in the international treaties, i.e. the Migratory Waterfowl Protection Strategy in the Asia-Pacific Region, the Migratory Bird Treaty between

China and Japan, the china-Australia Migratory Bird Treaty、China Biodiversity Conservation Action Plan. It is the home for over 95% of world's white crane, 60% of world's white-napped cranes, 55% of world's hooded crane, 60% of world's white storks, and 96% of world's swan goose population. Poyang Lake is also a species gene pool with 156 kinds of aquatic plants, 136 planktons, 230 kinds of benthic animals, 58 kinds of fishes, 89 kinds of water birds, etc. It also plays a significant role in the seasonal flow regulation of the Yangtze River. The average amount of lake water entering the Yangtze River is about 150 billion m3, amounting to 15.6% of the mean annual runoff of the river.

The water quality of the Poyang Lake has been comparatively good (with 83% falling under Class I ~ III, 13% under Class IV, and 4% under Class V). However, research results of the World Bank supported TCC5 project and the available monitoring data of Ministry of Environmental Protection show a concerning trend of water quality deterioration, with chemical oxygen demand (COD) and ammonia-nitrogen (NH3-N) gradually increasing and dissolved oxygen (DO) gradually decreasing. The primary sources for TP and TN in the basin are the domestic and agricultural sectors. Agriculture alone discharged 61.09% and 75.7% of the total TN and TP of the province respectively. The existing data on COD discharge collected by the local governments in the lake basin show that domestic wastewater (about 60%) and solid waste disposal (about 30%) produce the major water pollution. While industrial pollution remains an issue, discharges from industries are gradually decreasing. This is largely due to the industrial pollution control actions taken by the province government, which through the maximum load limit and relocation of industries into the concentrated industrial parks where the wastewater treatment facilities are ready to treat the industrial wastewater to the discharge standard. In addition, the five tributaries of the basin collectively contribute over 80% of the total pollution loads into the Poyang Lake.

Relatively small percentage of wastewater and solid waste are collected and treated. The wastewater treatment ratio in the basin is low. By provincial environmental statistics, only 79% of domestic wastewater is treated in urban areas of Jiangxi province, which is much lower than the national average of 85%. Similarly, solid waste collection and treatment rate in the province is 69% compared to the national average of 80%.Conclusions from recent studies and discussions with Provincial governments identify the following key causes for increase of pollution levels in the water bodies feeding into Poyang Lake: (a) lack of basin wide integrated water/environment management; (b) weak water quality and pollution source pollution monitoring and disclosure system; (c) lack of public awareness and incentives in the communities on environmental protection; (d) weak enforcement of regulations related to disposal of untreated industrial and domestic wastewater directly into water bodies; (e) lack of investment in infrastructure for wastewater collection and treatment systems in urban and rural areas as well as for solid waste management in the small cities and towns and rural areas; and (f) lack of use of good practices on proper domestic solid waste disposal and agriculture practices.

3.2 Water Use and Wastewater Discharge

The statistical data for water use in Jiangxi Province shows the annual water use reached the peak in 2013 as high as 26.481 billion m3 while plunged to 23.975 billion m3 in 2010. Among the water users, agricultural irrigation used the largest share typically ranging from 60.22% to 63.43%, while the industrial sector used 22.71% to 24.21%, and the domestic sector used 1.70% to 2.26%.The data on wastewater discharge generally follow the same pattern of water use. The majority of the wastewater flow is discharged from the agricultural sector, accounting for 81.45% to 79.57%, and the domestic sector contributed the second largest share of wastewater flow ranging from 12.21% to 14.56%. Industrial discharged the smaller share of wastewater mainly because of increased recycling rate of water inside the industries.

3.3 Topography and Geology

The Poyang Lake Basin is surrounded by mountains in the east, south and west, and it slopes from the south to the north. The landform of the basin can be distinguished by the hilly region in the middle and the vast plain in the north which is centered in the Poyang Lake.

The geology of the basin is very complex. The basin is located on the transitional area of two different geotectonic elements, with the northeastern part of the basin on the southeastern edge of Yangtze Platform, and the middle and southern parts are on the South China Fold System.

3.4 Climate

Poyang Lake Basin is located in the humid sub-tropical zone largely affected by the monsoon, and characterized by wild climate and rich precipitation, sufficient sunshine and long frost-free period. The temperature averages 16.3^{OC} to 19.7^{OC} and slightly decreases from the north to the south. The extreme high temperature ranges 41.2^{OC} to 44.9^{OC}, while the extreme low temperate from -15.2^{OC} to 11.2^{OC}. The high temperature often occurs during July and August, while the low temperature occurring during January to February. The Poyang Lake Basin is widely recognized as one of the areas with the greatest precipitation in China, with the precipitation averaging 1,638.4 mm. The distribution of annual precipitation fluctuates largely in different months in Jiangxi Province. The precipitation during March to June represents the 55.9% of the annual precipitation.

3.5 Soil

The basin of Poyang Lake has a rich variety of soil, which is comprised by 12 soil types, including red soil, yellow soil, rice soil, etc. Among them, the red soil is widely distributed in Jiangxi Province, accounting for

70.69% of the total area of Jiangxi. The rice soil is mainly distributed in the valleys and the plains, thus become the major arable soil in the province.

3.6 Ecology

Ecological survey has been conducted by the EA team in the assessment area of each sub-project. The following are the major findings and conclusions of the survey:

- Duchang, Yugan, Fengxin, Jing'an, Jishui and Shangli: these subprojects of six counties are located in the urban developed area and the areas drastically disturbed by human activities. Through consultation with the forestry department and site visit, it is confirmed that no rare or precious trees, no protected animals, no concentrated distribution area or habitats of birds, no sites of breeding, spawning and wintering for fish, are recorded or observed within the assessment area;
- Poyang: Through consultation with the forestry department and site survey, it is confirmed that there are no rare or precious trees, no sites of breeding, spawning and wintering for fish, are recorded or observed within the assessment area. There are some protected birds observed, i.e. *Egretta garzetta* and *Ardeola bacchus* protected at provincial level, but the assessment area is not the concentrated distribution area for them.
- Zoujiazui Lake: Zoujiazui Lake is within the urban area of Duchang County and its water quality has been severely polluted by the direct discharge of domestic wastewater and agricultural wastewater. Zoujiazui Lake is not a significant natural habitat and there are no rare or endangered species reported or recorded in this lake. The eco-system in the lake is dominated by common benthic species.
- Pipa Lake: Pipa Lake is within the urban area of Yugan County, it is hydraulically connected with the Huhui River through an outlet channel which is clogged and will be dredged under the project. Pipa Lake is so severely polluted by the discharge of domestic wastewater and the aquaculture activities in the Pipa Lake, that the water quality cannot meet the Class V of the Surface Water Quality Standard which is considered the lowest category of water quality in China. Pipa Lake is not a significant natural habitat and no rare or endangered species are found or recorded in this lake. The eco-system in the Pipa Lake is dominated by common benthic species. The relevant studies found that the self-purification of the Pipa Lake become very weak.

Polluted Zoujiazui Lake

Polluted Pipa Lake

- Poyang Lake National Wetland Park was established in 2008, covering an area of 36,285 hm^2 with 96.8% being water surface. This wetland park is in the east of the Poyang Lake and places an important role on the migratory route in the Northeast Asia, where the migratory birds stop for a rest and pass the winter. The Zhuhu(Pearl) Lake, zoned for the drinking water source for the whole Poyang County, is located within the Poyang Lake National Wetland Park. The Poyang subproject will construct 35 integrated wastewater treatment stations of small capacities ranging from 50 t/d to 250 t/d to treat sewage discharged from 35 villages; and build 101 plots of constructed wetland and 96 km bio-retention swales to collect and treat NPS pollution near the Zhuhu(Pearl) Lake. The geological relation between the Poyang Lake national Wetland Park and the Poyang subproject is presented in Figure 2.

3.7 Acoustic and Atmospheric Environment

The data obtained from the local environmental monitoring stations show that the acoustic environment quality in the seven counties is good so that meet the respective standard.

The air quality in the seven counties is good and meets the Class II of Ambient Air Quality Standard (GB3095-1996), except for Duchang where the PM10 and PM2.5 failed to meet the standard.

3.8 Quality of Sediments

The subproject in Duchang, Yugan and Fengxin will involve the dredging of sediments. A sampling and analysis program was conducted in line with the Specifications for Water Environment Monitoring (SL219-2013) and Technical Specifications for Ambient Soil（HJ/T166-2004）respectively by local certified laboratories. The quality of the sediments to be dredged has been compared with the national relevant standards and the standards of the USA and the EU. The detailed information of the sediments quality is presented in Table 3-1 below.

Table 3-1 Quality of Sediments

County	Water to be dredged	Sampling points（sampling date）	pH	Cu	Zn	Pb	Cd	Cr	Ni	Water content
Duchang	Zoujiazui Lake	North of the lake（2015.11.3）	6.52	26.05	53.86	17.03	Not detected	29.20	Not detected	90%
		South of the lake（2015.11.3）	6.56	33.45	97.15	19.85	Not detected	28.38	Not detected	90%
		North of the Lake（2016.3.18）	6.54	36.83	93.20	16.06	Not detected	28.69	Not detected	90%
Yugan	Pipa Lake	Point A（2016.06.06）	7.21	26.4	928.9	16.25	Not detected	170.4	8.9	90%
		Point B（2016.06.06）	7.45	16.75	1216.9	Not detected	Not detected	151.9	10.6	90%
Fengxin	Nan Ditch（2016.06.06）		6.45	6.45	2118.4	Not detected	Not detected	245.1	26.4	90%
	Dazhai Ditch（2016.06.06）		6.82	6.82	1163.5	1.5	Not detected	129.6	Not detected	90%
	Beizhizhen Ditch（2016.06.06）		6.99	6.99	2774.6	3.0	Not detected	209.1	23.4	90%
Standard	Class II of Ambient Soil Quality Standard GB/15618-1995		＜6.5	50	200	250	0.3	150	40	/
			6.5~7.5	100	250	300	0.3	200	50	/
	Pollutants Control Limits for Agricultural Application of Municipal Sludge GB4284-84		＜6.5	250	500	300	5	600	200	/
			≥6.5	500	1000	1000	20	1000	200	/
	The soil environment quality evaluation standards for land use in the exhibition（HJ350-2007）	A	/	63	200	140	1	190	50	/
		B	/	600	1500	600	22	610	2400	/
	Sludge Quality for application in Woods Land, Disposal of		5.5~8.5	1500	3000	1000	20	1000	200	60%

	Municipal Sludge（CJ/T 362-2011）								
	Sludge Disposal and Use Standard（40CFR Part 503）（USA）	/	4300	7500	840	85	/	450	/
	Standard for Agricultural Application of Sludge（Directive 86/278/EEC）（EU）	/	1000~1750	2500~4000	750~1200	20~40	/	300~400	/

The analysis results of the sediments quality show that:

1) In Duchang, the quality of the sediments meets the Class II of Ambient Soil Quality Standard (GB/15618-1995) (pH 6.5-7.5), as well as the Pollutants Control Limits for Agricultural Application of Municipal Sludge (GB4284-84)(pH≥6.5). Therefore the sediment to be dredged in Duchang subproject is not toxic material, and can be used in the agriculture or garden.

2) In Yugan, the heavy metals content in the sediments meets the Class II of Ambient Soil Quality Standard (GB/15618-1995) (pH 6.5-7.5), as well as the Pollutants Control Limits for Agricultural Application of Municipal Sludge (GB4284-84)(pH≥6.5). However the content of Zn exceeds the above standards, thus the sediments can neither be regarded as the natural soil nor be used in agriculture. Through further comparison with the Class B of the Soil Environment Quality Evaluation Standards for Land Use in the Exhibition（HJ350-2007）, Sludge Quality for application in Woods Land, Disposal of Municipal Sludge（CJ/T 362-2011）, Sludge Disposal and Use Standard（40CFR Part 503）（USA）and Standard for Agricultural Application of Sludge（Directive 86/278/EEC）（EU）, the sediments to be dredged in Yugan are not toxic materials and eligible for application in woods land.

3) In Fengxin, the quality of the sediments meets the Sludge Quality for application in Woods Land, Disposal of Municipal Sludge（CJ/T 362-2011）, Sludge Disposal and Use Standard（40CFR Part 503）（USA）and Standard for Agricultural Application of Sludge（Directive 86/278/EEC）（EU）, thus the sediments to be dredged in Fengxin are not toxic materials and can be applied in woods land.

3.9 Social and Economic Status

Total area of Jiangxi Province is 166,900 km^2. There are 11 prefecture level cities and 100 counties in the province of Jiangxi. Total population of Jiangxi in 2015 is 45.61 million of which 23.54 million are living in urban area, accounting for 51.62% of the total provincial population.

Jiangxi is not an economically developed province in China. In terms of GDP, it ranks the middle in China. In 2015, the regional GDP of Jiangxi is RMB 1,672.38 billion, 9.1% more than 2014, and the disposable income per capita is RMB 18,437, 10.2% more than 2014.The industrial output dominate the economy of Jiangxi. The outputs from agricultural, industrial and service sectors in 2014 is 10.7:53.4:35.9. The industry is centered on Petro-chemical, iron & steel, construction materials and automobiles.

The socio-economic information on the seven project counties are summarized in Table 3-2 below.

Table 3-2 Socio-economic information of the Seven Project Counties

County	Area (km2)	Population (10,000)	Regional GDP (100 million RMB)	Disposable income per capita (RMB)
Duchang	2669.5	81.05	85.09	18,794 of urban residents, and 5,461 of rural residents
Poyang	373.81	9.47	16.61	N/A
Yugan	2331	106.55	112.7	N/A
Fengxin	1642	33.41	105.68	N/A
Jing'an	1377	15.15	33.93	N/A
Jishui	N/A	7	123	22,935 of urban residents and 12,760 of rural residents

Shangli	721.11	24.1	160.95	N/A

4. Analysis of Alternatives

4.1 Introduction

During project development, various alternatives have been compared from technical, economic and environmental regards. In terms of the environmental assessment of alternatives, the primary objective was to identify and adopt options with the least adverse environmental impacts at reasonable cost. The evaluation and comparison has included the following options:

- The scenario of with and without the project;
- Wastewater Management Plans;
- Wastewater treatment modes;
- Wastewater treatment technologies;
- Solid waste collection and transportation plans;
- Dredging technologies;
- Solid waste compaction technologies; and
- Sites for solid waste transfer stations

The following criteria formed the basis of identifying the most appropriate options for the project:

- Complying with the required standard;
- Being appropriate in respect of local conditions;
- Being proven in operation at or close to the scale proposed;
- Supporting the competitive biding
- Representing the least cost option.

4.2 Alternatives of With and Without Project

Comparison of the alternatives of With and Without Project are made and it is clear that although the alternative of With Project could produce some adverse environmental impacts(especially those caused during construction phase), such as wastewater, noise, solid waste and air-borne dust, the environmental benefits, particularly the social benefits, of the With Project will greatly overweigh these adverse impacts. for example, the project will lead to the reduction of pollution loads discharging into Poyang Lake, e.g. annual reduction of 2,709 tons of COD, 561 tons of TN and 44 tons of TP; and contribute to the improvement of living environmental in the selected counties and benefit 1.28 million people. Thus the alternative of With Project is highly recommended.

4.3 Alternatives of Wastewater Management Plan

For the Duchang subproject, two alternatives for the wastewater management plans were developed and compared. The Alternative One is to cancel the 2# pumping station while constructing a sewer to the WWTP which could intercept the wastewater from the outfalls along the Zoujiazui Lake and wastewater near the lake. The Alternative Two is to intercept the wastewater near the Zoujiazui Lake to the 2# pumping station which will be expanded to a capacity of 12,000 m^3/d. Through comparison against the criteria above, the Alternative One is considered the preferred option as it avoid the noise impact and represent the least cost option.

4.3 Alternatives of Wastewater Treatment Mode

Under the Poyang subproject, two alternatives were developed and compared for the wastewater treatment mode. Alternative One is to adopt the concentrated treatment mode; Alternative Two is to adopt the scattered mode. Through comparison it is determined that the Alternative Two would produce less environmental impacts, and least cost in operation and maintenance. Thus Alternative Two is considered the preferred option.

4.4 Alternatives of Wastewater Treatment Technologies

Under the Poyang subproject, alternatives for the wastewater treatment wastewater treatment stations and the constructed wetland were developed and compared. The criteria were carefully designed which are adaptive to local conditions, such as sludge disposal requirement, land occupation requirement and local landform and difficulty in operation, given the rural setting of the subproject. The alternative of FMBR for integrated wastewater treatment stations is considered the preferred option as it is simple requiring less cost, and can avoid the production of excess sludge. The alternatives of different combination of wetland technologies were selected for adoption in each of the plot of the constructed wetland through comparison of the above criteria.

4.5 Alternatives of Solid waste Collection and Transportation Plans

Under Jing'an subproject, four alternatives for solid waste collection and transportation were developed for comparison. The Alternative Four which will transport the solid waste by compaction trucks without constructing and expanding solid waste transfer stations is considered the preferred option, as it will avoid the environmental impact in terms of nuisance of odor, dust and noise, the demand for land acquisition and resettlement.

4.6 Alternatives of Dredging Technologies

The subprojects of Duchang, Yugan and Fengxin will involve dredging activities. Two alternatives for dredging technologies were developed and compared for the three subprojects. The dredging technologies were selected which are adaptive to local conditions of the dredging sites, particularly in terms of land occupation, and estimated amount of sediments, after comparison.

4.7 Alternatives of Solid Waste Compaction Technologies

Under the subproject in Duchang, and Shangli, solid waste transfer stations of small capacities will be constructed. Alternatives of the compaction technologies that are suitable to such small transfer stations were developed and compared. After comparison, the alternative of mobile compaction equipment is considered the preferred option because it can avoid the secondary pollution during compaction of solid waste, i.e. leachate, and simple and cheap to operate.

4.8 Alternatives of Sites for Solid Waste Transfer Stations

Alternatives of sites for the solid waste transfer stations were developed and compared based on the criteria carefully designed by taking into account of the public opinions collected in consultation and local conditions. The alternative with the least demand for land occupation and longest buffer distance from residential areas is considered the preferred option, as it will cause least social and environmental impacts.

5. ENVIRONMENTAL IMPACT ASSESSMENT

5.1 Impact Assessment in Construction Phase

Potential adverse impacts of the project in the construction phase are summarized as below.

5.1.1 Air Pollution

The air pollution primarily caused by the air-borne dust generated during the trench excavation and material transportation, and vehicular emission. About 60% of the air-borne dust is contributed by the movement of transport vehicles. Typically the area of influence of air-borne dusts is limited to 50m outside the boundary of the construction site, or 150m leeward. However the impact of air-borne dust can be easily mitigated by water spray and careful management of construction site including fencing, prohibition of excavation in strong windy days. The vehicular emission may pose minor impact. Therefore, the impact on air quality during the construction is not severe and will disappear once after the construction is completed.

Under Duchang Subproject, the sediments will be exposed for naturally drying by using the confer dam in dry season. During the drying period, the sediments may generate nuisance odor affecting the residents nearby. However, the dry season in Duchang is from November to January of next year, thus the nuisance odor is not as strong as in summer. The odor suppression agents would be sprayed on the exposed sediments to effectively mitigate the nuisance odor.

5.1.2 Noise

Construction and transport vehicles would have potential impacts on acoustic environment, especially hospitals and schools. The operating equipment will generate the high level noise affecting the area within 100 m from the construction sites. Although the construction will be banned in night, the sensitive receptors near the construction sites may be heavily affected by the noise. However the noise impact can be effectively mitigated by adoption of low noise equipment and good maintenance of equipment, installation of noise barriers near the sensitive receptors, and slow-down of transport vehicles. The noise in construction thus will not cause significant impact and is temporary.

5.1.3 Water Pollution

The water pollutants will come from the domestic wastewater of workers and the small amount of wastewater generated from the construction of the pipelines and washing of vehicles. In addition, washing aggregates, mixing and concrete casting would also generate small amount of wastewater. As the project will be mostly constructed in urban area where the municipal sewers are easily accessible, the domestic wastewater can be discharged into the sewers, and construction wastewater can be reused for suppressing air-borne dust by spraying on sites after resettling, thus the impact of water pollution is minor.

Under Poyang subproject, untreated sewage from villages is discharging into Pearl Lake where there are seven concentrated drinking water sources. To reduce the water pollution, totally 35 small size integrated wastewater treatment stations will be constructed to treat the domestic wastewater from the villages. The effluent after being treated to the requested standard will be discharged into the waters. To avoid the adverse impact on these drinking water sources, the location of the outlets of the wastewater treatment stations have been carefully selected so that the outlets are all at least 100m downstream of the drinking water sources. Thus the location of the outlets of integrated wastewater treatment stations will be ensured to be in compliance with the relevant national regulations, and the effluent will not affect the quality of the water in these drinking water sources. During the construction, if the wastewater is discharged directly into the waters where the drinking water source are located, or solid waste is dumped into the water area, the water quality of the drinking water sources will be

affected. Mitigation measures have been developed, i.e. material sites, spoils sites and workers' camps should be prohibited from the protection zone of the concentrated drinking water sources; setting up temporary peripheral ditches around construction sites to intercept the wastewater into the resettling tank; solid wastes should be banned from dumping into the waters, etc. thus the adverse impact on the water quality of these drinking water sources can be mitigated effectively to an acceptable level.

Under the subproject in Duchang, coffer dam will be used to expose the area for dredging in Zoujiazui Lake and the water within the coffer dam will be discharged through a long ditch at a very slow velocity so as to settle the SS to the standard for discharging into the Zoujiazui Lake. Under the subproject of Yugan, the outlet channel will be dredged by using hydraulic suction dredging technology. During the dredging, the sediments will be disturbed causing re-suspension of SS which affects the water quality. Relevant experience shows that the area of the impact on water quality by dredging is limited to a small area.

Under the Fengxin subproject, the three mam-made irrigation ditches will be dredged using small equipment or manual method as there is essentially no flow in dry season in the ditches. Thus the dredging in the three ditches may not cause water pollution because the dredging is scheduled to dry season.

Under the subprojects of Yugan and Fengxin, the dredged sediments will be dewatered to 50% moisture content on temporary stockpiling sites and the effluent from the dewatering machines will be discharged into the on-situ settling tanks to reduce SS concentration to the discharge standard. Thus the dredging activities would not cause severe impact on water quality with the mitigation measures practiced.

5.1.4 Solid waste

The solid wastes generated during construction period include the domestic waste, spoil and the dredged sediments. It is estimated that 330 kg/d domestic solid waste will be generated and will be collected and transported to the landfill site in timely manner. After careful balancing, the spoil is estimated at 227,406 tons, which will be reused in other projects for grade filling. And the construction solid waste will be 10,750 tons, which will be transported to local construction solid waste landfill facility for landfill.

Under Duchang subproject, totally 8,000 m^3 sediments will be dredged at the weight about 800 tons. The sediments has been sampled and analyzed against relevant standards. It is found that the sediments are not toxic materials and can be applied for landscaping or agriculture use. Given the small quantity of the sediments, the sediments will be directly transported to the wasteland in Guling of Wangdun Town for landscaping, 3 km from the site, without being stockpiled temporarily on site. The area of the wasteland is 300 ha. which can accommodate 900 tons of sediments based on the application rate provided in the Pollutants Control Limits for Agricultural Application of Municipal Sludge (GB4284-84)(pH≥6.5). The sediments will be covered with soil at the site after application and warning signs will be set up to prevent the public from accessing the site. The owner of the disused land, Wangdun Township government, has agreed to accept the sediments.

Under the Yugan subproject, totally 30,000 m^3 sediments will be dredged which is equivalent to the weight of 3,000 tons. Through sampling and analysis, the sediments are identified as non-toxic waste and can be applied in woodland. The sediments will be dewatered to the moisture content of 50% on site and transported to the woods land in Changgangling and Xiaoganghe in Yuting Town which are 10 km and 5 km from the site respectively. The total area of the woodland is 126 ha. which is collectively owned by the Yuting Town and capable of accommodating 3,600t sediments based on the application rate indicated in the standard for sludge application in woodland. The owner of the woodland has agreed to accept these sediments. During the dredging, the dewatered sediments will be stockpiled on site for a short period before being transported to the woodland for application. The stockpiling site covers an area of 800 m^2 to the south of the outlet channel. The sediments stockpile is located far from the residential buildings and fenced with compacted clay; during rain days, if any, the stockpile will be covered with tarpaulin to prevent the sediments from being rushed away. The effluent from the dewatering machine will be settled to remove SS before being discharged into the outlet channel. Soil erosion control measures need to be taken at the land where the sediments are to be applied, so as to prevent the run-off of the sediments. The sediments will be covered with soil at the woodland after application and warning signs will be set up to prevent the public from entering the woodland.

Under the Fengxin subproject, totally 13,480 m^3 sediments will be dredged at the weight of 1,348 tons, requiring proper disposal. Given that the sediments are not toxic and can be applied in woodland, the sediments will be transported to the woods land in Huangxi Village of Ganzhou Town after being dewatered to the water moisture of 50% on site. The woods land is only 7 km from the site and can accommodate 3000t sediments based on the application rate provided in the Sludge Quality for application in Woods Land, Disposal of Municipal Sludge （CJ/T 362-2011）. It is considered the application of the sediments in the woods land in Huangxi Village is feasible technically and environmentally, and the owner, Yuantou group of Huangxi Village, of the woods land has agreed to accept the sediments. During the dredging, the dewatered sediments will be stockpiled on site for a short period before being transported to the woods land for application. The sediments stockpile will be located far from the residential buildings and fenced with compacted clay; during rain days, if any, the stockpile will be covered with tarpaulin to prevent the sediments from being rushed away. The effluent from the dewatering machine will be settled to remove SS before being discharged into the ditches.

Before the dredging operation on these waters, the solid waste at a combined quantity of 0.55t will be collected and transported by the local sanitation departments to the solid waste treatment/landfill facilities for disposal.

5.1.5 Ecology

The vegetation along the roads and in the construction sites will be affected by the construction. However the vegetation can be replanted or restored after the construction is completed. Thus the impact on vegetation is limited. To prevent invasion of alien species, only indigenous plants are allowed for the re-vegetation/rehabilitation purpose. Monitoring and alarm system will be established and operated for the alien species.

Poyang subprojects are in the vicinity of Pearl Lake which is a part of the Poyang Lake National Wetland Park. Construction of the small integrated wastewater treatment stations, constructed wetland and bio-retention swales would cause noise, wastewater, air-borne dust and, the bad behavior of the workers could affect the ecology, i.e. birds and bio-diversity. However these physical investments are in rural area (i.e. farmland and villages) which has been disturbed by human activities. Construction of these small scale works would only involve small equipment and small number of workers, and the construction period is very short. It is expected that the adverse impact on the ecology of Poyang subproject is limited provided that proper mitigation measures are adopted. These mitigation measures include the prohibition of construction during nighttime; good conduct of workers, use of low noise equipment and machineries; wastewater collection and reuse for spraying on site after resettling, etc.. During EA preparation, the management of National Poyang Lake Wetland Park has been consulted and they agreed with the project and the impact analysis results and the proposed mitigation measures.

The project will involve the dredging of small part of Zoujiazui Lake in Duchang County and the dredging of the outlet channel of Pipa Lake in Yugan County. Zoujiazui Lake is within the urban area of Duchang County and is not a significant natural habitat. The water quality of Zoujiazui Lake is worse than Class V which is considered the lowest category of surface water quality in China. The dredging of Zoujiazui Lake will lead to the loss of the benthic animals and the vegetation in the lake. However, the dredging activity in Zoujiazui Lake has been carefully designed so as to limit the depth of dredging to only 0.3 m which is the most polluted, and most of benthic species will be remained. In addition, the dredging only will be conducted to a small area of the lake and is scheduled in dry season when there is essentially no water in the lake of Zoujiazui. The influence on the eco-system in the Zoujiazui Lake is expected to be limited and the eco-system will be restored very quickly, and even the bio-diversity in the lake will be increased, after the completion of the project.

Pipa Lake is located within the urban area of Yugan County and has been heavily polluted by the discharge of domestic wastewater and the aquaculture activities in the lake. The water quality of Pipa Lake is worse than Class V which is considered the lowest category of surface water quality in China. The Pipa Lake is not a significant natural habitat and no rare or endangered species are found or recorded. To improve the water quality of the Pipa Lake, its clogged outlet channel connected with the Huhui River will be dredged. Dredging will cause the re-suspension of SS which would affect the water quality and the loss of bio-mass. However given the dredging only for the outlet channel and the proposed dredging method, the impact on the eco-system of the Pipa Lake is quite limited. With the improvement of water quality, the bio-mass will be largely increased after the project is completed.

The three ditches to be dredged under the Fengxin subproject are man-made irrigation ditches. These three ditches are not natural habitats as they have been drastically disturbed by human activities and there is essentially wastewater in the three ditches. The dredging activities on the three ditches will not cause major ecological impact.

5.1.6 Social Impact

Social impacts in the construction stage are diversified, specifically including:

- Impacts on local traffic: During pipeline construction, pavement excavation will occur. In the course of excavation, it is necessary to enclose the road sections around the construction area and reduce the number of lanes, thus affecting local traffic. In the same time, traffic will increase due to the additional construction vehicles. However, since there are not many such additional vehicles, the impacts on traffic flow along the roads should be minor. This impact can be mitigated by the careful coordination with traffic department to develop the measure for adjust or divert the traffic flow and enhance the traffic management. The measures suggested include the pipe jacking to shorten the construction period when the pipelines are to be constructed to cross busy roads.
- Impacts on municipal facilities: Pipeline construction may interrupt the existing underground pipelines and cables. Before the commence of the construction, the underground pipelines and cables will be identified together with the associated management departments, and the construction plan will be prepared by the contractors to submit to the supervisor for approval.
- Impacts business activities: construction of pipeline will produce certain adverse impacts on business activities along the roads by blocking of accessibility, and noise and dust. However, the adverse impacts will be temporary and will disappear when the construction completed. The access roads will be provided to the roadside commercial businesses, and water spray will be intensified on the road sections near the businesses, so that the impact on roadside businesses can be mitigated effectively.
- Impact on community safety: construction of the pipelines near the communities, hospital and schools would cause safety concern. The stockpile of the materials, movement of trucks and operation of equipment are

considered the major source for safety issues. The construction sites should be enclosed to prohibit the people, particularly the kids, from entering the sites, and corridors will be established to ensure the people and vehicles can take access to the public facilities and residential buildings. Staff of the contractors will be assigned to help guide the people to walk around the construction sites, and the drivers of the trucks will be trained on safety issues and the operation of the trucks will be monitored. Through these mitigation measures, the safety concern for communities will be addressed.

5.1.7 Land Acquisition and Resettlement

The land acquisition and resettlement has been minimized during the project development. A Resettlement Action Plan has been prepared by the Hohai University which has identified that totally 116 villages under 20 towns in the 7 project counties will be involved in the land acquisition and resettlement. The RAP identified that:

Permanent occupation of land involve 288.60 mu collective-owned land, most of which are disused land but 1.5 mu paddy filed/dry farmland. Totally 814 people in 210 households will be directly affected by the permanent occupation of land; 428 mu state-owned land will be permanently acquired, without resettlement of people;

Temporary occupation of land will involve 1 mu collective-owned land and 1121.47 mu state-owned land. Totally 7,865 people and 534 small businesses will be indirectly affected by the temporary occupation of land; no house/structure demolition will be involved;

During the preparation of the RAP, site visit has been made to identify the vulnerable people and the RAP has been carefully developed so as to avoid adverse impact on the vulnerable group in terms of land occupation and resettlement;

Compensation standard and livelihood recovery plan have been developed in line with the domestic laws/regulations and the OP 4.12, to ensure that the livelihood of the affected people be at least the same with that before project.

5.2 Impact Assessment in Operation Phase

5.2.1 Positive Impacts

The project will bring primary benefits after the project becomes operational. The main positive impacts include the reduction of water pollution loads into the Poyang Lake, and the reduced probability of water logging in the urban area, thus improving the living conditions of people and enhancing the sustainability of economic development. The reduction of water pollution loads and solid waste to be collected and the beneficiaries of the project are summarized in Table 5-1 below.

Table 5-1 Reduction of Water Pollution Loads and Solid Waste and Beneficiaries

County	Reduction of COD (t/a)	Reduction of TN (t/a)	Reduction of TP (t/a)	Collection of solid waste (t/a)	Population of direct beneficiaries (million)	Women beneficiaries (million)
Duchang	239.4	17.5	4.4	1.7	25.7	12.2
Poyang	1886	484.7	33.43		33.157	16.5785
Yugan	132.3	17.89	1.3	0.2675	13.2	6.6
Fengxin	215.5	15	2.4		12	6
Jing'an	52.56	5.84	0.58	0.24488	4.1719	2.0851
Jishui	183.96	20.44	2.04		17.0454	7.9556
Shangli				5.064	23.2567	11.1864
Total	2709.72	561.37	44.15	7.27638	128.531	62.6056

5.2.2 Negative Impacts in Operation Stage

Potential adverse environmental impacts during the operation phase of the project mainly come from substations.

5.2.2.1 Wastewater Impact

Operation of the solid waste transfer stations will generate leachate and wastewater generated by washing equipment in the stations. It is estimated that under Duchang subproject, totally 1,778 t/a wastewater will be generated in the three transfer stations, and the wastewater will be transported by tankers to Duchang Municipal WWTP for treatment; under the Yugan subproject, 2,675t/a wastewater will be generated in the two transfer

stations and the wastewater will be discharged into the adjacent municipal sewers through which the wastewater will be treated at the Yugan Municiapl WWTP; Under the Jing'an subproject, 1,511 t/a wastewater will be generated in the updated solid waste collection points, the wastewater will be discharged into the adjacent sewers to the Jing'an municipal WWTP for treatment; under Shangli subproject, totally 5,743t/a wastewater will be produced at the six solid waste transfer stations, and the wastewater will be transported by tankers to the leachate treatment stations of Pingxiang municipal solid waste incineration facility for treatment.

According the requirements of the Jiangxi EPB which require the wastewater generated from industries, except for the chemical and electroplate enterprises, be discharged into the municipal WWTP for treatment so as to better use the capacities of the operating WWTPs. Based on the current capacities and process of the WWTPs, to ensure the normal operation of the WWTPs, the maximum flow of industrial wastewater flow is expected to be less than 30% of the total wastewater flow in the WWTPs. Under the subproject of Duchang, the wastewater from the industrial parks of Furongshan, Leigongjian and Chengnan, which are established for garment making, will be collected and conveyed to Duchang WWTP for treatment. Through sampling exercise, it is determined that the industrial wastewater collected by the subproject of Duchang will not affect the normal operation of the WWTP in terms of the quality and quantity of industrial wastewater. In addition, it is also determined that the normal operation of the wastewater treatment facilities which will receive the wastewater or leachate from the solid waste transfer stations will not be affected by the wastewater or leachate from the project.

Operation of the water monitoring auto-stations will generate wastewater of small quantity requiring treatment. Under the subprojects in Duchang, Yugan, Fengxin, Jing'an, Jishui and Shangli, the wastewater will be discharged into the municipal sewers to the local municipal WWTP for treatment; the wastewater to be generated in Poyang subproject will be discharged into the integrated wastewater treatment stations. In addition, the testing equipment in the water quality monitoring auto-stations will generate wasted liquid or wasted solvent which are toxic materials. Local certified entity will be engaged to collect the toxic liquid to the hazardous waste disposal center for disposal.

5.2.2.2 Air pollution

The primary source for air pollution is the solid waste vehicles and the solid waste transfer stations in operation stage. The solid waste transport vehicles in water-tight design will be selected so as to avoid the release of nuisance odor during traveling. During the operation of the transfer stations, not only the nuisance odor but also the air-borne dust will be generated, which will adversely affect the residential areas in proximity. During the consultation the people to be affected by the solid waste transfer stations requested to install odor removal devices in the transfer stations, so as to address their concerns.

The model provided in the Technical Method for Developing Local Air Pollutants Emission Standard (GB/T13201-91) was used to estimate the concentration of the H_2S and NH_3 at the boundary of the transfer stations and the sensitive receptors in the nearest proximity. The result shows that the air quality either on the boundary of the transfer stations or at the sensitive receptors will meet the standards provided that the odor removal devices are installed.

In addition, the estimation of the intensity of the odor and dust show that the concentration of odor in terms of H2S and NH3 can meet the Sanitation Design Standard for Industrial Enterprises (TJ 36-79) and the dust concentration can meet the Integrated Air Pollutants Emission Standard (GB 16297-1996), thus the impact on the occupational health of the operation staff in the transfer stations is minor and acceptable.

5.2.2.3 Impact of Noise

The major cause for noise in operation phase is the operation of pumps in pumping stations, the equipment in the transfer stations and the solid waste transportation vehicles.

The model provided in the EA Technical Guideline-Acoustic Environment (HJ2.4-2009) has been used to predict the noise level at the boundary of the pumping stations and the transfer stations. It is clear that the noise level on the boundary of the stations meet the standard, if the mitigation measures are adopted. These measures include the selection of low noise equipment, provision of cushion base, and noise insulation windows and gates. The noise at the sensitive receptors at the nearest proximity has been estimated and it is thought that the noise levels at these sensitive receptors are in compliance with the standard.

Through modeling, it is clear that the noise level in daytime at 5 m from the roads can meet the Class 4a, and at 10 m can meet the Class I of the Acoustic Environment Quality Standard (GB 3096-2008) when the solid waste vehicles traveling near the residential buildings. Given that the solid waste vehicles are banned from operating in nighttime, the impact of noise by the operation of solid waste vehicles is minor and acceptable.

5.2.2.4 Impact of solid waste

The solid waste will be generated by the operation staff in the transfer stations and the water quality monitoring auto-stations. The domestic solid waste in the transfer station will be put into the compaction equipment and transported by solid waste vehicles to the sanitary landfill.

The integrated wastewater treatment stations to be built under the Poyang subproject will adopt the FMBR process which will provide long retention time to digest the sludge, thus there will not be any surplus sludge to be generated from the operation of the wastewater treatment stations.

5.2.2.5 Impact on ecology

After the implementation of a set of mitigation measures supported by the project (e.g. sediments dredging, sewage interception, lakeshore improvement), water quality of Zoujiazui Lake and Pipa Lake are expected to be improved, leading to less pollution load discharge into the Poyang Lake and the improvement of environment.

After the outlet channel of Pipa Lake is unclogged, fresh water from Huihui River can flow into the Pipa Lake by gravity during wet season. During dry season, fresh water (maximum 3,464 m^3/day) will be introduced into the Pipa Lake by a pump station from the Huhui River to offset the lake water loss due to the evaporation and infiltration. 54km long Huhui River originates at Jingtou Zhoujia and flows into Poyang Lake at Shikou. The water quantity to be taken from the Huhui River in dry season is very small (0.14% of the flow in the Huhui River), which is expected to cause little impact on the ecological flow and the eco-system of Huhui River.

Perspective Landscape of the Two Lakes(Zoujiazui, Pipa)

5.2.2.6 Social impacts

The social assessment report is prepared by the Hohai University and the following are the main findings, conclusions and suggestions made in the social assessment report.

The project will bring tremendous social benefits which largely overweigh the social impact. The main social benefits are:

- Improved living environment for residents;
- Increased opportunity for employment for farmers and vulnerable groups;
- Reduced mortality rate and improved health conditions for residents;
- Assisting in urbanization in sustainable manner in rural areas;
- Promoting the restructuring of economy and boosting the development of green economy.

However this project also faces the potential social risks, which mainly come from the land acquisition and resettlement, and the sustainability expectation after the completion of the project. Thus in social perspective, it is suggested that during the development of the project, the vulnerable groups should be given equal attention in terms of fair treatment. To enhance the benefit and avoid or minimize the adverse impact in social aspects of the project, following suggestions are made, including:

- Minimizing the area to be occupied, either temporary or permanent, through alternative development which should include the criteria of land acquisition and relocation of people;
- Carrying out participatory activities, which employ the approach to involving the stakeholders throughout the whole process of design, implementation, management and supervision of the project;
- Developing and implementing the environmental awareness promotion and public health education program;
- Developing proper resettlement action plan based on the consultation with the affected people and relevant national laws and regulation, so as to ensure that the livelihood of the affected people not be less than that before the project;
- Providing opportunity for employment for migrant workers, poverty families and women during the construction and operation of the project;
- Developing and implementing the favorable billing policy for the poverty group, through the public hearing procedure, which is adapted to the local conditions of poverty status;
- Scheduling the construction progress by soliciting the concerns and comments of the local people;
- Enhancing training to the contractors and PMOs on the safeguard policies of the World Bank;
- Establishing the management mechanism for the sustainability in the operation phase of the project, which will include the community management team with the representative of villagers being selected by voting process.
- Strengthening the law enforcement of environmental laws/regulation and training on environmental protection to the villagers.

The above suggestions have been considered in the design of the project and included in the ESMP.

5.2.2.7 Impact of studies

The project will support studies under the Jing'an subproject. They are the Water Environment Vulnerability of the Poyang Lake Basin, and the Financing Mechanism for the Water Environment Management of Poyang Lake, and the institutional strengthening package to enhancing the water environment management system. Based on the Interim Guidelines on the Application of Safeguard Policies to Technical Assistance (TA) Activities in Bank-Financed Projects and Trust Funds Administered by the Bank, these studies and the institutional packages are assessed and categorized. The potential impacts to be caused by the studies and the institutional package are expected to be positive and would not cause significant and irreversible adverse impact on the Poyang Lake; the studies and the institutional package are EA Category B or C. Draft TORs for the proposed studies will be prepared including the requirements of analysis of potential environmental and social issues.

5.3 Cumulative Impact

The methodology for the cumulative impact assessment defined in the Good Practice Handbook-Cumulative Impact Assessment of IFC has been adopted. During the assessment, various VECs were considered based on the nature, location, scale and magnitude of the proposed project. Through the consultation with relevant groups and experts, the VECs selected for further cumulative assessment is the Water Quality in Poyang Lake in terms of COD, TN and TP. In current stage, the specific project in the past, current or future on the water pollution control in the Poyang lake basin are not available. Thus the 13th 5 year Plan and 14th 5 year Plan for Environmental Protection of Jiangxi Province, and the Water Pollution Control Action Plan of Jiangxi Province are used to represent the relevant projects in past, current and future. The result of the cumulative impact show that this proposed is an integral part of the overall water pollution control effort in the province of Jiangxi and will assist in achieving the target of water pollution load reduction set by the government. The analysis of cumulative impact also suggests strengthening the implementation of the water pollution control efforts in Jiangxi.

5.4 Due Diligence Review

Due diligence review has been made by the EA team on the facilities that will receive and treat/dispose the wastewater and solid waste collected by the project, so as to ensure that the facilities are capable of accommodating the wastewater/solid waste in environmentally sustainable manner. The information about the relevant facilities is as follows:

Table 5-2 Relevant Facilities

Subproject	WW/ SW	Relevant Facilities	Description
Duchang	Wastewater	Duchang County Municipal WWTP	This WWTP was built in July 2010 following the environmental procedure with the current capacity being 20,000 t/d which will be increased to 40,000 t/d in 2020. The effluent quality meets the relevant standard and there is adequate surplus capacity to accommodate the wastewater collected under this subproject. The environmental performance of the plant is satisfactory.
	Solid waste	Duchang Municipal Solid Waste Treatment Plant	This plant has been in operation since May 2016 following environmental procedure with the capacity of 380 t/d using the composting technology. The remaining waste that cannot be composted will be sent to the NO.2 of Jiujiang Municipal Solid Waste Treatment Plant for landfill. The plant has already taken into account the quantity of the solid waste to be collected by the subproject during the design stage of the plant.
		NO.2 of Jiujiang Municipal Solid Waste Treatment Plant	It was built in Jan. 2011 following the environmental procedure with the capacity of 1000 t/d which will be expanded to 2,000 t/d in 2017. It adopts the sanitary landfill and it is capable of accommodating the waste that cannot be composted in the Duchang solid waste treatment plant.
Yugan	Wastewater	Yugan Municipal WWTP	The first phase of this plant was built in 2009 at a capacity of 20,000 t/a following environmental procedure and the second phase of 20,000 t/d will be completed in 2020. The surplus capacity currently is 5,000 t/d which is capable of accommodating the wastewater collected by the subproject and the environmental performance of this plant is satisfactory.

	Solid waste	Yugan County Sanitary Landfill	The landfill was built in 2014 and the environmental examination will be conducted by the end of 2016. The capacity is 237 t/d which has already taken into account the solid waste collected by this subproject in the design of the landfill.
Fengxin	Wastewater	Fengxin municipal WWTP	The first phase of this plant was built in 2009 at a capacity of 10,000 t/a and the second phase of 10,000 t/d was completed in 2014 following environmental procedure. The service are of the plant is include the project area and the wastewater to be collected by the sub-project has been considered in the design of the plant. The environmental performance of this plant is satisfactory.
Jing'an	Wastewater	Jing'an municipal WWTP	This plant became operational since 2010 and the capacity is 10,000 m3/d. The long term capacity of the WWTP is 20,000 m3/d. The surplus capacity of the plant is 2,000 t/a which is adequate to accommodate the wastewater collected by this subproject in short term, but when the wastewater volume in the long term to be collected by the subproject become 17,400 m3, the capacity of the WWTP should be expanded to 20,000 m3/d. The advice to accelerating the expansion of the WWTP to the capacity to 20,000 m3 has been provided to the local government. The environmental performance of this plant is satisfactory.
	Solid waste	Jing'an County Municipal Solid Waste Sanitary landfill	This landfill is 7.5 km from the urban area of the county, and its footprint is 123 mu. It was built in 2014 and the environmental performance is satisfactory. The service span of the landfill is 20.2 years and the area of the subproject is the service area of the landfill.
Jishui	Wastewater	Jishui County municipal WWTP	The first phase of the plant was built in 2010 to the capacity of 10,000 m3/d, and the second phase is being constructed to the additional 10,000 m3/d and will become operational by the end of 2016. The final total capacity is 40,000 m3/d which will be achieved in 2020. The service area of the plant includes the subproject area and it is identified that the wastewater to be collected by the subproject either in the short term or in the long term can be accommodated by the plant provided that the final capacity of 40,000 m3/d is realized by the end of 2020.
Shangli	Solid waste	Pingxiang Municipal Solid Waste Incineration Plant	This plant is being constructed and will become operational since 2017 while the subproject will be completed by the end of 2022. The plant can provide incineration service for this subproject before the subproject become operational. The capacity of the plant is 700 t/d and the space for the second phase designed at additional 350 t/d has been reserved. The subproject area has already been included in the service area of the plant in planning stage. The environmental facilities associated, i.e. leachate treatment and flue gas treatment, have been designed and are being constructed with the incinerators. The fly ash will be immobilized and landfilled in the landfill site, designed to the sanitary standard, within the plant. The EA for this plant has been prepared and approved by the EPB.

The monitoring requirements have been developed according to the relevant technical specifications and standards of China in the each EA for the above facilities. Such monitoring requirements also have been included in the monitoring plan of the ESMP for this project. In addition, the progress of the facilities under construction

that will treat/dispose the wastewater or solid waste to be collected by the project will be required to report in the ESMP.

5.5 Environmental Risks

The environmental risks include the break of sewers, accidents of wastewater discharge within the industrial parks, occupational health and safety risk for the workers during maintenance of the facilities, malfunction of solid waste transfer stations and leakage of leachate transport vehicles. The mitigation measures and the emergency preparedness plan have been developed and included in the ESMP.

6. PUBLIC CONSULTATION AND INFORMATION DISCLOSURE

6.1 Public Consultation

In accordance with the requirements of the China's EA Law and Method for Public Participation, as well as the World Bank safeguard policies, two rounds of public consultation were conducted by the EIA team. The first round focused on environmental screening to define public concerns, to assist identification of key environmental issues and to draw public response and comments on the initially developed mitigation measures for the potential adverse impacts identified before EA TOR finalization. The second round was designed to ensure public awareness of the EA effort and final project definition and mitigation of the adverse impacts by presenting a draft EA report to the public through access to information procedures. Details of the two rounds of public consultation undertaken are presented in Table 6-1.

Table 6-1 Implementation of the Public Consultation

Subproject	Round	Timing	Participants	Form
Duchang	1	Nov. 2015 to Jan. 20916	Affected local residents and concerned agencies	Interview, questionnaires and public meeting
	2	May, 2016	Affected local residents, concerned agencies	Questionnaires, interview
Poyang	1	Dec. 2015 to Jan. 2016	Local residents affected and of interest, concerned agencies	Questionnaires, interview and public meeting
	2	May, 2016	Affected residents, concerned agencies	Questionnaires, interview
Yugan	1	Dec. 2015 to Jan. 2016	Affected residents, sensitive receptors, concerned agencies	Interview
	2	May, 2016	Affected residents, sensitive receptors, concerned agencies	Questionnaires, interview and public meeting
Fengxin	1	Dec. 2015 to Jan. 2016	Affected residents, concerned agencies	Questionnaires, interview and public meeting
	2	May, 2016	Affected residents, concerned agencies	Questionnaires, interview and public meeting
Jing'an	1	Dec. 2015 to Jan. 2016	Affected residents, concerned agencies	Questionnaires, interview and public meeting
	2	May, 2016	Affected residents, concerned agencies	Questionnaires, interview and public meeting
Jishui	1	Dec. 2015 to Jan.	Affected residents,	Questionnaires, interview and public

		2016	concerned agencies	meeting
	2	May, 2016	Affected residents, concerned agencies	Questionnaires, interview and public meeting
Shangli	1	Dec. 2015 to Jan. 2016	Affected residents, concerned agencies	Questionnaires, interview and public meeting
	2	May, 2016	Affected residents, concerned agencies	Questionnaires, interview and public meeting

Responsive consultation was carried out throughout the EA preparation. During the first round of consultation, it was understood that the public are very supportive of the project and eagerly expecting the improvement of the environment as a result of the project. However, the public expressed some concern on the adverse impact of the project, including the nuisance odor of the solid waste transfer stations, the soil erosion, traffic blocking. The EA team explained these potential impacts and the mitigation measures that would be developed in the EA to address these impacts.

During the second round of consultation, the public were provided with the EA documents and explanation on the main findings and mitigation measures. The public agreed with the conclusions and measures provided in the EA.

6.2 Information Disclosure

Information on each of the sub-project has been disclosed to the public during the public consultation. During the first-round consultation, the project information and major elements of draft EA TORs have been disclosed. During the second round of consultation, the draft sub-EA has been placed in the local libraries or village committees easily accessible to the affected people. Advertisements have been posted in the affected villages/communities during the first round and second round consultation, to inform the public of project details and potential impacts, invite them to express their concerns and to inform the public the place to access to relevant information and draft EIA report.

The consolidated EA was placed in the website of the provincial PMO on July 25, 2016 at:

http://wzb.jxdpc.gov.cn/notice/201607/t20160725_193462.htm and the hard copy placed in the Library of Jiangxi. Advertisement was published on the Jiangnan City Newspaper on 30 July 1996.

7 ENVIRONMENTAL and SOCIAL MANAGEMENT PLAN

7.1 Institutional Arrangement

The institutional arrangement and responsibilities of relevant agencies and organizations for environmental management are as follows:

- The subproject IA will take the ultimate responsibility for environmental protection and management, with the responsibility for engaging environmental supervisors and monitoring agencies;
- Environmental Supervisors, to be engaged by the IA, will be responsible for day to day environmental management during the construction phase. Their responsibilities will include response to environmental monitoring reports and the taking of appropriate mitigation actions. They will also handle any environmental events which may occur during construction and operation;
- Provincial PMO will be responsible for supervising overall implementation of the EMP;
- Local EPBs will be responsible for enforcement of environmental regulations and standards and review of environmental monitoring reports;
- Monitoring Stations, to be engaged by the IA, will undertake environmental monitoring of air quality, noise, water quality, and other impacts on the environment in the project construction and operation;
- Contractors will be responsible for implementing the mitigation measures in implementation phase; and
- Relevant facilities will be responsible for provision of emission monitoring report conducted by local EPB.

A training program will be undertaken during project implementation for management and technical staff from the above organizations. Training course contents will include environmental regulations, environmental monitoring, mitigation measures, safety practice for small boiler demolition, and handling and responses to environmental incidents.

7.2 Mitigation Measures

Mitigation measures for the potential impacts in the design, construction and operation phases are summarized in Annex 1.

7.3 Environmental Supervision

ESMP implementation will be managed by Jiangxi PMO. An environmental and social management unit have been established in the PMO with dedicated safeguards staff. Civil work contractors and supervision companies will be required to assign qualified environmental staff to their team to ensure effective implementation of the ESMP. PMO, under assistance of on-site environmental supervisors, local EPB and external monitoring institution, will supervise the implementation of ESMP. To improve local capacity, the ESMP proposes capacity training activities for civil work contractors, PMO, environmental supervisors, and monitoring institutions etc.. The ESMP also specifies monitoring plan, and budget for the ESMP implementation. A set of environmental compliance checklists for the contractors and supervisors have been developed for construction period including checking the implementation of all of the mitigation measures, and correction of environmental practice and environmental acceptance for checking the implementation of the monitoring plan, mitigation measures and reporting system.

7.4 Reporting and Public Grievance Mechanism

The requirements for environmental supervision and monitoring, as well as the reporting system has been clearly specified. The public grievance mechanism will be established and maintained throughout the project to deal with any public concerns in environmental management.

7.5 Training Plan

A training program has been developed for the PMO staff, environmental supervisors, contractors and environmental monitoring units with the contents focusing on the responsibilities of the relevant organizations, environmental regulations, mitigation measures, supervision, reporting system and public grievance.

7.6 Environmental Monitoring Plan and Cost Estimate

An environmental monitoring plan has been developed for the construction and operation phases and incorporated into the ESMP, which includes the monitoring location, monitoring parameters, methods, frequency and cost estimate.

The total cost estimate for the environmental protection measures is RMB 3.90 million for construction phase, RMB 1.70 million for operation phase, and the monitoring is RMB 2.20 million.

Figure 1. Project Location

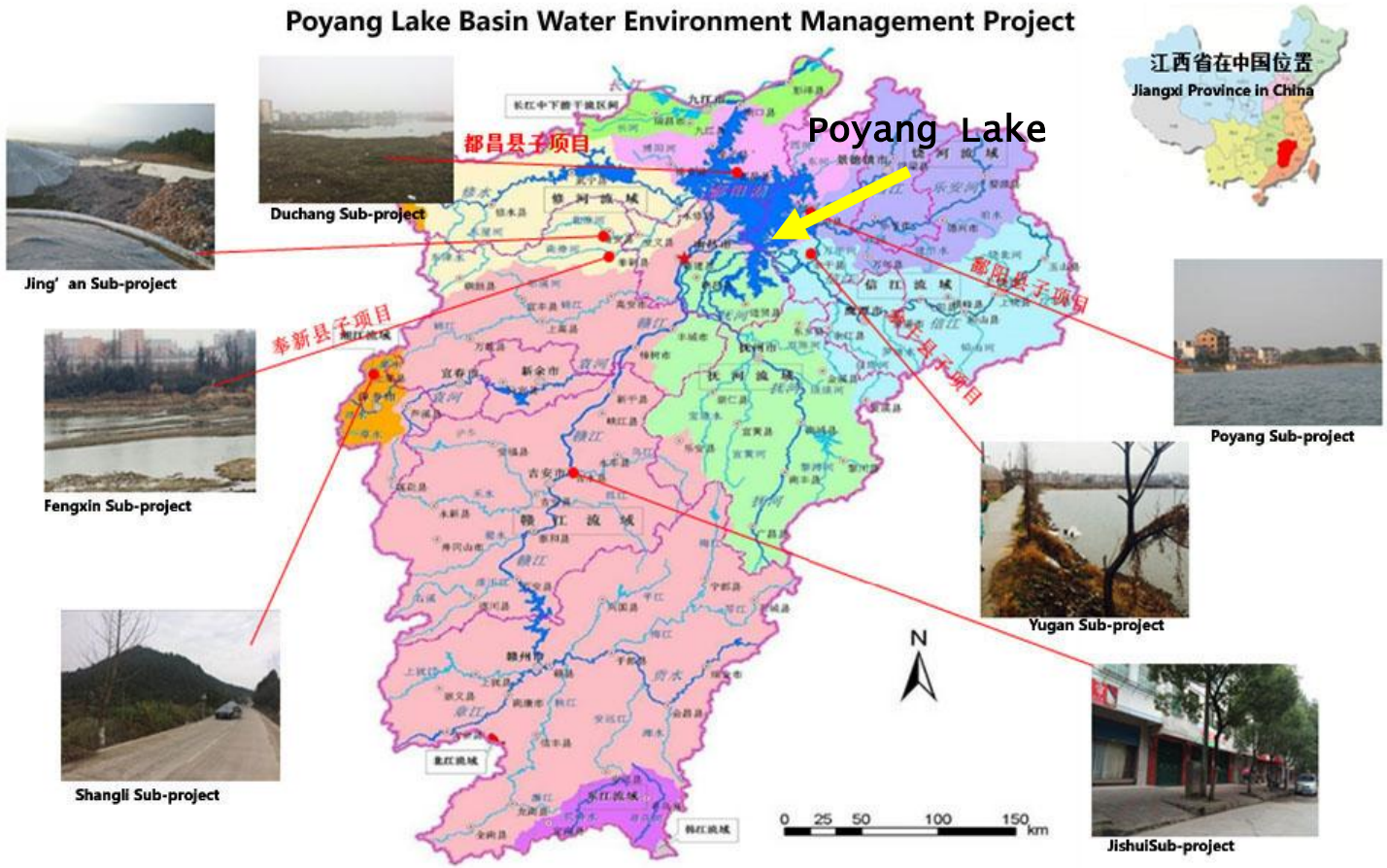
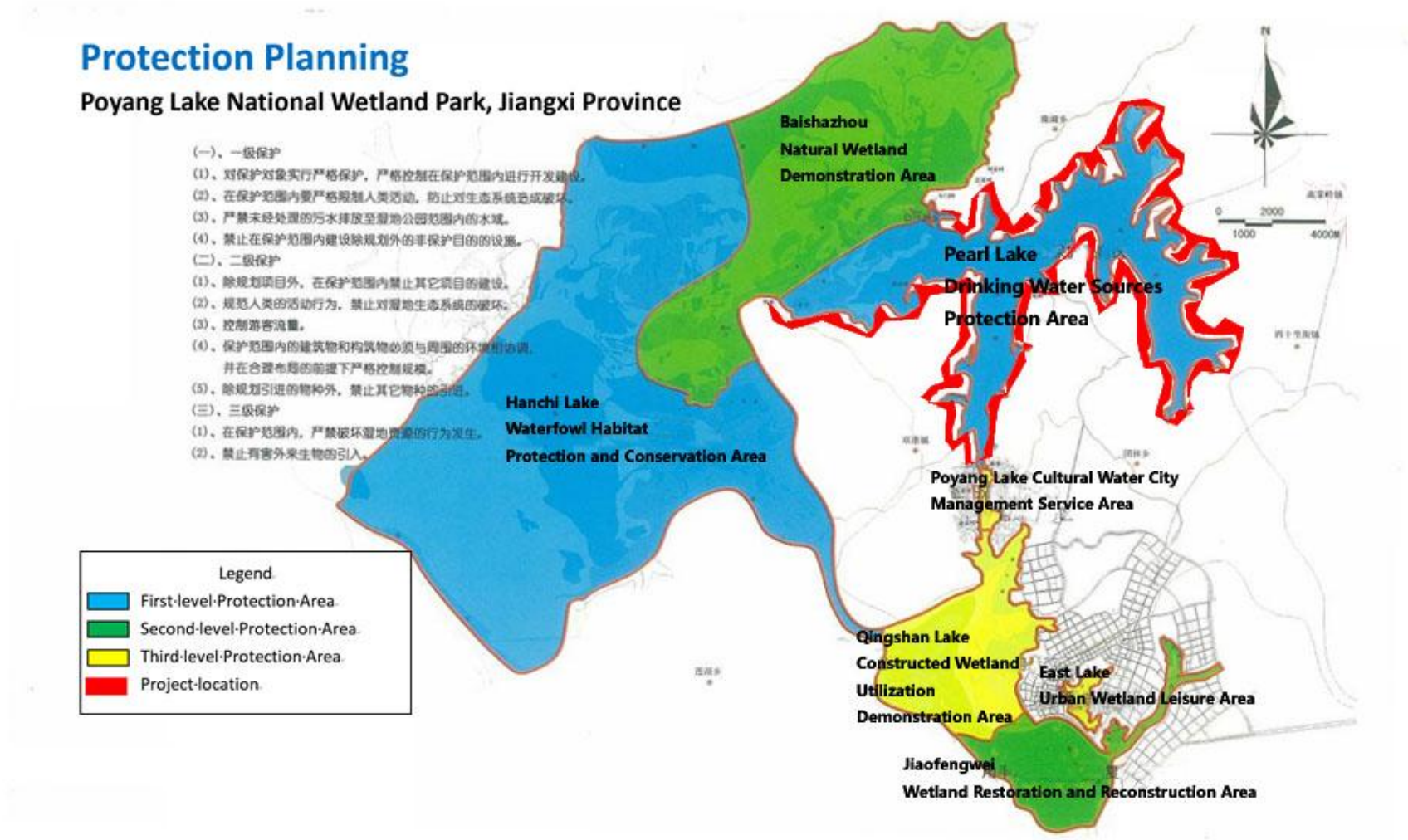


Figure 2. Geological Relation between the Poyang Lake National Wetland Park and the Project



Annex 1. MITIGATION MEASURES

Activities	Potential impacts	Mitigation / prevention measures	Investment estimate (10,000Yuan)	Implemented by	Supervised by
Preparation period					
Tendering and bidding	——	1, Environmental Management Plan（EMP）should be included in the biding documents 2, Environmental Management Plan（EMP）should be in the contracts with contractor, engineering supervision unit to be implemented.	——	Provincial PMO, County PMO	——
Prior to construction	——	1, Timely inform the public about the information like construction plan, environmental impact statement, pavement construction, temporary bus routes, etc.. 2, Public should be noticed about the public facilities failures caused by the construction, such as plumbing, electricity, telephone, bus routes failure, at least five days in advance by way of notice announcement in construction point, bus station, affected regions.	——	Province PMO, County PMO	——
Construction period					
Earthwork excavation; Site preparation; Waste soil and slag storage	Destruction of vegetation; Influence of crop production; Disturbance of wild animals activities; Influence of landscape; Cause of Soil and	1, Scientific layout arrangement of construction site；minimal land occupation; and restoration of the temporary occupied areas in accordance with the original land use type after the construction. Reasonable selection of construction period; To avoid the rainy season, rainy days as far as possible； Setting enclosure blocks around construction area to prevent construction materials, construction waste into surface water. 2, Soil drainage ditch should be set around the construction site according to the topography and geomorphology condition, and provided with the soil grit chamber at the outlet point to	70	Construction Unit	Province PMO, County PMO, Project owner, County EPB, Forestry Bureau, Water Bureau

Activities	Potential impacts	Mitigation / prevention measures	Investment estimate (10,000Yuan)	Implemented by	Supervised by
	water loss; Cause of geological disasters, etc.	slow down the water flow and settle down the sands. 3, In Combination of the key and general soil and water conservation work, the engineering measures and plant measures. Taking engineering measures as the guide, and exerting the quick acting, effect of engineering measures and water and soil conservation supporting of plant measures. Plant measures play a long-term and stable role of soil and water conservation, greening and landscaping project area surrounding environment. 4, To Strengthen publicity and education, prohibit to cut down the forest, hunt wild animals; During construction, if rare and endangered plants, ancient and local famous trees and plants is found, it should be reported to the relevant departments and take protection measures locally; To control construction noise, to reduce the interference of construction noise to animals. 5, When stripping topsoil in the construction process, layered excavation, layered stacking should be employed, with timely removal of temporary facilities, loose of the soil compaction Layered backfill of the soil and Restoration of vegetation should be done after completion of construction. The appropriate type of vegetation in the region should be selected according to the local climate characteristics, slope rate and geological condition. 6, Fire monitoring of the construction area involving the forest; Strengthen the investigation of key protected plants, ancient and famous trees with the regional distribution. Strict management of construction work may cause fire. During the period of forest fire prevention, it is forbidden to use fire in the mountain area. 7, Protection of the litter leaf layer and organic matter in the surface soil, Backfill to damaged area, to promote the growth			

Activities	Potential impacts	Mitigation / prevention measures	Investment estimate (10,000Yuan)	Implemented by	Supervised by
		of native plants. 8, Using the local grass and vegetation to cover the erosion or barren areas, or hardening the soil surface in this region. 9, Erosion control measures should be taken before the advent of the rainy season in order to carry out the next. Construction work. Corresponding erosion measures should be completed for each complete construction point. 10, In all construction sites, before vegetation restoration, deposition control facilities should be set to slow down the runoff rate, change the direction of flow, settle the sands and so on. These deposition control facilities include material heap, stone road, grit tank, straw bag, hedgerows and mud slag heap etc.. 11, By laying ditch, berm, grass fence and stone piles and other measures to prevent water rushed into the construction site or interfering with site. 12, Maintain and continue to use erosion control until the vegetation is fully recovered 13, When necessary, Sprinkle water on the soil road, excavation area, filler and soil storage area to reduce wind erosion.			
Material processing and transportation, etc.	Impacts of dust, transport vehicle exhaust emissions on the ambient air	1.Using advanced construction process; dust cleaning equipment; speed control of vehicles; exhaust gas control of vehicles and coals; Water spraying on construction area (4~5times/d); clean energy like LPG, electricity for construction people; strengthen of the construction area management and labor protection for construction people; all of above will reduce the ambient air impact. 2, Vehicle wash platforms are set up at the inner side of the	100	Construction Unit	Province PMO, County PMO, Project owner, County EPB

Activities	Potential impacts	Mitigation / prevention measures	Investment estimate (10,000Yuan)	Implemented by	Supervised by
		entrances and exits for material and waste transport vehicles, meeting the following requirements: Anti overflow Block around the platform to prevent the overflow of the Vehicle wash wastewater. Vehicles should wash the tires and vehicle body before leaving the construction area,. The height of Material and waste loaded on the transport vehicles, should not exceed over the edge of the vehicle. Truck body should be covered with tarpaulin or use the sealed hopper. 3, Use of commercial concrete and asphalt, no onsite concrete mixing station and asphalt Mixing Station. 4, Transport vehicles, bulldozers, excavators should be driven in low speed when passing by the village and entering the construction area; meanwhile the construction machinery should be kept in good maintenance and normal working to reduce the emissions exhaust gases. 5, Set up the Dust screen around the construction area, especially for those close to residential areas, hospitals and schools. 6, Try to reduce the dust and particulate generation, to avoid the impact on the living and commercial activities of the residents living around, Focusing on protection of sensible people (such as children, the elderly and so on).			
Solid waste of construction (earthwork, construction waste, etc.)	Soil and water loss; River channel blocking; Water body pollution etc..	I, Earthworks： 1, In the early stage of construction, the excavation of the site must be carried out. Make full use of the terrain's natural drop, try to avoid digging at high place and filling at deep points. 2, As for the excavated earthwork, soil can be used for land preparation in later cultivation project, and rocks can be used for the foundation stone for the stone Irrigation, side ditch, etc.,	40	Construction Unit	Province PMO, County PMO, Project owner, County EPB

Activities	Potential impacts	Mitigation / prevention measures	Investment estimate (10,000Yuan)	Implemented by	Supervised by
		shall not be arbitrarily placed. 3, Temporary storage site for earthworks should be reasonably arranged, away from the environment sensitive points of reception like residents, schools, should be located in downwind or lateral wind direction of the urban and residential area's summer dominant wind; Temporary stacking of earthwork should be rolled and covered by felt cloth and other waterproof, windproof measures should be taken.。 4, Soil drainage ditch should be set around the temporary storage site, and provided with the soil grit chamber at the outlet point to slow down the water flow and settle down the sands. II, Construction waste ： 1, Comprehensive classification and recovery of recyclable waste should be carried out (scrap metal, scrap materials, packaging bags should be sold to scrap yards, waste brick should be used as road base material). 2, Waste that cannot be recovered should be timely transported to local construction waste landfill site. Transport vehicles Should be sealed in the transport process, to avoid falling. 3, Temporary dumping site should take the waterproof, windproof measures.			
Domestic waste of Construction camp	Easy to corrupt, stink, grow of mosquitoes, breed of bacteria, damage the environment even release toxic	Domestic waste bin should be set up in construction area, daily cleaned, collected, and classified by specific people, then collected and transported by the local sanitation department.	10	Construction Unit	Province PMO, County PMO, Project owner, County EPB

Activities	Potential impacts	Mitigation / prevention measures	Investment estimate (10,000Yuan)	Implemented by	Supervised by
	gases				
Construction wastewater	Water environment pollution	1, The wastewater of Sand and gravel processing system is used for sprinkling for construction dust etc., shall not be discharged into the water body; Slurry produced in the construction process is pumped to the settling tank by slurry pump, solidified by drainage and evaporation, shall not be discharged into the water body. Wastewater of mechanical equipment washing is treated by the oil separation tank, then used for sprinkling for construction dust, and shall not be discharged into the water body. 2, The construction site layout should take full account of drainage needs; be as far as possible from river water; ensure that the construction site, warehouse, storage of diesel oil and asphalt, and equipment for the production of asphalt are not set within the 500m range of the river; avoid pollutants to flow into the river during the operation time, especially the leak by land or surface water during the rainy season. 3, In the course of construction, the work area should be clean, sewage and pollutants should not enter into the excavation trench, leading to sewage infiltration. 4, If the oil needs to be stored on site, impervious treatment must be done to the warehouse. Measures should be taken for oil storage and use to prevent water pollution from oil escaping, emitting, dropping and leakage. 5, Foundation construction should be done in the non flood season as far as possible to reduce the influence of shallow groundwater depth on construction.	100	Construction Unit	Province PMO, County PMO, Project owner, County EPB, Water Bureau
Domestic wastewater	Water environment pollution	1, Existing domestic wastewater treatment systems nearby the construction area are proposed to treat the domestic wastewater of project construction people, No discharge into the water	20		

Activities	Potential impacts	Mitigation / prevention measures	Investment estimate (10,000Yuan)	Implemented by	Supervised by
		body. 2, prevention measures should be taken for the domestic waste storage room according to the relevant requirements.			
Noise generated by construction machineries, transport vehicles, sand and stone processing systems and other construction activities	Impacts of noise on nearby environment and construction personnel	1, Setting up no honking warning sign on the noise sensitive road sections; Using low noise devices; Control of noise point source, transmission route, traffic noise and so on; Equipped with anti noise ear plug for construction personnel; Reasonable arrangement of construction time. Reasonable arrangement of construction time according to Emission standard of environment noise for boundary of construction site(GB12523-2011); Avoiding multiple high noise equipment working at the same time; Avoiding the noise sensitive time to the surrounding environment; Arrangement of the high noise equipment working in the daytime as possible; Reducing nighttime transportation, Strict prohibition of construction at nighttime (22：00~6：00). The construction which has to be at nighttime, must obtain the approval of the local environmental protection department, and prior communication with the residents, taking noise reduction measures (such as setting noise barrier) at the same time, to reduced he influence of construction noise on the residents to a minimum. 3, All construction vehicles' speed should not exceed 25 km / h on the road outside the construction site. 4, All construction vehicles' speed should not exceed 15 km / h in the construction site. 5, Try to maintain the noise of machinery and equipment below 90 dB as much as possible 6, Setting up temporary noise barriers at the side of the sensitive point of reception (including schools, hospitals,	50	Construction Unit	Province PMO, County PMO, Project owner, County EPB

Activities	Potential impacts	Mitigation / prevention measures	Investment estimate (10,000Yuan)	Implemented by	Supervised by
		nursing homes, etc.) when high noise equipment construction. 7, Using correct measures to reduce the noise and vibration impacts caused by the construction.			

Operation period Common EMP and mitigation measures

Activities	Potential impacts	Mitigation / prevention measures	Investment estimate (10,000Yuan)	Implemented by	Supervised by
Operation period					
Domestic wastewater	Surface and groundwater pollution	Wastewater collected by the municipal pipeline and discharged to the municipal wastewater treatment plant for treatment; In the area without pipeline, Wastewater collected by the closed vehicle, and shipped to the municipal wastewater treatment plant for treatment.	50	County PMO, Project owner,	County EPB
Equipment noise	Impacts of noise on nearby environment	Measures of sound insulation, shock absorption for equipment	100	County PMO, Project owner,	County EPB
Domestic waste	Influence of landscape; River channel blocking; Water body pollution etc.	Collected and transported to waste transport station, or handed over to municipal department for treatment	20	County PMO, Project owner,	County EPB

EMP and mitigation measures for ecologically sensitive area in construction period

Name of Ecologically sensitive area	Activities	Potential impacts	Mitigation / prevention measures	Investment estimate (10,000Yuan)	Implemented by	Supervised by
Design period						
National Wetland Park	Constructed wetland, Ecological sewage interception channel	Alien species invasion	1, Selection of indigenous tree species and shrubs, for Constructed wetland and ecological sewage interception channel instead of introduction of new exotic trees and invasive tree species; 2, Selection of native species in water ecological remediation, in the principles of biological diversity, which is benefit for construction of a stable ecosystem; 3, Selection of Species that have significant effects on the improvement of the ecological system, to meet the requirements of water purification.	——	Design unit	Province PMO, County PMO, Project owner, County EPB, Forestry Bureau
Construction period						
All the Ecologically sensitive areas	Construction preparation and organization	——	1、Awareness dissemination and education for workers before construction; Strengthen the protection of the ecological sensitive area; Prohibit the behavior of destructing ecological environment, such as destruction of trees, grass, Illegal hunting for wild animals. 2、In the process of project construction, construction should be in strict accordance with the construction drawings, should not expand the scope. The construction area should be strictly defined, non-construction personnel should not enter the construction area. Optimize the construction sequence and construction site design, minimize the disturbance of the surface and the destruction of vegetation area. 3、Soil taking and dumping field, abandon slag field, material dumping field, mixing field and construction camp are forbidden to set up in the ecological sensitive area; Mainly use local personnel for construction, non local construction workers should rent the local housing; Try to use the existing road or choose the wasteland, avoiding crossing or occupying of woodland.	——	Construction Unit	Province PMO, County PMO, Project owner, County EPB, Forestry Bureau, Water Bureau

Name of Ecologically sensitive area	Activities	Potential impacts	Mitigation / prevention measures	Investment estimate (10,000Yuan)	Implemented by	Supervised by
National Wetland Park	Wastewater treatment, waste collection, processing and transport	Affect water quality, birds, amphibians, aquatic organisms, etc.	1, Prevention and control measures of impacts on mammals and amphibians ①The project area should be divided into several sections in the construction periods, and keep enough distance between sections, to provide enough space for mammals and amphibians to escape. ②Discharge of construction period wastewater should be toward away from the protected area side as far as possible to reduce the impact of sewage on mammals and amphibians. ③Mechanical stirring system, sand system should be installed with silencer pad, equipped with sound insulation room or cover, and periodic inspection and maintenance should be done in strict accordance with the operation requirements of the mechanical equipment to reduce noise caused by improper lubrication of equipment; And to reduce the impacts of noise on mammals and amphibians. ④Publicity and education should be done to the construction personnel, enhancing the awareness of wildlife conservation, to prevent the occurrence of hunting phenomenon, and reduce the impact of personnel on mammals and amphibians. 2, Prevention and control measures of impacts on birds According to the analysis of the impact of the project construction on birds in Wetland Park, the main measures are: ① In the construction period, construction tasks should be arranged as little as possible during the time period of more birds in the area (from October to next March), while the construction intensity should be increased in order to finish the work on time during the time that the birds is away from the area.; ②forbidden construction at nighttime. ③Mechanical stirring system, sand system should be installed with silencer pad, equipped with sound insulation room or cover, and periodic inspection and maintenance should be done in strict accordance with the operation requirements of the mechanical equipment to reduce noise caused by improper lubrication of	——	Construction Unit	Province PMO, County PMO, Project owner, County EPB, Forestry Bureau

Name of Ecologically sensitive area	Activities	Potential impacts	Mitigation / prevention measures	Investment estimate (10,000Yuan)	Implemented by	Supervised by
			equipment; and to reduce the impacts of noise on on birds. ④Construction and living areas should be far away from the protected areas, and install the curtain to block the light to reduce the impact of night light on birds. ⑤Strengthen the management of construction activities and personnel during the construction period; Strengthen the publicity of environmental laws and regulations; Compilation of bird knowledge manual, make knowledge popularization in the area, improve the birds protection consciousness of the construction personnel. Reduce the impact of personnel disturbance on birds. 4, Use native plants and prohibit the introduction of exotic species.			
Water source protection area	Wastewater treatment, waste collection, processing and transport	Affect water quality, birds, amphibians, aquatic organisms, etc.	1, To inform the construction personnel of Poyang County the Pearl Lake water body function for drinking water, Centralized drinking water source protection area and water source protection and conservation area of Wetland Park; Strengthen the awareness of water conservation for construction personnel; Strengthen environmental protection education for construction personnel; Strict restrict personal hygiene behavior of construction personnel; Prohibit the construction personnel to swim. 2) Prohibition of the establishment of the material field, waste dumps, construction camps, etc. in the centralized drinking water source protection area; Try to avoid the concentrated distribution area of the agricultural irrigation ditch as far as possible. 3) Set up necessary temporary drainage ditch, dredging the construction wastewater, using the sedimentation tank to reuse the wastewater in the construction. 4) When excavation at the rain and road surface runoff, temporary sedimentation tank should be set up, to settle down the sands. A geotechnical cloth fence is arranged at the water outlet side to intercept the sands once again. Sedimentation tank should be flattened when the construction complete. 5) The construction of temporary road must be with smooth drainage to prevent the massive sandy mud from flowing into the Pearl Lake by the storm. 6) Prohibition of dumping of waste water, waste, waste, waste rock and other solid	——	Construction Unit	Province PMO, County PMO, Project owner, County EPB, Water Bureau

Name of Ecologically sensitive area	Activities	Potential impacts	Mitigation / prevention measures	Investment estimate (10,000Yuan)	Implemented by	Supervised by
			waste into Pearl Lake. 7) Slurry produced in the construction process is pumped to the settling tank by slurry pump, solidified by drainage and evaporation, shall not be discharged into the water body. 8) Wastewater of mechanical equipments washing is treated by the oil separating tank, then used for water sprinkling for construction dust, and shall not be discharged into the water body. 9) In the course of construction, the work area should be clean, sewage and pollutants should not enter into the excavation trench, leading to sewage infiltration. 10) Construction should be done in the non flood season as far as possible to reduce the influence of shallow groundwater depth on construction; 11) Regular inspection and maintenance of construction machinery to prevent oil leakage. 12) Local residents houses are rented as the construction camp. Existing domestic wastewater treatment systems nearby the construction area are proposed to treat the domestic wastewater of project construction people, No discharge into the water body. prevention measures should be taken for the domestic waste storage room according to the relevant requirements. 13, prevention measures should be taken for the domestic waste storage room according to the relevant requirements.			

EMP and mitigation measures for Ecologically sensitive area in operation period

Name of Ecologically sensitive area	Activities	Potential impacts	Mitigation / prevention measures	Investment estimate (10,000Yuan)	Implemented by	Supervised by

Name of Ecologically sensitive area	Activities	Potential impacts	Mitigation / prevention measures	Investment estimate (10,000Yuan)	Implemented by	Supervised by
Operation period						
National Wetland Park	Wastewater treatment, waste collection, processing and transport	Affect water quality, birds, amphibians, aquatic organisms, etc.	1, Prohibit of Dumping of domestic waste and sewage discharge in the wetland protection area and its periphery protection zone 2, Prohibit of dangerous chemicals vehicles passing on the roads in the scenic area.	——	Construction Unit	Province PMO, County PMO, Project owner, County EPB, Forestry Bureau
Water source protection area	Wastewater treatment, waste collection, processing and transport	Affect water quality, birds, amphibians, aquatic organisms, etc.	1, Prohibit of Dumping of domestic waste and sewage discharge indrinking water source protection area. 2, Same with article2 of Wetland Park	——	Construction Unit	Province PMO, County PMO, Project owner, County EPB, Water Bureau

EMP and mitigation measures for sub project of river and lake water environment Rehabilitation

Activities	Potential impacts	Mitigation / prevention measures	Investment estimate (10,000Yuan)	Implemented by	Supervised by
Design period					
Ecological revetment, water purification and aquatic	Alien species invasion	1, Selection of indigenous tree species and shrubs, for ecological revetment instead of introduction of new exotic trees and invasive tree species; 2, Selection of native species in water ecological remediation, in the principles of biological diversity, which is benefit for construction of a stable ecosystem;	——	Design unit	Province PMO, County PMO, Project owner, County EPB, Forestry Bureau,

Activities	Potential impacts	Mitigation / prevention measures	Investment estimate (10,000Yuan)	Implemented by	Supervised by
ecosystem remediation		3, Selection of Species that have significant effects on the improvement of the ecological system, to meet the requirements of water purification.			Water Bureau, County Sanitation Department
Construction period					
Dredging	Surface water pollution; Impacts on aquatic animals and plants Impacts of abandoned sludge on Environment	1, Duchang county Dredging should be done in dry season. The plan is using long arm excavator to excavate the sediment after cofferdam building, water drainage and sediment air dry up. Try to reduce the temporary land occupation and make timely removal. Sediment is directly transported to wasteland in Gulingshan'ao Wangdunxiang in closed vehicles. Block is set around the Wangdunxiang Gulingshan'ao wasteland dumping site to reduce water and soil loss. Sediment will be covered by soil and virescence after natural drying in Wangdunxiang Gulingshan'ao wasteland dumping site.。 2, Sediment in Yugan county Dredging should be done in dry season; Environmental cutter suction dredger, under water excavation is adopted; Dredging sediment is used for woodland in Changgangling after centrifuge dehydration and drying treatment, water content of below 60%.The woodland area using sediment cannot be used for cultivation of vegetables, grain and other crops. Block is set to reduce water and soil loss. Try to reduce the temporary land occupation and make timely removal. The temporary land should be rehabilitated after the construction. 。	120	Construction Unit	Province PMO, County PMO, Project owner, County EPB, Water Bureau, County Sanitation Department

Activities	Potential impacts	Mitigation / prevention measures	Investment estimate (10,000Yuan)	Implemented by	Supervised by
		3, Sediment in Fengxin county Dredging should be done in dry season; Mechanical plus artificial dredging method is adopted. Dredging sediment is used for woodland in Changkeng Village Huangxi Village, Ganzhou Town after centrifuge dehydration and drying treatment, water content of below 60%. The woodland area using sediment can not be used for cultivation of vegetables, grain and other crops. Block is set to reduce water and soil loss. Try to reduce the temporary land occupation and make timely removal. The temporary land should be rehabilitated after the construction. 。			
Lakeshore restoration	Water body pollution	1, Construction materials field should be away from the surface water as far as possible, and the general materials temporary stacked in the water near due to the engineering requirement must be covered and fenced up. 2, The waste oil and other solid waste in the construction are forbidden to dump or throw into the water, should be promptly transported to the designated location.	40	Construction Unit	Province PMO, County PMO, Project owner, County EPB, Water Bureau, County Sanitation Department