The World Bank Financed

Poyang Water Environment Management Project

Environmental Assessment Report

CERI eco Technology Co., Ltd.

August 2016 Nanchang

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1 Overview

1.1 Project Introduction

Project Name	The World Bank Financed Poyang Water Environment Management Project				
Construction unit	Poyang County Leading Group Office of World Bank Financed Poyang Water Environmental Management Project				
Legal Representative	/		Contact person	Wang Bo	
Telephone	13979365843	Fax	/	Zip code	333100
Construction Site	Poyang County, Shangrao City				
Approval Department	/		Registered Number of Approval	/	
Type of Construction	New project■ Renovation and expansion□ Technical modification□		Industry Type and Code	N7721 Water Pollution Control	
Occupied Space（m2）	/		Green Area（m^2）	/	
Total Investment (10,000 yuan)	30086.46	Environmental Protection Investment in the total (10,000 yuan)	209.9	Ratio of the Environmental Protection Investment to the Total Investment	0.7%
EIA Cost (10,000 yuan)	/	Expected commissioning date	December, 2022		

1.2 Project Background

Water pollution in Poyang County mainly comes from residents' daily life, agriculture and industry, among which the first one is the biggest pollution source. Poyang County plans to improve drainage system and the penetration rate of sewage facility reaching 90%. Now there is sewage treatment plan in the industrial park, which can collect and deal with pollution in the town effectively. Zhuhu Lake, situated in the in the west of Poyang County and the eastern edge of Poyang Lake, is the eastern branch of Poyang Lake. Zhuhu Lake is not only a key water flowing to Poyang Lake but also is a vital drinking water source for Poyang County. Currently, Poyang Lake Eco-Economic Zone presents strong momentum in

economic and social development. Zhuhu Lake of Poyang County lies in lakeside controlled development belt where problems of domestic sewage pollution and agricultural point pollution are prominent. Furthermore, construction of municipal facilities in Zhuhu Lake Basin lags far behind that in the town of Poyang County.

To reduce pollutants entering Poyang Lake Basin through key waters (Zhuhu Lake) and promote water quality management, the government of Poyang County plans to initiate Poyang Water Environment Management Project by utilizing the World Bank loan.

In accordance with stipulations of *Environmental Impact Assessment Law of the People's Republic of China*, *Regulations on Administration of Environmental Protection in Construction Projects*, *Circular on Strengthening Administration of Environmental Impact Assessment for Development Projects Financed by International Financial Organizations* as well as safeguard policies of World Bank, the project should conduct environmental impact assessment. The environmental impact assessment was entrusted to Beijing CERI Eco Technology Co., Ltd.

After accepting the entrust, Beijing CERI Eco Technology Co., Ltd inspected the site and collected necessary materials to analyze relevant documents. Based on relevant environmental laws, regulations and technical guidelines, the prepared environmental impact assessment report of the project is submitted to World Bank and environmental authorities for approval.

1.3 EIA Objectives

The objectives of environmental impact assessment are to analyze the project's positive environmental impact and to identify, select and predict potential impacts on environment, then proposes specific, effective alleviation measures and environmental management plan for inevitable negative environmental impacts. This will provide basis for independent review of environmental safeguards by the World Bank and approval decision-making on and administration of environmental impact assessment by relevant authorities of China.

1.4 Basis for EIA Preparation

1.4.1 Relevant National Laws and Regulations on Environmental Protection

1) Environmental Protection Law of the People's Republic of China (April, 2014);
2) Environmental Impact Assessment Law of the People's Republic of China (Revision, July, 2016)

3) Law of the People's Republic of China on Water Pollution Prevention and Control (June, 2008)
4) Law of the People's Republic of China on Atmospheric Pollution Prevention and Control (August, 2015)
5) Law of the People's Republic of China on Prevention and Control of Ambient Noise (March, 1997)
6) Law of the People's Republic of China on Prevention and Control of Solid Waste Pollution (June, 2013)
7) Law of the People's Republic of China on Land Administration (August, 2004);
8) Law of the People's Republic of China on Protection of Wildlife (August, 2004);
9) Law of the People's Republic of China on the Protection of Cultural Relics (Amendment, June 2015)
10) Water Law of the People's Republic of China (August, 2002);
11) Law of the People's Republic of China on Flood Control (amendment) (April, 2015);
12) Law of the People's Republic of China on Soil and Water Conservation (December, 2010);
13) Urban and Rural Planning Law of the People's Republic of China (October, 2007)
14) Law of the People's Republic of China on Soil and Water Conservation (August, 1993);
15) Regulations of the People's Republic of China on Nature Reserves (October 9, 1994)
16) Regulations on Landscape and Famous Scene (Decree 474 of the State Council, September 19, 2006)
17) National Policies on Wetland Park (Trial) (Lin Shi Fa No.1, February 2, 2010)
18) Management Rules on Wetland Protection (State Forestry Administration Decree No.32, March 28, 2013)
19) Regulations on Basic Farmland Protection (State Council Decree No. 257, December, 1998)
20) Regulation of River Course Management (State Council Decree No.3, March, 1988)
21) Outline of National Ecological Environmental Protection (Guo Fa [2000] No.38, November, 2000)

22) Regulations on Administration of Environmental Protection in Construction Projects (State Council Decree No. 253, November, 1998);
23) Administration of Environmental Impact Assessment of Construction Projects by Means of Classification Catalogue (April, 2015);
24) Circular on Implementing Environmental Impact Assessment System for Development Projects (State Environmental Protection Administration Huan Fa [2006] No. 28, March 18, 2006);
25) Decision on Implementing Scientific Concept of Development and Strengthening Environmental Protection (Guo Fa [2005] No. 39)
26) Suggestion on Strengthening Supervision of Resource Exploitation and Ecological Environmental Protection (State Environmental Protection Administration Huan Fa [2004] No. 24)
27) Pollution Prevention and Control Regulations of Drinking Water Source (Revision) (October, 2010)
28) National Catalogue of Industrial Structure (Version of 2011) (Revision, 2013);
29) Circular on Strengthening Environmental Impact Assessment for Construction Projects with Loans from International Financial Corporation (June, 1993);

1.4.2 Local Environmental Protection Regulations

(1) Regulations of Jiangxi Province on Environmental Protection in Development Projects (Revision, September 17, 2010);

(2) Regulations of Jiangxi Province on Environmental Pollution Prevention and Control (January 1, 2009);

(3) Methods of Jiangxi Province for Prevention and Control of Pollution to Domestic Drinking Water Sources (November of 2012, revision);

(4) Regulations of Jiangxi Province on Environmental Protection of the Poyang Lake Eco-Economic Zone (May 1, 2012)

(5) Methods of Jiangxi Province for Land Acquisition Administration (December 22, 2001);

(6) Regulations of Jiangxi Province on Wetland Protection of the Poyang Lake (Jiangxi Provincial Government Decree No. 19, March, 2004).

1.4.3 Relevant Planning

(1) Jiangxi Province Surface Water(Environment) Function Zoning (the Approved)

(2) Regulations on Poyang Lake Basin Eco-Economic Zone Protection (Environmental Protection Bureau of Jiangxi Province, July, 2008)

(3) Improvement Planning of Five River Basins of Poyang Lake Eco-Economic Zone (Department of Water Resources of Jiangxi Province, September, 2008)

(4) Eco-forestry Development Planning of Poyang Lake Eco-Economic Zone (2008～2020)

(5) General Planning of Poyang County Town (2007-2020)

(6) Special Planning for Poyang County Urban Area Drainage Works (2010-2020).

1.4.4 Technical Guidelines and Regulations of EIA

(1) Technical Guidelines on EIA: General Principles (HJ 2.1-2011);

(2) Technical Guidelines on EIA: Atmospheric Environment (HJ 2.2-2008);

(3) Technical Guidelines on EIA: Surface Water Environment (HJ/T 2.3-1993);

(4) Technical Guidelines on EIA: Groundwater Environment (HJ610-2016);

(5) Technical Guidelines on EIA: Acoustic Environment (HJ 2.4-2009);

(6) Technical Guidelines on EIA: Ecological Impacts (HJ 19-2011);

(7) Technical Guidelines on Assessment of Environmental Risks of Development Projects (HJ/T 169-2004);

(8) Technical Specifications for Ecosystem Status Evaluation (HJ/T 192-2006);

(9) Technical Specifications for Regionalizing Environmental Noise Function (GB/T15190-2014).

1.4.5 World Bank Safeguard Policies

This EIA analyzes correlation between the project and World Bank Safeguard Policies, and the result is shown in the following table.

Table 1-1 World Bank Safeguard Policies

World Bank Operation Policy/Policy	Relevance	Reason of Involving
OP/BP4.01 Environmental Assessment	√	Involved. The project is about water environment management, aiming at reducing pollutant into surface water and improving local environmental quality. It will lead to positive environmental benefits as well as undesirable influences, such as common construction impact and solid waste during operation.
OP/BP4.04 Natural Habitat	√	Involved. Construction of the project lies in Zhuhu Lake Basin of Poyang County and Zhuhu Lake, an important natural habitat, belongs to Poyang Lake National Wetland Park. The construction will diminish pollutants to Zhuhu Lake but will not fundamentally alter or damage Zhuhu Lake.
OP/BP 4.36 Forestry	×	Irrelevant. The project exerts no influence on the healthy or quality on the forest, nor will it hurt benefit of people who own the forest or their dependence on woods.
OP/BP 4.09 Pest Control	×	Not involved. Construction of the project does not concern purchase of pesticide, nor will it increase pesticide usage.
OP/BP 4.11 Material and Cultural Resources	×	Irrelevant. According to on-site survey and research, material and cultural resources are not involved.
OP/BP 4.10 Ethnic Minorities	×	Irrelevant. The project has no aborigines and is not minorities inhabit.
OP/BP 4.12 Involuntary Resettlement	√	Involved. The project construction will occupy some land temporarily or permanently.
OP/BP 4.37 Dam Safety	×	Irrelevant. The construction is not about dam building and does not rely on dams finished or under construction.
OP/BP 7.50 International Waters	×	The project is situated in Poyang County, Shangrao City, Jiangxi Province, not concerning international waters.
OP/BP 7.60 Disputed Areas	×	Construction sites are all located in Jiangxi Province, concerning no disputed areas.
BP17.50 Information Disclosure	√	Project EIA conducted public consultation and information disclosure.
IFC Environmental, Health and Safety General Guidelines	√	IFC *Environmental, Health and Safety General Guidelines* applies to activities of the project.
IFC EHS Guidelines for Water and Sanitation	√	IFC EHS Guidelines for Water and Sanitation applies to activities of the project.
IFC EHS for Waste Management Facilities	√	IFC EHS for Waste Management Facilities applies to activities of the project.

1.4.6 Document Basis of EIA

(1) Feasibility Study Report for the project;

(2) Project Resettlement Plan;

(3) Project Social Impact Assessment.

1.5 Contents and Key-points of EIA

According to domestic technical guidelines on EIA and World Bank safeguard

policies, EIA of the project is mainly to answer the following questions:

(1) Engineering features of the project and major potential environmental problems;

(2) Feasibility of the project site selection and major environmental protection targets (sensitive points);

(3) Potential positive and negative environment impacts of implementing the project;

(4) Countermeasures of mitigating potential negative impacts;

(5) Analysis of alternatives;

(6) EMP.

1.6 Standards for Assessment

IFC *Environmental, Health and Safety General Guidelines* involves standards and requirements on atmospheric pollutants, noise and acoustic quality, sewage and waste management, occupational health and safety.

The project's assessment criteria are determined by comparing and analyzing applicable standards in the country and those in World Bank *Environmental, Health and Safety General Guidelines*. The following are details of the comparison and analysis.

1.6.1 Environmental Quality Standards

(1) Ambient Air

According to EHS, ambient air should adopt criteria in accordance with national laws. If there is no such standard, the latest WHO Air Quality Guidelines or of international recognition should be referred to. See Table 1-2. China has issued *Ambient Air Quality Standards* (GB3095-2012), since the project is situated in Category II of ambient air function zone, and Category II of the standard should be applied. For more details see Table 1-3.

Table 1-2 EHS Ambient Air Quality Standards (μg/m^3)

Item	Average Cycle	Guideline Value	Standard
SO_2	24 h	125 (First-stage Target Value) 50 (Second-stage Target Value) 20 (Guideline Value)	WHO Global Air Quality Guidelines
	10 min	500 (Guideline Value)	
NO_2	1a	40 (Guideline Value)	
	1h	200 (Guideline Value)	
PM_{10}	1a	70 (First-stage Target Value)	

		50 (Second-stage Target Value) 30 (Third-stage Target Value) 20 (Guideline Value)	
	24 h	150 (First-stage Target Value) 100 (Second-stage Target Value) 75 (Third-stage Target Value) 50 (Guideline Value)	
$PM_{2.5}$	1a	35 (First-stage Target Value) 25 (Second-stage Target Value) 15 (Third-stage Target Value) 10 (Guideline Value)	
	24 h	75 (First-stage Target Value) 50(Second-stage Target Value) 37.5 (Third-stage Target Value) 25 (Guideline Value)	

Table 1-3 Ambient Air Quality Standards (Excerpt)

Pollution Factors	Ambient Air Quality Standard ($\mu g/m^3$)			Foundation
	Average per Hour	Average per Day	Average per Year	
SO_2	500	150	60	Category II standard in *Ambient Air Quality Standards* (GB3095-2012)
NO_2	200	80	40	
TSP	--	300	200	
PM_{10}	--	150	70	

Comparison and analysis indicate that NO_2 per hour in China national standard is consistent with the guideline value in EHS. PM_{10} per hour and annual value in China national standard are in accordance with the first-stage target value in EHS. And $PM_{2.5}$ average for 24 hours and annual value are in line with the first-stage target value in EHS, and SO_2 average value for 24 hours is lower than the first-stage target value in EHS.

On the basis of EHS, ambient air quality should apply standards in national laws, so the project adopts relevant standards in Table 1-3.

(2) Surface Water

Category III standard in *Surface Water Environment Quality Standards* (GB3838-2002) is applied for water quality of Zhuhu Lake, see Table 1-4.

Table 1-4 Groundwater Quality Standards (Excerpt) Category III (mg/l, excluding pH)

Item	Water Temperature	PH	DO	Fecal Coliform	Permanganate Index	COD	BOD
Standard	Max rise≤1	6~9	≥5	≤10000	≤6	≤20	≤4

value	Max drop≤2						
Item	NH_3-N	TP	TN	Cu	Zn	Fluoride	Fe
Standard value	≤1.0	≤0.05	≤1.0	≤1.0	≤1.0	≤1.0	≤0.3
Item	Mn	Se	As	Hg	Cd	Cr6	Pb (Lead)
Standard value	≤0.1	≤0.01	≤0.05	≤0.0001	≤0.005	≤0.05	≤0.05
Item	Cyanide	FN	Petroleum	anionic surfactant	Sulfide	Sulfate	Chloride
Standard value	≤0.2	≤0.005	≤0.05	≤0.2	≤0.2	≤250	≤250
Item	Nitrate						
Standard value	≤10						

Note: Water temperature varies due to anthropicfactor, TP is measured by N, TN by N, fluoride by F, sulfate by SO_4^{2-}, chloride by Cl, nitrate by N and fecal coliform per L.

(3) Acoustic Environment

China national Acoustic Environmental Quality Standards limit and EHS guideline value for noise are shown in Table 1-4.

Table 1-4 Comparison of Acoustic Environment Quality Standards (dB (A))

Acoustic Environment Quality Standards (GB3096-2008)				EHS Guideline Value for Noise		
Applicable Area	Type of Function Zone	Day 6:00~22:00	Night 22:00~6:00	Object	Day 7:00~22:00	Night 22:00~7:00
Residential areas, hospitals, research design, and office area	Category I	55	45	Residential areas, offices, cultural and educational areas	55	45

The project is located in Zhuhu Lake Basin of Poyang County, which is mainly residence in rural area. Comparison and analysis shows that standard values of residence area in *Acoustic Environment Quality Standards* (GB3096-2008) and EHS guideline value for noise are consistent, since the former time range is slightly stricter than the latter, standard value in Category I of *Acoustic Environment Quality Standards* (GB3096-2008) is applied.

1.6.2 Pollutant Discharge Standards

(1) Atmospheric Pollutants Standards

Atmospheric pollutants during the project construction period are mainly particulate matters. Monitored concentration limits for fugitive discharge in Comprehensive

Atmospheric Pollutant Emission Standards is applied. See Table 1-5. Odor pollutants of sewage treatment station during operation implements Category II Monitored concentration limits for fugitive discharge in *Emission Standard for Odor Pollutants* (GB14554-93), standard values. See Table 1-6.

Table 1-5 Atmospheric Pollutant Emission Standards (mg/m^3)

Phrase	Pollutant	Maximum Emission Concentration	Monitored Concentration Limits for Fugitive Discharge
Construction	Particulate matter	120	1.0

Table 1-6 Emission Standard for Odor Pollutants (mg/m$^{3)}$

Pollutant	Standard Value for Fugitive Emission (New/Rebuild/Expansion)
NH_3	1.5
H_2S	0.06

(2) Wastewater Discharge Standards

After the project is completed, domestic sewage will be collected through pipe network and then disposed in sewage treatment plant. Water discharged into Zhuhu Lake shall meet emission limit of lakeside development belt under control in *Water Pollutant Discharge Standard for Poyang Lake Eco-Economic Zone* (DB36/852-2015). See Table 1-7.

Table 1-7 Water Pollutant Discharge Standards

Standards	Maximum water pollutant concentration (mg/l)						
	COD	SS	NH_3-N	TP	TN	animal/vegetable oils	Petroleum
Emission limit of lakeside development belt under control in *Water Pollutant Discharge Standard for Poyang Lake Eco-Economic Zone* (DB36/852-2015)	50	10	8	0.5	15	1	1.0

(3) Noise Emission standard

During construction period *Standards for Ambient Noise Emission at Construction Site Boundary* (GB12523-2011) is applied, and during operation period Category I of *Emission Standards for Industrial Enterprises Noise at Boundary* (GB12348-2008) is applied. See Table 1-8.

Table 1-8 Ambient Noise Emission Standards dB (A)

Construction Period	Noise Emission Standard Value		Standard
	Day	Night	
Construction period	70	55	*Ambient Noise Emission at Construction Site Boundary* (GB12523-2011)
Operation Period	55	45	Category I of *Emission Standards for Industrial Enterprises Noise at Boundary* (GB12348-2008)

(4) Solid Waste

Disposal of solid waste is subject to *Pollutant Control Standards for Storage and Disposal Sites of General Industrial Solid Waste* (GB18599-2001). Chemical hazardous waste from monitoring room will be disposed in accordance with *Standard for Pollution Control on Hazardous Waste Storage* as well as requirements of EHS and World Bank relevant safeguard policies.

1.7 Identification of Environmental Impact and Assessment Factors

1.7.1 Environmental Impact Factors

Table 1-9 reveals identification of project impacts on environmental impact factors.

Table 1-9 Screening of Environmental Impact Factors

Major Factors	Pollutants	Construction Period	Operation Period
Atmospheric Air	Particulate matters	△	--
Water	COD	△	●
	BOD_5	△	●
	SS	△	●
	NH3-N	△	●
Noise	Noise	△	--
Solid Waste	Solid Waste	△	--
Eco-environment	Soil Erosion	△	--
	Animal and Plant Resources	△	--
Social Impact	Land occupancy	△	--
	Traffic	▲	--

Note: ▲Significant impacts, △ common impacts, ●positive impacts, --no impacts.

Table 1-9 indicates the following problems in this project:

(1) Construction period: There are common impacts such as land occupation, soil erosion, dust, noise and wastewater, ecological impacts and social impact as the laying of supporting pipelines might disrupt traffic.

(2) During operation period, the project will bring in favorable influence on water

environment of Zhuhu Lake.

1.7.2 Assessment Factors

Assessment factors are identified based on environmental impact features and impact factors, and major assessment factors are illustrated in Table 1-10.

Table 1-10 Assessment Factors

Environmental factors	Assessment Factors	
	Assessment Factors of Status Quo	Assessment Factors of Prediction
Ambient Air	TPS、NO_2	/
Acoustic Environment	LAeq	/
Water Environment	Water temperature, pH, NH_3-N, COD, BOD_5, TP, TN, DO, COD Mn, fluoride, Cu, Zn, Fe, Mn, Se, As, Hg, Cd, Cr6, Pb, cyanide, FN, petroleum, sulfide, sulfate, chloride, nitrate, fecal coliform	/
Eco-environment	Plants and animals, biodiversity	/
Solid Waste	/	Construction spoil and domestic waste

1.8 Environmental Function Zone

1.8.1 Functional Zone of Ambient Air

Ambient air of the project is located in zone Category II.

1.8.2 Function Zone of Surface Water Environment

Surface water environment of the project refers to water body of Zhuhu Lake. Zhuhu Lake provides drinking water, and the goal of water quality is to be classified as Category III functional zone in *Environmental Quality Standard for Surface Water* (GB3838-2002).

1.8.3 Acoustic Environment Function Zone

Acoustic Environment Quality Standard (GB3096-2008) Category 1 is applied.

1.9 Environmental Protection Targets

1.9.1 Ambient Air and Acoustic Environment Protection Targets

Major environmental impacts occur in the period of construction. Ambient air and

acoustic environmental protection focus on villages which have common protection targetss rather than those under key protection such as hospitals, schools, kindergartens or nursing homes. See Table 1-11.

Table 1-11 Environmental protection targets

Project Content	Impact Phase	Impact Factor	Protection Targets		Population (people)	Location	Distance (m)	Environmental Function Requirements
			Township/Town	Natural Village				
Sewage treatment plant, pipeline and ecological sewage interception ditch engineering	Construction Period	Dust, noise of machinery, etc.	Baishazhou Township	Zhongnao	400	North of the sewage treatment plant	100	*Ambient Air Quality Standard* (GB 3095-2012) Category II, *Acoustic Environment Quality Standard* (GB3096-2008) Category 1
				Tangli	700	North of the sewage treatment plant	120	
				Yaoli Village	450	East of the sewage treatment plant	100	
				Tangzui Village	460	East of the sewage treatment plant	100	
				Caojiazui	1200	East of the sewage treatment plant	130	
				Ligongnao Village	650	South of the sewage treatment plant	100	
				Datang	400	East of the sewage treatment plant	110	
				Hujia Village	1300	South of the sewage	120	

						treatment plant		
				Zhaojia	500	East of the sewage treatment plant	100	
			Zhuhu Township	Caojia	1500	East of the sewage treatment plant	120	
				Zhoujia	1300	North of the sewage treatment plant	130	
				Dukou	600	West of the sewage treatment plant	100	
				Luyitang (Tongxing)	900	North of the sewage treatment plant	120	
				Hengtouzui	600	East of the sewage treatment plant	100	
			Gaojialing Town	Zhuyundun	1000	East of the sewage treatment plant	130	
				Luye Village	450	North of the sewage treatment plant	100	
				Dazong	300	East of the sewage treatment plant	110	
			Sishilijie	Huangbiquan	1000	East of the sewage	130	

			Town			treatment plant		
				Hupen Village	800	North of the sewage treatment plant	150	
				Pantaozui	800	South of the sewage treatment plant	150	
				Chenli Village	1200	South of the sewage treatment plant	150	
				Wangjia	400	East of the sewage treatment plant	130	
				Zhanjia	900	East of the sewage treatment plant	120	
			Tuanlin Township	Sheshan	1300	East of the sewage treatment plant	100	
				Hushan	300	West of the sewage treatment plant	120	
				Bantangxu	1300	West of the sewage treatment plant	120	
				Meihu	300	South of the sewage treatment plant	100	

				Shizishan	200	East of the sewage treatment plant	120	
				Gaohu	200	in the east of the sewage treatment plant	100	
			Shuanggang Town	Jiangjia Village	3155	North of the sewage treatment plant	100	
				Tangjia	1300	in the west of the sewage treatment plant	100	
				Foufan	500	South of the sewage treatment plant	100	
				Jingtang Village /Qianfan	700	East of the sewage treatment plant	120	
				Xujia	700	South of the sewage treatment plant	100	
				Maojia Village	200	South of the sewage treatment plant	120	

1.9.2 Water Environment Protection Targets

Situated in Zhuhu Lake Basin of Poyang County, the project is to reduce water pollutants flowing into Zhuhu Lake. Zhuhu Lake Basin is located in Poyang Lake National

Wetland Part and is the first-grade protection area and the conservation area of Zhuhu Lake's water source. There are 7 centralized sources of drinking water in the basin, which are drinking-water source of Inner Zhuhu Lake within Poyang County (Yangmeiqiao Water Plant), intakes for water plant in Zhongtang and Yongchang of Sishilijie Town, water plant intakes in Pozhong of Poyang County (Gaojialing Town), Tuanlin Town, Shuanggang Town and Zhuhu Town.

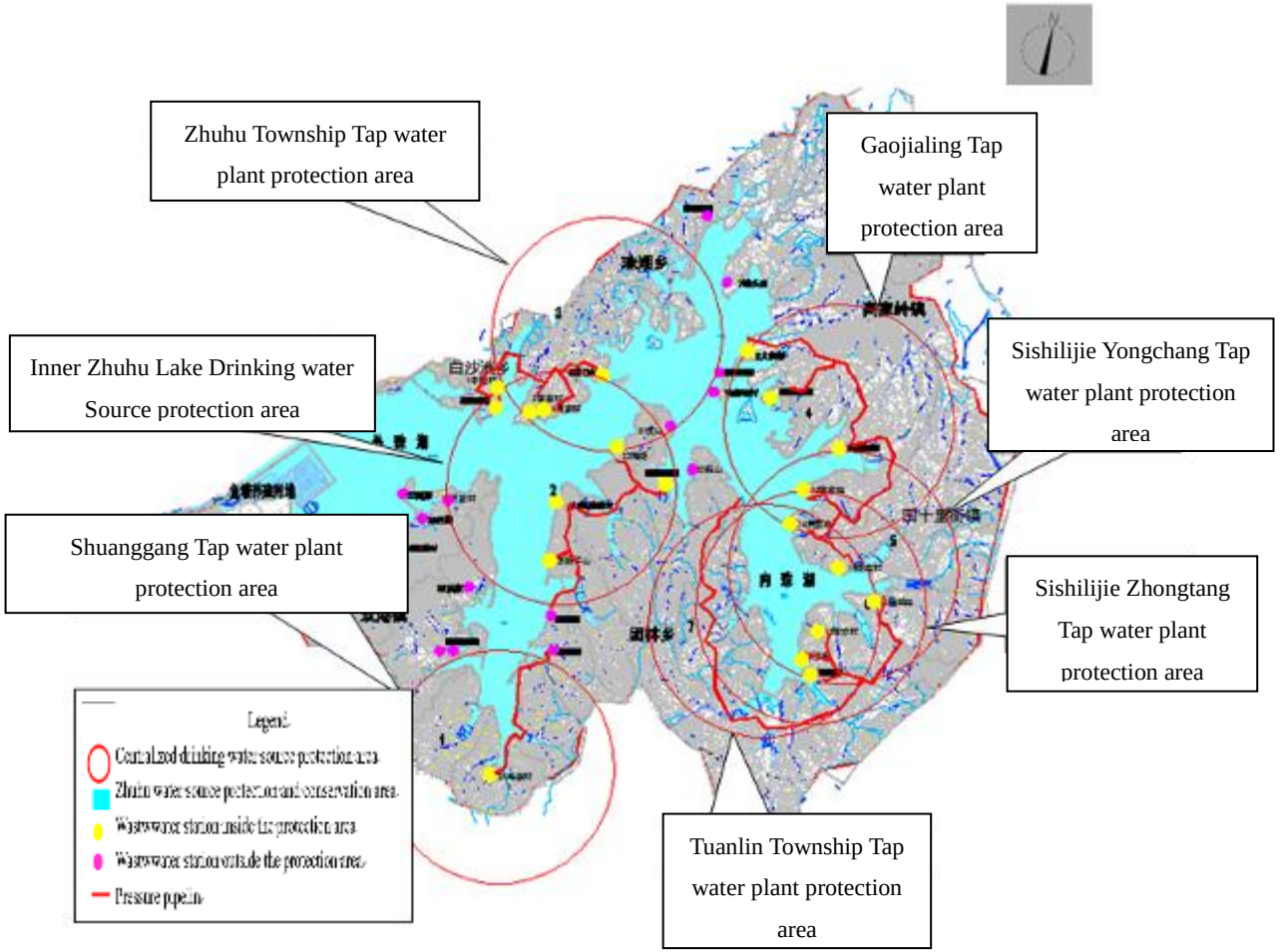
Water environment protection targets are presented in Table 1-12, geographical relationship between the project and water environment protection is shown in the following table.

Table 1-12 Water Environment Protection Targets

No.	Name of Protection Targets	Waters	Scope of Protection Area	Water Intake Scale (10 thousand $m^{3)}$	Engineering Content in Protection Area		Distance between Outlet of sewage treatment plant and protection area border (m)	Water quality goal	Water function	Relationship between outlet of sewage treatment plant and protection targets
1	Conservation area of Zhuhu Lake water source in Poyang Lake National Wetland Park	Zhuhu Lake	Zhuhu Lake water	/	None		/	Category III	Drinking-water	To reduce water pollutants, drain qualified discharge of sewage plant rather than domestic sewage into Zhuhu Lake
2	Inner Zhuhu Lake water source in Poyang Lake National Wetland Park	Zhuhu Lake	The first-grade protection zone: water or land centered on the intake with a radius of 500 m; the second-grad	211.72	Sewage plant	8 plants for Shizishan, Ligongnao, Potangxu, Meihu and Caojia Village, Zhongnao Village, Tangli Village, Bantangxu	100	Category III	Drinking-water	There are 20 sewage plants, whose outlets lie 100m away from downstream of the second-grade protection zone, no outlets in the first-grade and second-grade protection zone of
					Artificial Wetland	6 wetlands, No. 46, 47, 48, 49, 81, 82	/			
3	Conservation area of water plant source in Zhongtang,	Zhuhu Lake		3	Sewage plant	7 plants in Caojiazui, Pantaozui, Hupen Village, Huangbiquan, Chenli Village, Wangjia, Zhanjia	100	Category III	Drinking-water	

	Sishili Town		e protection zone: water or land extending 2,500 from the outer diameter of the first-grade.		Artificial Wetland	4 wetlands, No. 24, 29, 31, 90	/			water plants source.
4	Conservation area of water plant source in Yongchang, Sishili Town	Zhuhu Lake		20	Sewage plant	8 plants for Luye Village, Caojiazui, Pantaozui, Hupen Village, Huangbiquan, Chenli Village, Wangjia, Zhanjia	100	Category III	Drinking-water	
					Artificial Wetland	5 wetlands, No.25, 26, 27, 28, 91	/			
5	Conservation area of water plant source in Pozhong (Gaojialing Town),	Zhuhu Lake		5.4	Sewage plant	Dazong Village, Zhuyundun, Luye Village, Caojiazui, Huangbiquan	100	Category III	Drinking-water	
					Artificial Wetland	7 wetlands, No. 18, 19, 20, 21, 22, 23, 88	/			
6	Conservation area of water plant source in Tuanlin Town	Zhuhu Lake		3.8	Sewage plant	6 plants, Pantaozui, Hupen Village, Huangbiquan, Chenli Village, Wangjia, Zhanjia	100	Category III	Drinking-water	
					Artificial Wetland	Wetlands, No. 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 38, 39, 40, 41, 42, 43, 44, 95, 96, 97	/			
7	Conservation area of water plant source in Shuanggang Town	Zhuhu Lake		30	Sewage plant	1 plant in Maojia Village	100	Category III	Drinking-water	
					Artificial Wetland	14 wetlands, No. 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 99	/			
8	Conservation area of water plant	Zhuhu		6	Sewage plant	3 plants for Dukou Village, Zhoujia Village, Caojia	100	Category	Drinking-w	

	source in Zhuhu Township	Lake				Village		III	ater	
					Artificial Wetland	10 wetlands, No. 1, 2, 3, 4, 5, 6, 83, 84, 85, 86	/			



Map 1-1 Geographical Relationship between the Project and Water Environment Protection Targets

1.9.3 Ecological Environmental protection targets

See Table 1-13 for ecological environmental protection targets and the relationship between the project and the location of Poyang Lake National Wetland Park.

Table 1-13 Ecological Environmental protection targets

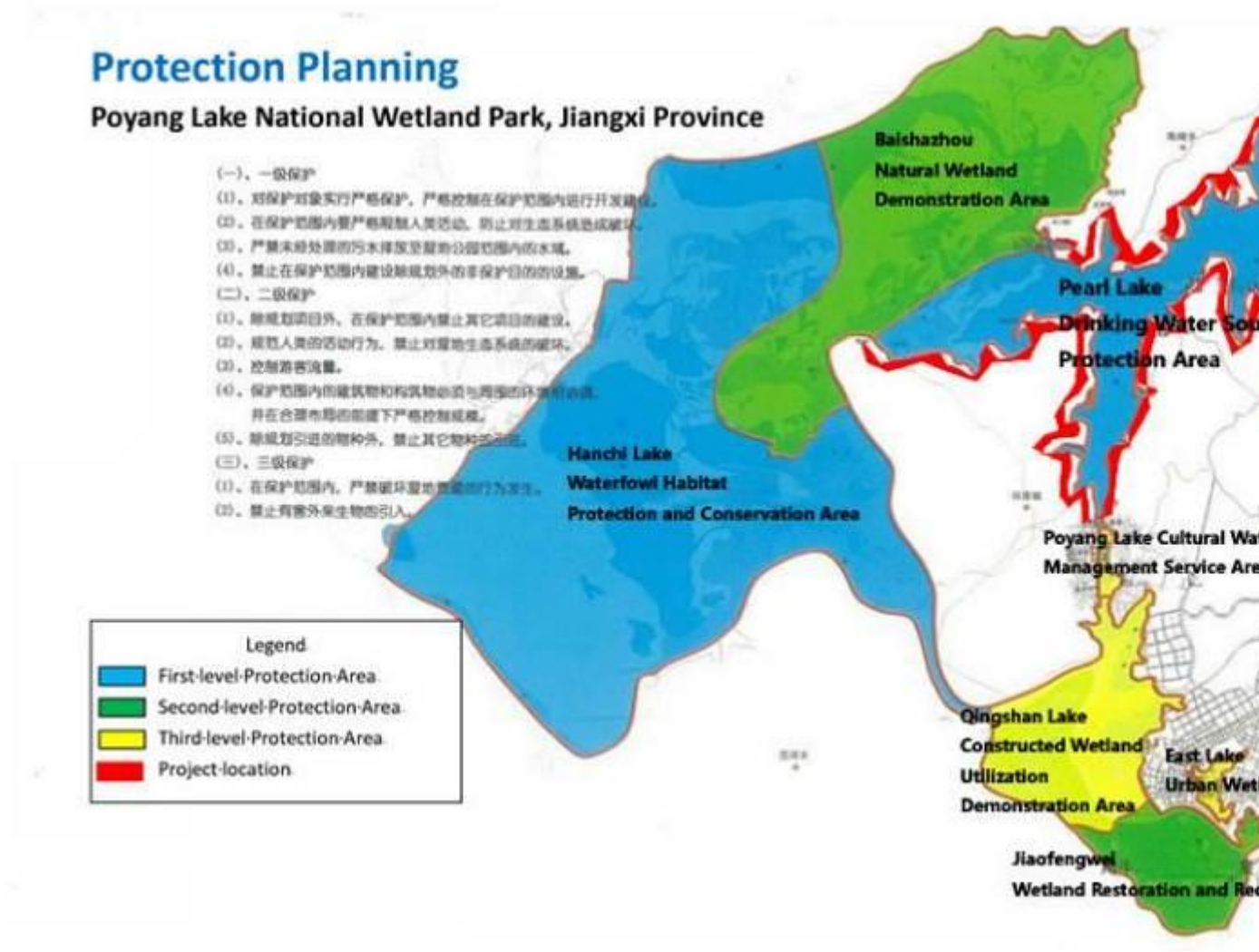
Environmental Factor	protection targets	About the protection targets
Ecological Environment	Ecological sensitive area	Poyang Lake National Wetland Park. The park was approved as national wetland part in November 2008 by State Forestry Administration. The project is situated at the park's east side, involving no land of the Park and adjacent to conservation zone of Zhuhu Lake's water source and 500 m to in the east of demonstration area of Baishazhou natural wetland, 1,000 m to in the north of Poyang Lake Cultural Water City.
	Terrestrial plant	Damage of plants for permanent and temporary land occupation
	Wildlife	Wildlife, birds affected in the project area

1.9.4 Social Environmental Protection Targets

Table 1-14 presents social environment protection targets.

Table 1-14 Social Environmental protection targets

No.	Affected Item	Protection Targets
1	Infrastructure	Existing roads and buildings
2	Traffic	Traffic and safety of residents during project construction
3	Municipal facilities	Municipal facilities of water and power supply



Map 1-2 Relationship between the Project and Location of Poyang Lake National Wetland Park

2 Project Description

2.1Project Introduction

(1) Project name: World Bank Financed Poyang Water Environment Management Project

(2) Construction agency: Leading Group Office of World Bank Financing Poyang Water Environmental Improvement Project

(3) Construction site: Poyang County, Shangrao City, Jiangxi Province. Location of the project see annex I.

(4) Type of construction: New project

(5) Project investment: Total investment of 300,864,600 yuan.

(6) Project components: The project is constituted by sub-projects within the basin, including collection and treatment of rural domestic sewage, ecological restoration and protection of waters, monitoring system of water quality and other non-project measures. Table 2-1 shows project components and construction contents.

Table 2-1 Project Components and Construction Contents

Name	Subproject	Construction Contents	Type	Construction Sites	Service Coverage
Zhuhu Basin collection and treatment of rural domestic sewage	Sewage treatment plant	35 sewage plants for each village near Zhuhu Lake with a total treatment scale of 2,600 t/d, 22 plants of capacity 50 t/d, 11 plants of 100 t/d, one plant of 150 t/d and one of 250 t/d.	New	Zhongnao, Tangli, Caojia, Zhoujia, Dukou, Tongxing, Hengtouzui, Dazong, Yaoli, Miaozui Village, Zhuyundun, Luye Village, Caojiazui, Huangbiquan, Hupen Village, Pantaozui, Chenli Village, Wangjia, Zhanjia, Sheshan, Hushan, Potangxu, Meihu, Ligongnao Village, Shizikou, Datang, Gaohu, Maojia Village, Jiangjia Village, Tangjia, Hujia, Zhaojia, Houfan, Qianfan, Yujia	Villages along Zhuhu Lake
	Sewage collection pipeline	New sewage pipeline of 101.22 km with diameter of DN300-DN400, of which 42.1 km is for power pipe and 19,131 m for ditches, 6,397 m for pipe connecting ditches, 2, 677 manholes and 85 venting valve wells.	New		
Zhuhu Basin ecological restoration and protection	Ecological interception ditch	Interception Ditch of 95.85 km	New	See annex II	Zhuhu Basin
	Artificial wetland	101 artificial wetlands covering 154,765.02 m^2	New	See annex II	

Name	Subproject	Construction Contents	Type	Construction Sites	Service Coverage
of waters					
Water quality monitoring system	Room for water environment monitoring system	One, using building of Poyang Lake National Wetland Park Management Committee	Renovation	Within Poyang Lake National Wetland Park Management Committee	Zhuhu Basin
	Automatic water quality monitoring station	One, total floor area of 153.5 m^2	New	Drinking water intake of the County, water source of Ligongnao	
	Automatic forecast station	8 stations of water environment automatic forecast machines	New	7 intakes for Ligongnao, Yongchang and Zhongtang of Sishilijie, Tuanlin, Gaojialing, Zhuhu Township, Shuanggao and waters of Shuanggang Town and Baishazhou Township	

2.1.1 Construction Scale

Zhuhu Lake Basin has an area of 226 km^2 with land area of 164.3 km^2 and water area of 61.7 km^2, and design of the project covers all the land area.

1. Sub-project of Rural Domestic Sewage Collection and Treatment

(1) Engineering quantity list of sewage treatment plant is shown in Table 2-2.

Table 2-2 Engineering Quantity List of Sewage Treatment Plant

No.	Sub-project	Size (t/d)	Quantity
1	Sewage Treatment Plant	50	22
2	Sewage Treatment Plant	100	11
3	Sewage Treatment Plant	150	1
4	Sewage Treatment Plant	250	1

Table 2-3 Sewage Treatment Plant Engineering Quantity for Villages

No.	Location	Population	Size（t/d）	Manhole
1	Zhongnao Village	400	50	89
2	Tangli Village	700	50	113
3	Caojia Village	1500	150	120
4	Zhoujia Village	1300	100	78
5	Dukou Village	600	50	27
6	Luyi Village	900	100	84

7	Hengtouzui Village	600	50	75
8	Dazong Village	300	50	31
9	Yaoli Village	450	50	38
10	Miaozui Village	460	50	51
11	Zhuyundun Village	1000	100	70
12	Luye Village	450	50	77
13	Caojiazui Village	1200	100	87
14	Huangbiquan Village	1000	100	123
15	Hupen Village	800	50	97
16	Pantouzui Village	800	50	101
17	Chenli Village	1200	100	177
18	Wangjia Village	400	50	77
19	Zhanjia Village	900	100	152
20	Sheshan Village	1300	100	34
21	Hushan Village	300	50	38
22	Bantangxu Village	1300	100	107
23	Meihu Village	300	50	30
24	Ligongnao Village	650	50	39
25	Shizishan Village	200	50	33
26	Datang Village	400	50	80
27	Gaohu Village	200	50	58
28	Maojia Village	200	50	28
29	Jiangjia Village	3155	250	193
30	Tangjia Village	1300	100	111
31	Huajia Village	1300	100	113
32	Zhaojia Village	500	50	24
33	Houfan Village	500	50	27
34	Jingtang Village	700	50	39
35	Yujia Village	700	50	56

(2) Table 2-4 is the engineering quantity list of sewage collection pipelines.

Table 2-4 Engineering Quantity List of Sewage Collection Pipelines

No.	Engineering Project	Specification	Unit	Quantity
1	Sewage Pipelines	DN300	m	55856
2	Sewage Pipelines	DN400	m	3264
3	Sewage Pressure Pipeline	De63	m	18800
4	Sewage Pressure Pipeline	De75	m	3300
5	Sewage Pressure Pipeline	De110	m	20000
6	Ditch	360mmx440mm	m	19131

7	Ditch Connecting Pipe	DN200	m	6397
8	Sewage Manhole	Φ1000		2677
9	Venting Valve Well	1000*1000		85

2. Ecological Restoration and Protection of Water System in the Basin

Ecological restoration and protection of water system in the Zhuhu Lake Basin falls into two measures, which are constructed wetlands with an area of 154,765.02 m^2 and ecological interception ditches stretching 95.85 km.

(1) Table 2-5 is the engineering quantity list of constructed wetlands.

Table 2-5 Engineering Quantity List of Constructed Wetlands

No.	Engineering Project	Unit	Quantity
I	Vertical Subsurface-flow Wetland	m^2	94736.52
1	Earthwork Engineering	m^3	104210.17
2	Pipeline Engineering	m	52143.37
3	Bentonite	m^3	9627.55
4	Cattail	Plant	78820.78
5	Scirpus tabernaemontani	Plant	78820.78
6	Thalia dealbata	Plant	66505.04
7	Canna glauca	Plant	88673.38
8	Iris tectorum Maxim	Plant	94584.94
9	Acorus calamus	Plant	94584.94
10	Monochoria korsakowii	Plant	39410.39
11	Papyrus	Plant	14778.90
12	Cyperus alternifolius	Plant	35469.35
13	Lythrum salivehicleia	Plant	63056.63
14	Gravel	t	90947.06
15	Crushed stone	t	42631.43
16	Coarse sand	t	17052.57
17	Kinetic pump	set	140.00
18	Grating	set	70.00
II	Surface flow wetland (New)	m^2	60028.50
1	Earthwork Engineering	m^3	11573.90
2	Pipeline Engineering	m	1166.74
3	Reed	Plant	196811.92
4	Iris tectorum	Plant	196811.92
5	Thalia dealbata	Plant	55353.35
6	Eel grass	Plant	1476089.43
7	Elodea nuttallii	Plant	307518.63

8	Hydrilla verticillata	Plant	307518.63

(2) Table 2-6 is the engineering quantity list of ecological interception ditch.

Table 2-6 Engineering Quantity List of Ecological Interception Ditch

No.	Engineering Project	Unit	Quantity
I	Interception ditch (type A) connecting 78 wetlands	m	47665.67
1	Earthwork Engineering	m^3	23832.84
2	Cattail	Plant	85798.21
3	Acorus calamus	Plant	85798.21
4	Scirpus validus Vahl	Plant	28599.40
5	Eel grass	Plant	571988.05
6	Hydrilla verticillata	Plant	238328.36
7	Bog pondweed	Plant	190662.68
8	Watermilfoil	Plant	119164.18
II	Interception ditch (type B) connecting 23 wetlands	m	48186.13
1	Earthwork Engineering	m^3	12528.39
2	Cattail	Plant	144558.38
3	Scirpus validus Vahl	Plant	48186.13
4	Thalia dealbata	Plant	108418.78
5	Canna	Plant	108418.78
6	Gravel	t	13010.25

3. Water Quality Monitoring System

Table 2-7 presents engineering quantity list of water quality monitoring system.

Table 2-7 Engineering Quantity List of Water Quality Monitoring System

Project Name	Item	Quantity	Unit	Note
Water Environment Monitoring Center	Quantity	1	Set	Using the building of Poyang Lake National Wetland Park Management Committee
	Floor	1	Floor	
Automatic Monitoring Station of Water Quality	Quantity	1	Set	Located in the origin of the County's drinking water, namely source of Ligongnao drinking water.
	Floor	2	Floor	
	Area	153.5	m^2	
Automatic Forecast Station	Quantity	8	Site	Situated in seven intakes of Ligongnao, Yongchang and Zhongtang of Sishilijie, Tuanlin, Gaojialing, Zhuhu Township, Shuanggang as well as waters in Shuanggang Town and Baishazhou Township.

2.1.2 Engineering Plan

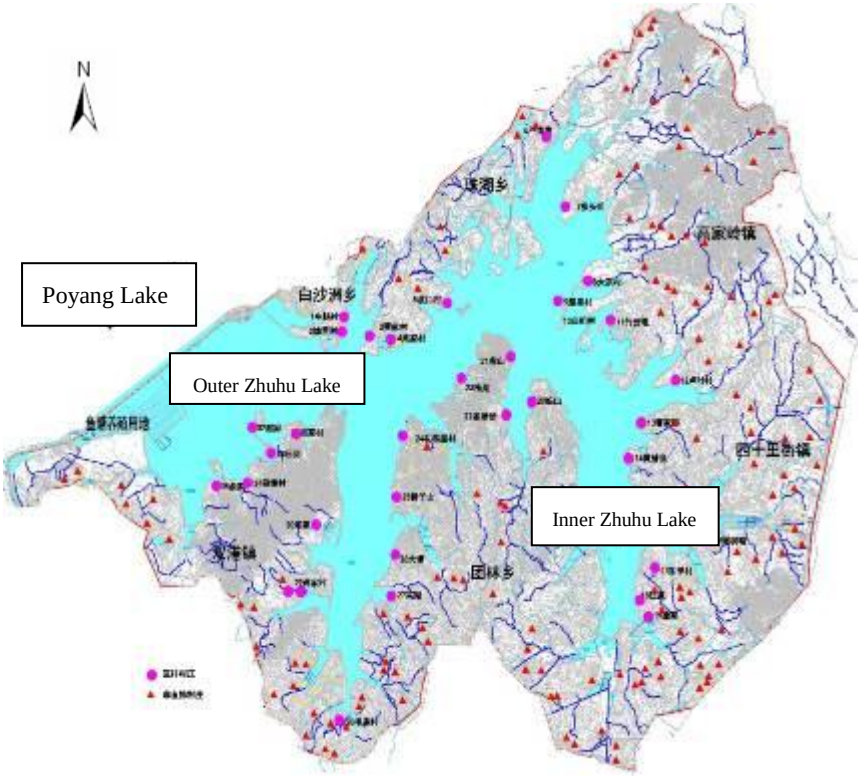
2.1.2.1 Rural Domestic Sewage Collection and Treatment Project in Zhuhu Lake Basin

1. Service Coverage

Domestic sewage in Zhuhu Lake Basin are discharged into Zhuhu Lake directly or through ditches, involving 183 villages and 82,149 people.

Table 2-8 Service Coverage of the Plan of Domestic Sewage Treatment in Zhuhu Lake Basin

No.	Way of Discharging Rural Domestic Sewage	Service Coverage	Service Population
1	Discharging into Zhuhu Lake directly	35 villages	29,710
2	Discharging into Zhuhu Lake by ditches	148 villages	52,439



Map 2-1 Distribution of Pollutant Source of Domestic Sewage in Zhuhu Lake Basin

2. Treatment technique

The project's 35 domestic sewage treatment plants will adopt FMBR technique. See the following layout diagram of sewage treatment plants. The figure below shows the process flow.

Sewage → Grating → FMBR → Output

Fig. 2-2 Process of FMBR

Grating is set up at the sewage inlet to remove floating solid substance. Then the sewage is pumped to facultative bioreactor that has facultative multiple microorganisms,

through which organic pollutants will be discomposed. In the end, outlet water filtered by film will be discharged if it is in accordance with lakeside development belt under control in Water Pollutant Discharge Standard for Poyang Lake Eco-Economic Zone (DB36/852-2015). Meanwhile, activated sludge formed in the facultative bioreactor will diminish itself, and as a result zero emission of organic sludge can be achieved.

3. Design for water source Conservation Zone

There are 7 central sources of drinking-water in Zhuhu Lake Basin. In this plan, there are 20 integral treatment facilities in the conservation zone of water source. To protect the water source, the project plans to move water outlet 100 m away from the second-grade conservation zone of water source through power pipe of lifting pump. See engineering quantity below for water outlets affected.

Table 2-9 Engineering Plan for Water Outlets Affected

No.	Villages Affected	Scale of Plant	Length of Power Pipe (km)	Layout of Outlet
1	Caijia Village	150	1.3	Water outlets will be moved outside the second-grade conservation zone of water source through power pipe of lifting pump
2	Zhoujia Village	100	1.5	
3	Dukou Village	50	1.5	
4	Zhuyundun	100	1.5	
5	Luye Village	50	0.2	
6	Caojiazui	100	1.1	
7	Huangbiquan	100	0.5	
8	Hupen Village	50	10.8	
9	Pantaozui	50	2.8	
10	Chenli Village	100	2.0	
11	Wangjia	50	0.7	
12	Zhanjia	100	10.8	
13	Meihu	50	1.2	
14	Ligongnao Village	50	1.8	
15	Shizishan Village	50	1.4	
16	Maojia Village	50	3.5	
17	Zhongnao Village	50	0.5	
18	Tangli Village	50	0.58	
19	Bantangxu	100	0.9	
20	Dazong Village	50	2.45	

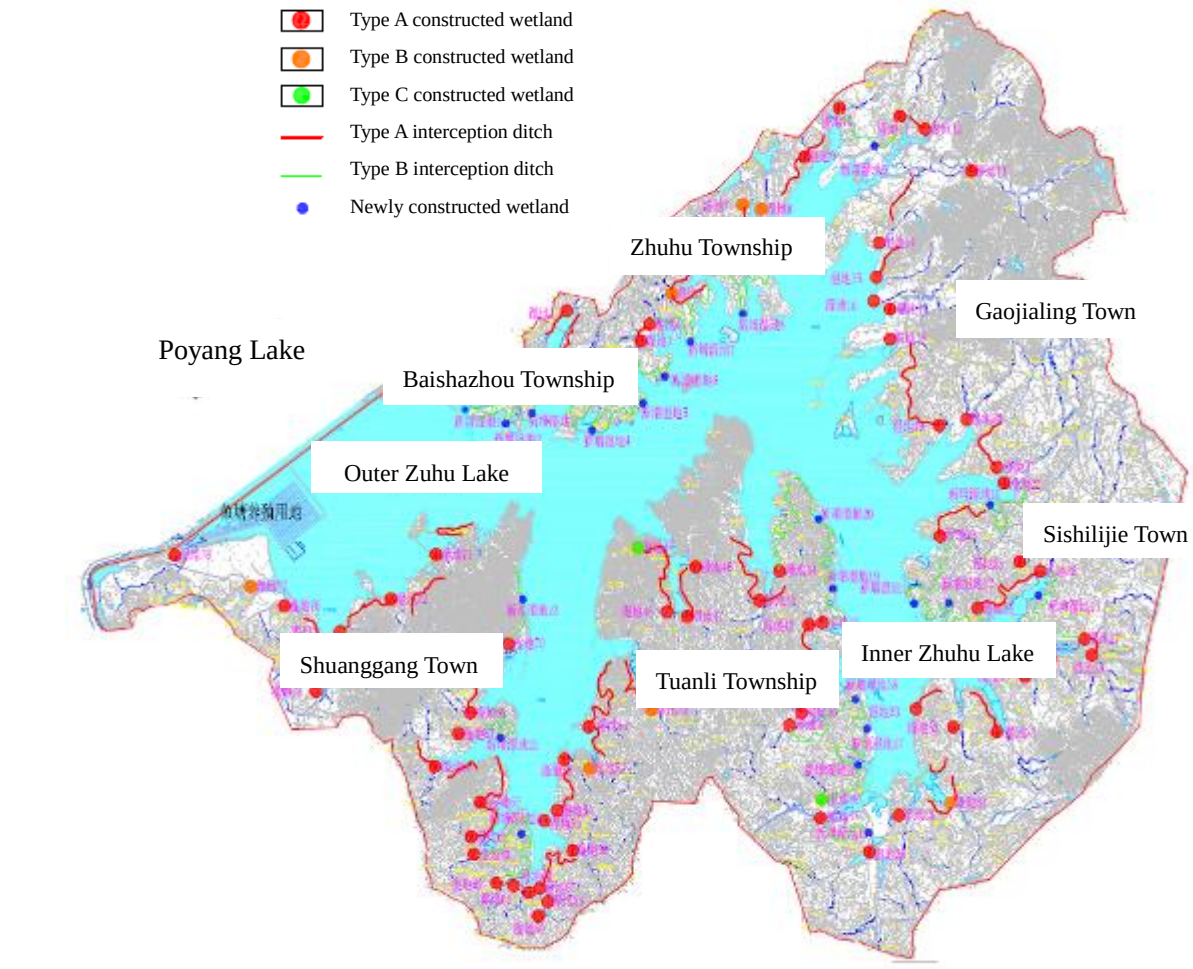
2.1.2.2 Zhuhu Lake Basin Water Ecology Restoration and Protection Project

Water Ecology Restoration and Protection Project in Zhuhu Lake Basin mainly serves diffused pollution region in the basin, covering an area of 10,617 ha. See Table 2-10 and

Table 2-3 for the plan.

Table 2-10 Engineering Plan for Zhuhu Lake Basin Water Ecology Restoration

No.	Plan	Quantity	Type
I	Constructed Wetland		
1	type A Wetland	68	Downward-upward vertical vertical subsurface flow constructed wetland
2	type B Wetland	31	Surface Flow Constructed Wetland
3	type C Wetland	2	Downward-upward vertical subsurface flow-Surface Flow Constructed Wetland
II	Interception Ditch		
1	type A Interception Ditch	47.7 km	Bottom width 0.5m, upper width 0.75m, depth 0.7m
2	type B Interception Ditch	48.2 km	Bottom width 0.5m, upper width 0.75m, depth 0.7m



Map 2-3 Engineering Plan for Zhuhu Lake Water Ecology Restoration

1. Constructed Wetland

(1) Type of Wetland

Wetlands in this project fall into three groups, which are downward-upward vertical flow subsurface flow constructed wetland of type A, surface flow constructed wetland of type B and downward-upward vertical subsurface flow-surface flow wetland.

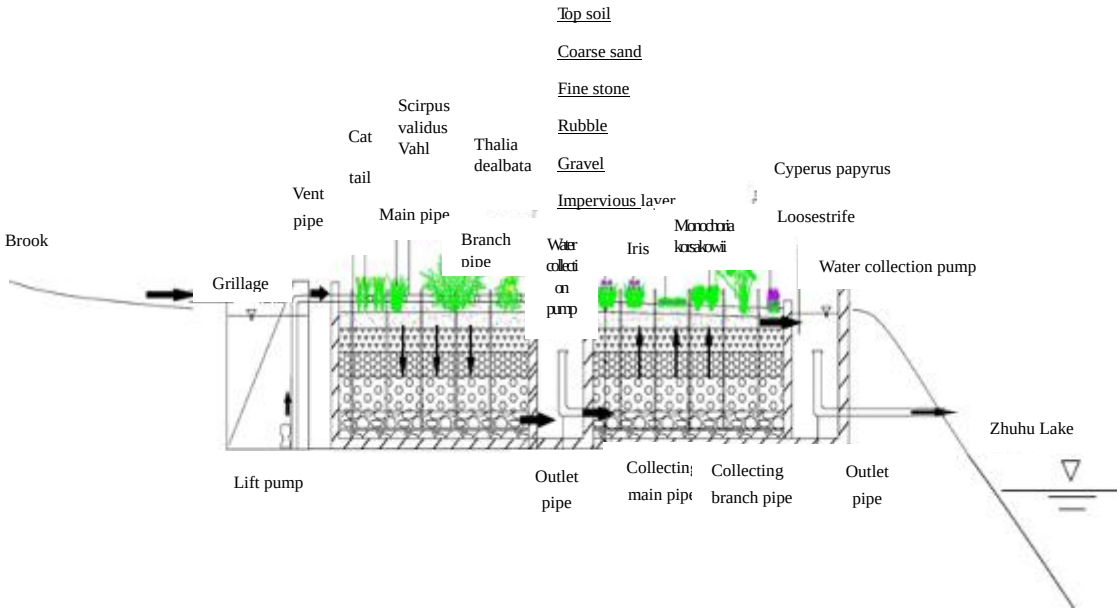


Fig. 2-4 Sectional View for type A Wetland

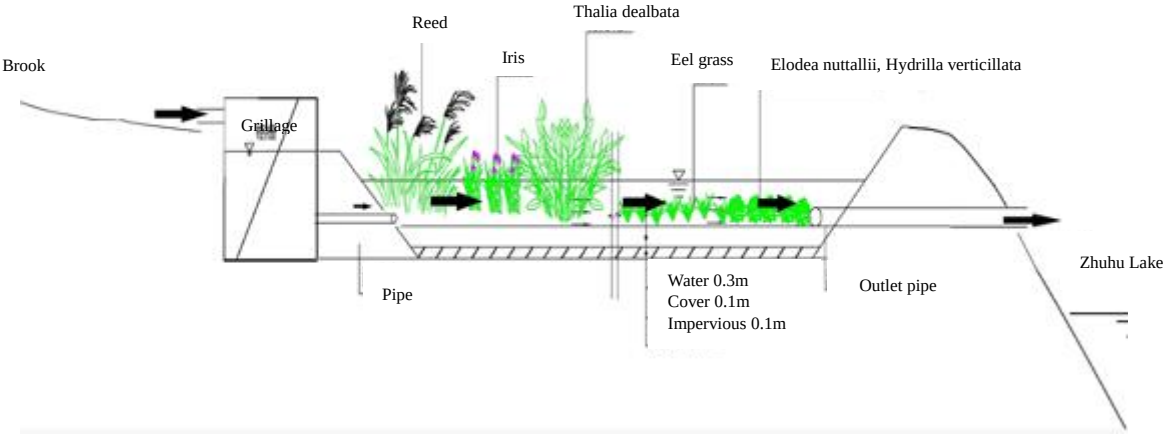


Fig. 2-5 Sectional View for type B Wetland

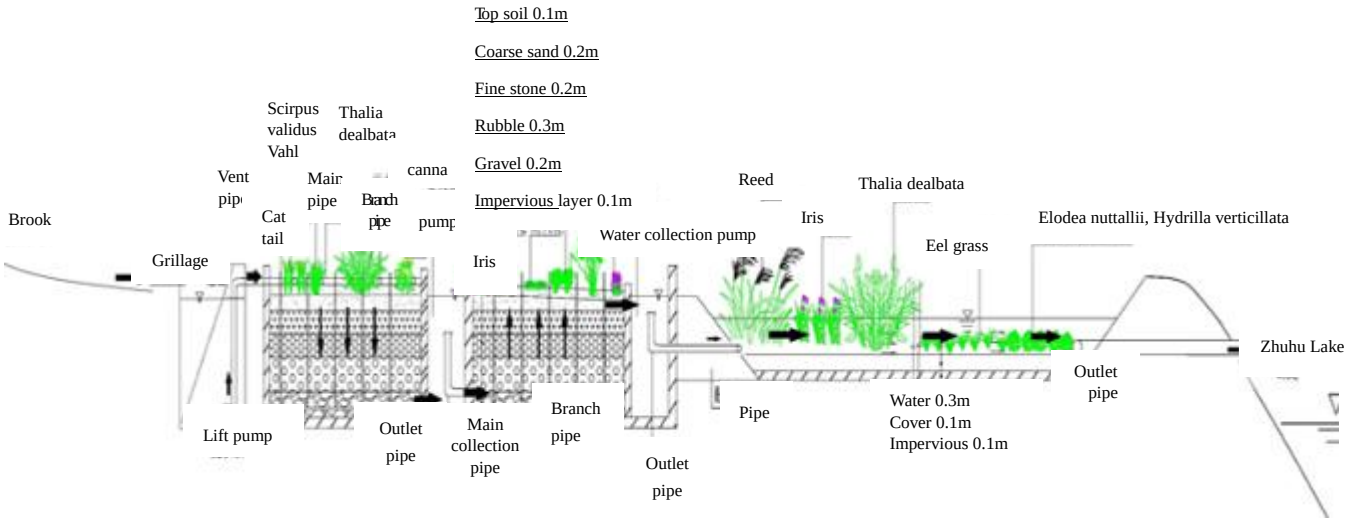


Fig. 2-7 Sectional View for type C Wetland

According to on-site survey and topographic map, the project area has 10 ponds or

puddles that can be built into surface flow constructed wetland with number of 5, 6, 7, 8, 34, 38, 49, 50, 52, 77. The plan will make full use of current resources and replace the initial vertical subsurface flow wetland with some or all of these wetlands.

(2) Wetland Parameters

Table 2-11 Reference Value for Wetland Treatment Parameter

Wetland Type	COD Load g/(m^2·d)	Hydraulic Surface Loading m^3/(m^2·d)	Hydraulic Retention Time (d)
Surface Flow Wetland	≤20	≤0.1	1~3
Vertical Subsurface Flow Wetland	≤60	≤0.3	1~3

Table 2-12 Parameters for Wetlands Treatment

No.	COD Load g/(m^2·d)	Hydraulic Surface Loading m^3/(m^2·d)	Hydraulic Retention Time (d)	No.	COD Load g/(m^2·d)	Hydraulic Surface Loading m^3/(m^2·d)	Hydraulic Retention Time (d)
1	18.34	0.21	1.93	41	29.12	0.31	1.29
2	21.41	0.28	1.44	42	48.64	0.49	0.81
3	17.81	0.22	1.80	43	52.68	0.56	0.72
4	13.94	0.17	2.37	44	30.52	0.34	1.19
5	7.58	0.10	1.26	45	18.65	0.24	1.67
6	4.38	0.06	2.09	46	31.82	0.36	1.10
7	9.62	0.12	1.01	47	21.56	0.28	1.42
8	5.62	0.07	1.68	48	48.26	0.49	0.82
9	53.47	0.55	0.72	49	7.63	0.10	1.43
10	19.28	0.24	1.63	50	11.84	0.14	0.87
11	17.90	0.24	1.67	51	19.10	0.24	1.68
12	19.28	0.26	1.52	52	15.58	0.16	0.75
13	19.33	0.27	1.50	53	28.27	0.32	1.25
14	19.44	0.26	1.56	54	21.05	0.25	1.58
15	22.73	0.29	1.39	55	36.69	0.41	0.97
16	18.73	0.26	1.57	56	27.33	0.27	1.51
17	15.12	0.19	2.11	57	49.38	0.53	0.76
18	25.23	0.30	1.31	58	49.55	0.49	0.82
19	18.23	0.24	1.63	59	25.11	0.29	1.40
20	18.63	0.22	1.86	60	24.45	0.28	1.44
21	19.23	0.26	1.52	61	17.64	0.21	1.89
22	23.17	0.28	1.41	62	15.21	0.17	2.29
23	22.92	0.26	1.51	63	59.46	0.61	0.65
24	36.56	0.42	0.95	64	52.57	0.50	0.80

25	18.26	0.25	1.59	65	25.61	0.30	1.34
26	18.62	0.24	1.64	66	23.95	0.29	1.38
27	21.48	0.23	1.71	67	39.53	0.45	0.90
28	20.19	0.26	1.52	68	41.17	0.46	0.87
29	26.11	0.29	1.38	69	49.51	0.53	0.75
30	23.04	0.29	1.38	70	42.31	0.47	0.85
31	22.88	0.30	1.35	71	32.00	0.38	1.04
32	18.88	0.23	1.77	72	50.77	0.50	0.81
33	16.22	0.17	2.30	73	29.50	0.36	1.10
34	5.07	0.07	1.76	74	22.98	0.28	1.43
35	16.52	0.21	1.90	75	20.11	0.24	1.69
36	14.29	0.19	2.08	76	22.98	0.24	1.69
37	16.80	0.23	1.77	77	9.52	0.11	1.10
38	7.26	0.08	2.80	78	22.16	0.28	1.44
39	28.80	0.36	1.12				
40	44.65	0.49	0.82				

Tale 2-13 Type and Area for Wetlands

Wetland No.	Wetland Type	Surface Flow Wetland Area m^2	Vertical Subsurface Flow Wetland Area m^2	No.	Type	Surface Flow Wetland Area m^2	Vertical Subsurface Flow Wetland Area m^2
1	type A	-	389	41	type A	-	468
2	type A	-	885	42	type A	-	250
3	type A	-	752	43	type A	-	260
4	type A	-	785	44	type A	-	522
5	type B	2015	-	45	type A	-	2128
6	type B	5326	-	46	type A	-	593
7	type B	1444	-	47	type A	-	2315
8	type B	3255	-	48	type A	-	269
9	type A	-	126	49	type C	4928	358
10	type A	-	973	50	type B	1823	-
11	type A	-	2118	51	type	-	1741

					A		
12	type A	-	3160	52	type A	902	-
13	type A	-	6231	53	type A	-	704
14	type A	-	1597	54	type A	-	1282
15	type A	-	885	55	type A	-	537
16	type A	-	3565	56	type A	-	477
17	type A	-	1315	57	type A	-	347
18	type A	-	616	58	type A	-	280
19	type A	-	2696	59	type A	-	871
20	type A	-	697	60	type A	-	895
21	type A	-	4985	61	type A	-	1633
22	type A	-	799	62	type A	-	1540
23	type A	-	594	63	type A	-	276
24	type A	-	379	64	type A	-	260
25	type A	-	7307	65	type A	-	1021
26	type A	-	2009	66	type A	-	1376
27	type A	-	547	67	type A	-	584
28	type A	-	1873	68	type A	-	544
29	type A	-	499	69	type A	-	395
30	type A	-	1114	70	type A	-	529
31	type A	-	1611	71	type A	-	1002
32	type A	-	1037	72	type A	-	310

33	type A	-	761	73	type A	-	1294
34	type B	13013	-	74	type A	-	1590
35	type A	-	1948	75	type A	-	1529
36	type A	-	4996	76	type A	-	817
37	type A	-	4358	77	type B	2895	-
38	type C	1280	765	78	type A	-	2103
39	type A	-	931	Total		36881	94737
40	type A	-	331				

Table 2-14 Filler Layout for Constructed Wetlands

No.	Layer	Thickness (m)	Particle Size mm	Material
1	Cover	0.1	8-16	Gravel
2	Filler	0.1	0.5-1	Coarse Sand
		0.2	2-6	Gravel
		0.3	2-6	Gravel
3	Intermediate	0.1	5-10	Gravel
4	Drainage	0.2	16-32	Gravel

Table 2-15 Plant Design for Constructed Wetland

Planting Area	Plant Name	Density plant/m^2	Planting Ratio %
Downward Vertical Subsurface Constructed Wetland	Cattail	16	10
	Scirpus validus Vahl	16	10
	Thalia dealbata	9	15
	Canna glauca	12	15
Upward Vertical Subsurface Constructed Wetland	Iris tectorum	16	12
	Acorus calamus	16	12
	Monochoria korsakowii	16	5
	Cyperus papyrus	6	5
	Cyperus alternifolius	9	8
	Lythrum salivehicleia	16	8
Surface Flow Constructed Wetland	Reed	16	20
	Iris tectorum	16	20
	Thalia dealbata	9	10
	Eel Grass	80	30
	Elodea nuttallii	50	10

	Hydrilla verticillata	50	10

2. Ecological Interception Ditch

(1) Design Idea

1) On the basis of checking site topography, an type A ecological interception ditch is designed along the terrain by finding blind catchment of water near existing brooks or wetlands, and the end of the ditch connects constructed wetland of current brooks.

2) Based on comparison of maps, a type B interception ditch is situated in villages without brooks that discharges wastewater into the lake directly. The ditch extends from higher place to the lower along villages with new constructed wetlands at the end, and wastewater will be drained to Zhuhu Lake after treatment.

Processes of two types of ecological interception ditches are shown as below.

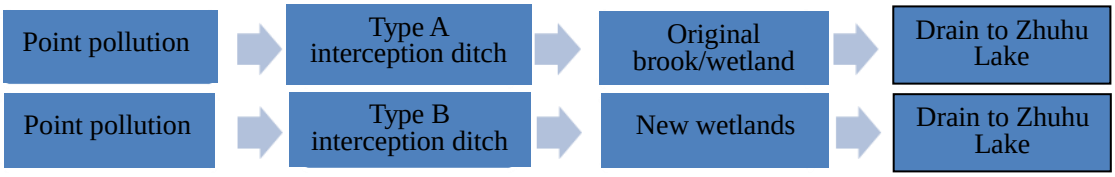


Fig. 2-6 Ecological Interception Ditch Processes

(2) Design for (type A) Ecological Interception Ditch

The interception ditch of type A complements brooks' capacity of catching water. With a length of 47.7 km, type A interception ditch provides 817 ha extra area of water catchment. In the sectional design, the bottom width is 0.5 m, the upper width, 0.75 m, the depth 0.7 m and the ordinary water level is designed as 0.3 m. At the ditch end, earth-rock dam of 0.3 m is built to retain water, serving as an overflow dam connecting constructed wetlands when water comes. Impermeable base under the dam is constituted by natural clay with a thickness of 0.1 m. Beside the lower side of the interception ditch is a 3.5 m wide walkway accessible for trivehicle. See the table below for wetland the ditch serves and length for each section.

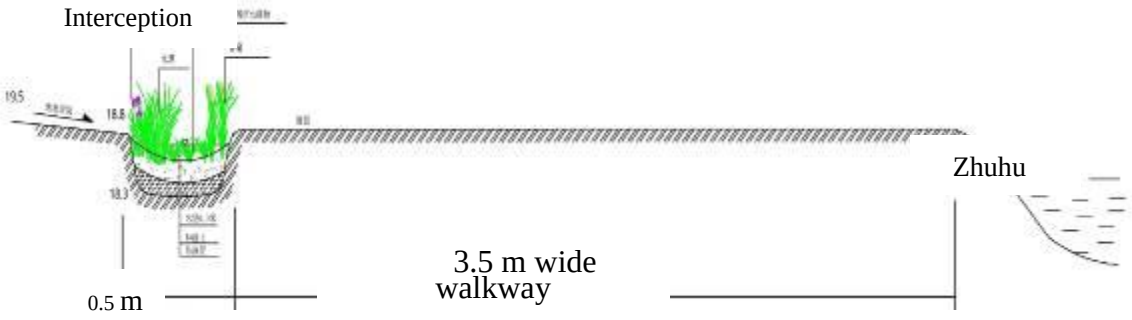


Fig. 2-7 Sectional View for type A Ecological Interception Ditch

Table 2-16 Wetlands Served and Relevant Parameters

Wetland Served	Ditch Length (m)	New Water Catching Area (ha)	Wetland Served	Ditch Length (m)	New Water Catching Area (ha)
2	2082	32	41	721	32
4	881	11	42	769	32
5	2098	10	43	2002	28
6	1041	11	44	1521	28
7	1201	11	45	2770	59
8	1201	12	48	961	10
9	1441	21	49	961	10
11	881	9	50	1441	30
19	2482	38	51	2322	47
21	1121	22	53	1041	18
23	3443	45	65	2162	39
24	3123	30	72	1121	34
29	336	14	73	1361	16
31	929	20	75	1521	32
32	1217	26	Sum	47666	817
33	1201	30			
34	1113	29			
39	1201	31			

The type A ecological interception ditch diminishes some pollutants in the way of catching water through diversion and grows aquatic plants which consists of emerging and submerged plants. Emerging plants with dense roots will be grown on the higher side to prevent diffused pollutants especially floating Particulate matters brought by surface streams, submerged plants will be grown on the lower side to purify NP and other pollutants in the water, the former accounts for 30% and the latter takes up 70%. Plants design of the type A interception ditch is presented below.

Table 2-17 Plants Design of the type A Interception Ditch

	Variety	Density plant/m^2	Ratio %
Emerging Plants	Cattail	30	12
	Acorus calamus	30	12
	Scirpus validus Vahl	20	6
Submerged Plants	Eel Grass	80	30
	Hydrilla verticillata	50	20
	Potamogeton distinctus	80	10
	Watermilfoil	50	10

Newly-added ditch can process surrounding diffused pollutants flowing to wetlands but will increase operating load for original wetlands. Nevertheless, the volume is minor and

aquatic plants in type A interception ditch can cut down pollutants, the submerged plants work well in removing NP which can set-off some load brought by new area of water catchment. Then wetland will enforce the treatment to ensure quality of outlet water and reduction of pollutants.

(3) Design of (type B) Ecological Interception Ditch

The type B interception ditch provides channels of collecting water for surrounding villages without brooks catching water and can prevent pollution from entering Zhuhu Lake directly. The ditch stretches 48.2 km adding water catchment area of 946 ha, its bottom width,0.5 m, and its upper width 0.75 m. The ditch has an ecological base constituted by 0.3 m gravel to filter diffused pollution and alleviate treatment pressure. The bottom is built with natural clay as impermeable layer. The lower side is equipped with a walkway of 3.5m, accessible to trivehicle. At the end of each interception ditch lies the type B constructed wetland, namely, the surface flow constructed wetland, the length-width ratio is 4:1. Major parameters for type B interception ditch and new constructed wetland is illustrated below.

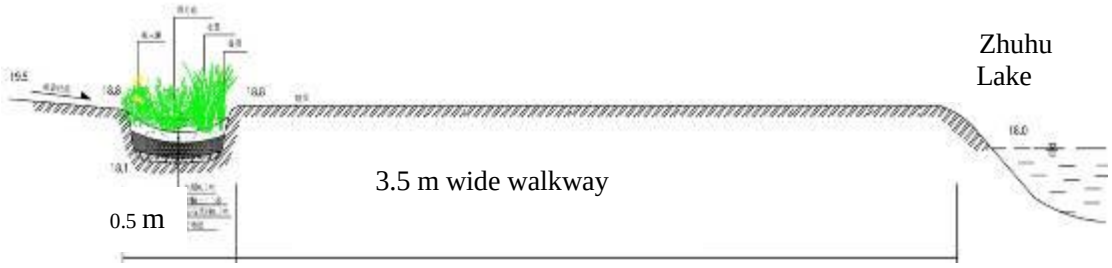


Table 2-8 Sectional View of type B Ecological Interception Ditch

Table 2-18 Major Parameters for type B Interception Ditch and New Constructed Wetland

No. for New Wetlands	Ditch Length (m)	Area for Water Catchment (ha)	Sewage Treatment Capacity (t/d)	Surface Flow Wetland Area (m^2)	Wetland Channel (m)
1	4012	77	173	1884	43
2	1673	21	47	514	23
3	1489	30	67	734	27
4	3859	55	124	1346	37
5	2963	40	90	979	31
6	2002	20	45	489	22
7	2402	20	45	489	22
8	3203	41	92	1003	32
9	1922	52	117	1272	36
10	2242	35	79	856	29
11	1201	30	67	734	27
12	1201	30	67	734	27

13	1601	44	99	1077	33
14	2162	60	135	1468	38
15	1281	38	85	930	30
16	1281	30	67	734	27
17	1281	30	67	734	27
18	1281	30	67	734	27
19	2002	29	65	710	27
20	2002	30	67	734	27
21	3763	68	153	1664	41
22	1762	39	88	954	31
23	1601	97	218	2374	49
Total	48186	946	2125	23148	713

Gravel at the bottom of type B ditch improves treatment effect, above that are emerging plants such as cattail and scirpus validus Vahl and on the higher side are vegetation with abundant roots like Thalia dealbata and canna that can block floating Particulate matters in surface streams, and cattail and scirpus validus Vahl can be planted at the lower side to purify water.

Newly constructed wetlands are designed as surface flow constructed wetlands with a combination of emerging and submerged plants. Emerging plants will be at the former section to cut down floating particle in the water and submerging plants at the latter section to further diminish pollution. Plant combination of type B interception ditch and newly constructed wetland is shown as below.

Table 2-19 type B Interception Ditch and Newly Constructed Wetland Plant Design

type B Interception Ditch		
Variety	Density (plant/m^2)	Ratio %
Cattail	30	20
Scirpus validus Vah	20	10
Thalia dealbata	15	30
Canna	15	30
Reed	16	20
Iris tectorum	16	20
Thalia dealbata	9	10
Eel Grass	80	30
Elodea nuttallii	50	10
Hydrilla verticillata	50	10

2.1.3 Construction Schedule

The project will start from January, 2018 and all sub-projects will be finished and checked by the end of December 2012. The project construction will last five years.

2.1.4 Engineering Investment

1. Total Investment for the Project

The engineering investment is estimated to be 300,864,600 yuan, of which 29,096,300 yuan is for strengthening administration in Poyang Lake Basin, and 236,577,200 yuan is for restoring water environment and improving sewage treatment system and 5,150,000 yuan for project support.

2. Fund Preparation

The estimated investment is 300,864,600 yuan, of which 30,000,000 dollars will be financed by World Bank (1 dollar for 6.6 yuan, about 198,000,000 yuan) and supporting fund of 102,864,600. The supporting fund will be financed by higher leading bodies and self-finance of local governments.

2.2 Project Analysis

2.2.1 Analysis of Pollutant during construction

(1) Wastewater

Wastewater during construction are mainly domestic sewage of workers and construction wastewater.

① Domestic Sewage

In the busiest period of construction, number of workers will reach 120. Water used by workers is about 50 L/day and the discharge index is 0.8, therefore, total discharge of sewage will reach 4.8 m^3/d. Wastewater consists of COD of 250 mg/L, BOD_5 of 150 mg/L, SS of 200 mg/L and NH of 35 mg/L, so pollution output is COD of 1.2 kg/d, BOD_5 of 0.72 kg/d, SS of 0.96 kg/d and NH of 0.18 kg/d.

Domestic sewage produced during construction will be collected and treated by the local residential treatment facility.

② Wastewater of Construction

Wastewater during construction falls into two types: one is muddy water of small

amount produced by digging pipelines and cleaning machinery or vehicles; the other type occurs during sand or stone wash, mixture or concreting. Major pollutants in wastewater are SS, petroleum, etc. Construction wastewater after sedimentation will be used for watering.

(2) Waste Gas

Dust is the major source of waste gas, including that caused by vehicles or construction (ditch digging, earthwork stack, load or unload of construction materials).

According to relevant literature, dust generated by construction transport vehicles amounts to 60% of the total and is associated with road conditions and vehicle speed. Generally, influence range of dust blown by natural wind on roads under construction is within 100 m. If the road is watered 4 to 5 times per day during construction, dust in the air can be reduced by 70% and the pollution distance of TSP will be narrowed within 20 to 50 m. Watering test result is revealed in the following table.

Table 2-20 Test Result for Dust Suppression during Construction

Distance from the Roadside (m)		5	20	50	100
TSP Concentration (mg/m^3)	No Watering	10.14	2.810	1.15	0.86
	Watering	2.01	1.40	0.68	0.60

Other source of construction dust is open storage ground and bare ground. This kind of dust affects by humidity of storage and wind speed, as a result, the dust can be eliminated effectively by watering the road and storage, avoiding operation in windy days or reducing open storage.

Moreover, exhaust gas of vehicles and oil-exhaust gas of construction machinery are also two (small-amount) sources of waste gas, including main pollutants HC, CO, NOx, etc.

(3) Noise

Construction noise mainly comes from material transportation, ditch digging, loading and unloading of tubing and backfilling machinery, such as loaders, bulldozers, excavators and heavy-duty trucks. Noise emission is intermittent, and the noise level of machinery is about 75 dB(A)-90 dB (A). Without control, the noise will affect surrounding environment.

Table 2-21 Major Noise Source of Construction Machinery dB (A)

No.	Machinery	Distance between Test Point and Machinery (m)	Maximum Sound Level
1	Loader	5	90
2	Bulldozer	5	81
3	Excavator	5	86
4	Heavy-duty Truck	5	84

5	Large Capacity Vehicles	—	86
6	Light Truck	—	75

(4) Solid Waste

Solid waste during construction mainly originates from domestic waste and digging soil.

① Domestic Waste

Supposing there are 120 workers and 0.5 kg waste generated by each worker per day, then total domestic waste is about 60 kg/d. This assessment suggests that waste bins and signs should be set up at the site, and the sanitation department shall pick up the collected waste.

② Construction Rubbish and Spoil

As estimated, the total amounts of excavation, earth filling and spoil are 159,237 m^3, 19,110 m^3, and 140,127 m^3. Meanwhile, the construction will produce a certain amount of waste, including broken brick, sand and gravel of about 2,110 m^3.

(5) Ecological Impact and Soil Erosion

Major reasons that the engineering will affect project ecological environment include soil excavation, construction, land occupation, construction noise and daily activities of workers. The direct impact of soil excavation is to alter some landscape, soil deterioration and peeling of surface weathering zone. Unreasonable construction method or unfavorable season may result in soil erosion. Engineering construction will damage vegetation of occupied land and surrounding area directly and will also affect wildlife to some degree.

2.2.2 Analysis of Pollutant Sources during Operation

(1) Wastewater

① Sewage Treatment Plant during operation

The project will build 35 rural sewage treatment plants with a total treatment scale of 2,600 t/d, including 22 plants of 50 t/d, 11 of 100 t/d, one plant of 150 t/d and one of 250 t/d. Outlet water of all plants should be in accordance with the emission limit of lakeside development belt under control in *Water Pollutant Discharge Standard for Poyang Lake Eco-Economic Zone* (DB36/852-2015), then the water will be discharge into Zhuhu Lake

and into waters outside conservation zone of 7 intakes. As a result, the discharge will have few impacts on water environment.

② Water Environment Monitoring System

There will be 5 new staffs in room for water environment monitoring system. The staffs work 255 a year, each of them are estimated to use 50 L every day, so the total domestic water consumption will be 0.25 m^3/d. Supposing the discharge rate is 80%, then domestic sewage volume of water environment monitoring room will be 0.2m^3/d and 51t/a.

(2) Waste Gas

Operation of sewage plants will produce odor gas, which mainly are NH_3 and H_2S. Grillages, conditioning tanks and integral facilities will be buried under the ground, and each treatment unit will be capped. All sewage is in the pipe or closed pond without open water, so there will few odorous pollutants.

(3) Noise

Noise comes from sewage treatment plants, water pumps of constructed wetlands. With a relatively small size, the water pump capacity of sewage plants is 0.46kw-3kw, and the noise level is about 65 dB (A)-75 dB (A). Since water pumps are placed underground, by adopting flexible connection, vibration reduction and building sound insulation, the noise level will be reduced to about 40dB (A)-50 dB (A) which has few impacts on the acoustic environment.

(4) Solid Waste

Sewage treatment plant of the project applies FMBR, by which the sludge will diminish itself without emission. Therefore, solid waste of the project operation stems from domestic waste of water environment monitoring system building and waste liquid from laboratory.

The sub-project will be located in Poyang Lake National Wetland Park Administration Committee using the existing house for water environment monitoring system. There will be 5 staffs working 255 days a year, their average amount of solid waste is 0.5 kg, 2.5 kg per day and 0.64 t/a per year. This type of domestic waste will be classified and then be treated by sanitation department of the county.

Laboratory will generate HW34, HW35, HW42 which are hazardous waste. Comparing with laboratory of the same scale, the above waste liquid is about 500 kg, which will be

collected and treated by qualified agencies instead of being discharged outward.

2.3 Production and Predicted Emission of Major Pollutants

Table 2-22 Major pollutants and their estimated emission of the project

Item \ Content		Emitter (No)	Pollutant	Concentration and Quantity	Emission Status and Direction
Water Pollutant	Construction Period	Domestic Sewage	CMD COD BOD_5 SS NH	$4.8m^3/d$ 250mg/L，1.2kg/d 150mg/L，0.72 kg/d 200mg/L，0.96kg/d 35mg/L，0.18 kg/d	Using local sewage treatment facility, no discharge
		Wastewater	SS	Small amount, fugitive	Small amount, fugitive
	Operation Period	Water Environment Monitoring System Room	Domestic Sewage	51t/a 250mg/L, 0.013t/a 150mg/L, 0.008t/a 200mg/L, 0.010t/a 35mg/L, 0.002t/a	Drain to sewage treatment facility in Poyang Lake National Wetland Park
Air Pollutant	Construction Period	Dust	TSP	Small amount, fugitive	Small amount, fugitive
		Oil-exhaust gas of construction machinery	HC, CO, NOx	Small amount, fugitive	Small amount, fugitive
	Operation Period	Sewage Treatment Plant	NH_3, H_2S	Small amount, fugitive	Small amount, fugitive
Noise	Construction Period	Machinery	Sound Pressure Level	75 dB (A) ~ 90dB (A)	
	Operation Period	Operation Facilities		40 dB (A) ~ 50dB (A)	
Solid Waste	Construction Period	Engineering Construction	Construction Waste	$2110\ m^3$	$2110\ m^3$
			Spoil	$140127m^3$	$140127m^3$
		Daily Life	Domestic Waste	60kg/d	Removal by sanitation department
	Operation Period	Water Environment Monitoring System Room	Waste Acid (HW34), Waste Alkaline (HW35), Waste Organic Solvents (HW42)	500kg/a	transfer to qualified agency

3 Environmental Status Quo

3.1 Natural Environment

(1) Geographic Location

Zhuhu Lake, situated in the in the west of Poyang County and the eastern edge of Poyang Lake, lies adjacent to Lushan Mountain in the west, Yellow Mount in the north, Mount Sanqing in the east and Longhu Mountain in the south. Waters of Zhuhu Lake is part of the Poyang Lake National Wetland Park (East). Zhuhu Lake won its name because it was the home of pearls (zhu) in Tang Dynasty. The lake extends eastward to Pantaozui of Sishilijie, southward to Guantian of Shuanggang Township, and northward to Hengtouzui of Zhuhu Township, presenting an irregular shape.

(2) Climatic features

Zhuhu Lake features subtropics monsoon climate with cold winter and hot summer. The climate boasts four distinct seasons, plentiful rain and long frost-free period, which is suitable for planting crops. Sometimes, however, disastrous weathers occur. According to measurement resources of the meteorological station from 1954 to 1980, the monthly average temperature was 4.9℃, the average temperature of July, 29℃, and the annual average temperature, 17.6℃. There were 265 frost-free days, and the precipitation was about 1,570.7 mm. The prevailing wind around the year was north wind, in the summer the prevailing one was south wind with an average wind speed of 3.5 m/s.

(3) An Introduction of Hydrogeololgy and the Basin

Zhuhu Lake is one big lake and reservoir in Poyang County. Its basin is part of Rao River basin. The lake was one eastern branch of Poyang Lake, but the dam between Baishazhou and Baqian Village built in 1960s separated Zhuhu Lake from Poyang Lake. Thereafter, it has become a reservoir lake rather than a natural one. Different waters in the lake bear distinct names, among which the one located in the in the west of line Wangjiadu-Piaolishan-Dukou Village is commonly known as Outer Zhuhu Lake, and the water in the east is Inner Zhuhu Lake. The lake looks like a twig with the inner and outer lake connected, featuring twists and bays. The lake's surface area is 61.7 km2, its average depth is 5.72 m, the maximum water depth is 7.1 m and the water-storage capacity is 462 million m^3. Water of the lake is mainly supplied by runoffs of the basin, which then is discharges into Poyang Lake under the control of the dam. The construction of the dam improves the capacity of the lake in fighting flood, adjusting flow, irrigation, etc. and

reduces the threats of floods along the lake.

(4) Geology and Geomorphology

Town of Poyang County, where Zhuhu Lake basin lies, is a region of hills, of which the highest is Zhishan Hill with an altitude of 73.4 meters. In the north is a chain of hills formed by denudation (Zhishan Hill, Dingzi Hill). The eastern area is low humps constituted by the quaternary deposits while the southern and western area as well as two banks of the lake and the river are contemporary alluvial plain. The terrain is like a ladder as the northwest is higher and the southeast lower.

(5) Land Resources

Zhuhu Lake basin has a land area of 373.81 km^2, covering 6 townships or towns which are Tuanlin, Baishazhou, Sishilijie, Zhuhu, Gaojialing, Shuanggang. Hills around have low vegetation coverage of 10%, of which deciduous shrubs account for 50%, broad-leaved forest only makes up 12.3%, resulting in poor forest quality. Farmland there covers 223.93 km^2, about 60% of the area. Lake or dam area reaches 91.91 km^2, about 24.59%; land for industrial, mining and residential use are 20.61 m^2, accounting for 5.51%. And the unoccupied land area is 0.33 km^2, taking up 0.09% of the whole.

3.2 Social Environment

(1) Administrative Divisions

The basin is constituted by some administrative regions of six towns or townships, including Tuanlin, Baishazhou, Sishilijie, Zhuhu, Gaojialing and Shuanggang.

(2) Demography

According to statistics of 2014, Zhuhu Lake Basin has a population of 94,700.

Table 3-1 Profile of Zhuhu Lake Basin Population (Statistics of 2014)

Town/Township	Land area (km^2)	Population in the Basin (capita)		Village Committee
		Total	Permanent	
Tuanlin Town	45	6031	4825	Village Committees of Ou'tang, Jiangshan, Bantang, Tongqian, Qingshan, Qinghu, Jianshe, and Wangyang
Baishazhou Township	72	5625	4500	Village Committees of Chemen, Chuangye, Wangjia, Huzhao, Datang, Ligongnao, Neiqing, and Caojiazui
Sishilijie Town	64	6406	5125	Village Committees of Sishilijie, Taiping, Guo'an, Tanghu, Xinlu, Qinglong, Gonghong, Hudong, Nuanshui, Xubu, and Biquan

Zhuhu Township	42	7000	5600	Village Committees of Qunlian, Qunzhong, Donghong, Hualong, Lishan, Tongxing, Lukou, Yutian, Fengtang, Putian, Sanmen, Rongqi, Fengchan, Zhoujia, Caojia, and Gushan
Gaojialing Town	85	6913	5530	Village Committees of Donghong, Shuangling, Wangling, Chengtang, Neihu, Chelang, Dazong, Hanshan, and Xiaoming
Shuanggao Town	53	62756	50205	Village Committees of Changshan, Leting, Lehu, Lexing, Zhulin, Xiachang, Sancha, Niejia, Lichihu, Gaojialing, Jingtang, Jinghua, Longtoushan, Tuanjie, Guantian, Xintian, Xinmin, Yaqiao, Yushen, Dongqiao, Pengjia, Shuangqiao, Shuanggang, Shuangfeng, Raoshan, Raofeng, and Huayuan
Total	361	94731	75785	

(3) Economy and Industry

Zhuhu Lake Basin boasts an economy of 1.661 billion yuan, of which the primary industry takes up 598 million, the secondary 515 million and the service industry 548 million yuan, with a ratio of 36: 31: 33. With less developed industry, the region focuses on agriculture and service industry. Poyang Country, where Zhuhu Lake Basin lies, was named National Advanced Food Production Model in 2010 and is a producer of grain whose major crop is rice. The county's total grain output amounts 21,600 tons and its annual output of aquatic products reaches 2,850 tons, among which salangidae is a specialty of Jiangxi Province. Tourism there is centered on boosting eco-tourism of Poyang Lake Wetland Park.

3.3 Ecological Environment

Situated in Zhuhu Lake Basin of Poyang County, the project aims to cut down water pollutants flowing to Zhuhu Lake. Zhuhu Lake, part of Poyang Lake National Wetland Park, is a first-grade protection zone in the park and harbors conservation area of the lake source. 100 m from west side of the project is demonstration zone of Baishazhou Natural Wetland, second-grade conservation area of the Park. 1,000 m away from south of the project is Poyang Lake Cultural Water City, the third-grade conservation area.

Poyang Lake National Wetland Park is classified into seven function zones, which are conservation area of Hanchi Lake waterfowl habitat, recovery and rebuild area for

Jiaofengwei Wetland, urban wetland recreation area and management and service area of Donghu Lake. Conservation area of Zhuhu Lake water source, including Zhuhu Lake water, is a vital part of the park, whose function is to protect origin of drinking water in Poyang County and to restore the environment in some degree. Demonstration zone of Baishazhou Natural Wetland is an important region presenting typical wetland scenery of Poyang Lake for the public and boost wetland eco-tourism, which provides desirable landscape for ecological tourism. The Poyang Lake Cultural Water City, centered on landmarks with the park theme, is developing an artificial watercourse. Based on this watercourse, the Poyang Lake Cultural Water City featuring Poyang Lake wetland culture, history and customs is built.

3.3.1 Terrestrial Ecology

3.3.1.1 Terrestrial Plants

(1) Terrestrial Plant Resources

The region assessed enjoys subtropical climate, used to featuring vegetation of mid-subtropical evergreen broad-leaved forest. Due to human activity, however, vegetation evolves to current secondary and artificial type. Now the vegetation mainly consists of pinus massoniana, slash pine plantation and bushwood, no natural evergreen broad-leaved forest remains in the region, and the dominant agricultural vegetation is rice. Plants are those common varieties and crops in hilly regions in in the south of the Yangtze River. According to consultation with forest authority and site survey, there is no wild plants, ancient or precious trees under national or provincial key-protection in the EIA area.

(2) Vegetation

Major plant variety in the assessment region is Pinus massoniana, most of which is young forest growing from seeds spread naturally. In the forest, Pinus massoniana of arbor species is the predominant accompanied by some young trees such as Scnima superba, Liquidambar formosana, Castanopsis sclerophylla and camphor tree. The stand canopy density ranges from 0.35 to 0.65, dense under-bush contributes to slight soil erosion.

Varieties of shrub and grass under trees are Loropetalum chinensis, Gardenia jasminoides, Syzygium buxifolium, Vaccinium bracteatum, Rhododendron simsii and Adinandra millettii, and herbs include Dcranopteris dichotomai and Miscanthus floridulus. Coverage of bush or shrub is about 25% to 60%, and there is a small amount of inter stratum

plant, which mainly is Rosa laevigata.

Liquidambar formosana/ Schima superba: Due to human interference, the height of bushwood usually is 1.5 to 2 m, dominant constructive species are Scnima superba, Liquidambar formosana and companying bush consists of Castanopsis sclerophylla, Loropetalum chinensis, Gardenia jasminoides, Syzygium buxifolium, Vaccinium bracteatum, Symplocos sumuntia, Adinandra millettii and Phyllostachys heteroclada.

Phyllostachys heteroclda: Hyllostachys heteroclda has a length of 1-1.8 m, diameter of 5-15 mm, whose twig usually grows alone with 3 to 5 leaves. There is fine hair on the upper part of leaf-sheath and one tiny blade ear on each side of the sheath. The leave is lanceolate with a width of 8 to 16 mm. For its toughness, the bamboo is good for making works. Bamboo shots grow in April and May and are edible. Groups of the Phyllostachys heteroclda often can be found at foot of mountain or barren hillside, beside ditch, farmland or field.

Artificial forests in the assessment area are mainly constituted by cedar and Pinus elliottii.

Cunnighamia Lnceolata: As a tree of shallow root, cedar has no obvious principal root but boasts dense horizontal root system and tends to grow in fertile soil. Spreading over hills in sub-tropical region, cedar is an excellent timber wood traditionally. Cedar forest in the EIA area distributes at hillside of red soil formed by sandstone. Because the forest is planted and fostered by man, there are also Pinus massoniana, Liquidambar formosana, Schima superba and Paulownia kawakamii, etc.

Canopy density of middle-aged cedar forest usually is 0.45 to 0.75, and the coverage of shrub and grass under trees is about 15%-55%. Bushwood falls into Loropetalum chinensis, Itea oblonga, Vaccinium bracteatum and Rubus corchorifolius. Lianas consists of Rosa laevigata and Smilax glabra. Herbs are dominated by Dicranopteris dichotoma and Miscanthus floridulus.

Canopy density of young cedar forest is 0.25-0.45. Bushwood in the forest exceeds middle-aged cedar wood, common varieties are Litsea cubeba, Castanopsis sclerophylla, Quercus fabri, Vaccinium bracteatum, Loropetalum chinensis, herbs mainly include Pteridium aquilinum var.latiusculum, Dicranopteris dichotoma and Miscanthus floridulus.

Pinus elliottii：Most of Pinus elliottii in the area are young trees, there are also other young trees of Scnima superba, Liquidambar formosana, camphor tree. The canopy density ranges from 0.2 to 0.6.

Major underwood varieties are Loropetalum chinensis, Rhododendron simsii,Syzygium buxifolium, Vaccinium bracteatum, Smilax china and Rosa laevigata. Herbs is dominated by

Dicranopteris dichotoma. Coverage rate of shrub and grass is 30% to 65%.

Agricultural vegetation: This kind of vegetation takes up certain proportion in the EIA area. Rice field or non-irrigated lands lie in valleys along hills or on banks of rivers. Rice is the predominant crop, in winter and spring Brassica napus can be found in many places, and non-irrigated lands usually are planted with peanut, sweet potato and vegetables.

3.3.1.2 Terrestrial Animals

1. Breeds of Animals

The assessment area is featured by dense population in villages or townships, endowed with agricultural vegetation and cedar forest, Pinus massoniana, Pinus elliottii and bushwood, animal breeds are those common in Jiangxi Province.

(1) Beasts

There are Rhizomys sinensis, Rattus norvegicus, Rattus flavipectus, Ruttus confucianus and Lepus sinensis, of which Lepus sinensis and mouse are common ones. Rodent is the bin the east of most breeds and quantity and is also coexistent animals in villages, some of them live in both human house and the wild.

(2) Birds

The project is close to Poyang Lake National Wetland Park. The park is a home for many migrating birds, especially serving as a place for those from northeast Asia to migrate, rest, feed and to live through the winter. The park enjoys abundant birds, including a large variety and quantity of rare migratory birds and their habitat in the park lies in Chihan Lake. The area assessed is characterized by frequent human activity and resident of dense population, birds may fly through or stay briefly, but there is no regular habitat or gathering site for them.

Common birds in the region are resident birds such as Passer montanus, Turdus merula, Lonchura striata, and summer residents are Hirundo rustica, Egretta garzetta, Ardeola bacchus and Nycticorax nycticorax, winter residents include Phoenicurus auroreus, Turdus naumanni and Emberiza spodocephala, etc. Among these, Egretta garzetta and Ardeola bacchus are wildlife under key-protection of Jiangxi Province.

① Egretta garzetta

Egretta garzetta, also named as little Egret, is a medium-sized wader belonging to

Egretta of family Ardeidae. It usually inhabits in low-altitude swamp, rice field, lake or shoal and nests in the canopy of broad-leaved forest or cedar wood. The bird often migrates southward from the end of September to the beginning of October in the fall, and moves back in the second half of March. Egretta garzetta clusters, usually stays at shallow waters in groups of 3-5 or 10, it feeds on various little fishes, ricefield eel, loach, frog, shrimp, eel, dragonfly larvae, mole cricket, cricket, ante, grub, coleoptera, caterpillar and aquatic insects, and eats some grains as well. The bird feeds in the day and rests in the night. It often flies to waterside over ten miles away from its habitat to seek food, and sometimes it stays in certain place for prey or feed on grass with cattle, or stands on the cattle back for parasite occasionally. Breeding season of the bird starts from March and lasts to July.

② Ardeola bacchus

Ardeola bacchus, a representative wader, belongs to Ardeola of family Ardeidae, who usually inhabits in rice field, ponds, lakes, reservoir, swamp or wetlands, sometimes it stays in bamboo grove or trees beside water. It mainly feeds on animals such as fish, shrimp, field snail, frog, loach, aquatic insects and grasshopper and eats some plants as well. The bird often migrates southward from the end of September to the beginning of October in the fall in small groups or family, and moves back in the beginning or second half of April. It spends winter in Guangdong, Fujian, Hainan, Taiwan and south Asian countries and breeds in March to July.

(3) Amphibians

Common amphibians in the region are batrachia such as Bufo gargarizans, Rana limnocharis and Rana guentheri inhabiting beside water, damp brush meadows, river valley or near the villages. There is no wild amphibians under national or provincial key-protection.

(4) Reptile

Reptiles in the region are Takydromus septentrionalis, Ptyas korros and Enhydris chinensis, no reptiles under national or provincial key-protection are found in the region.

3.3.2 Aquatic Ecosystem

3.3.2.1 Aquatic Plant

There are 6 floating algae of 4 categories, dominating by Chlorophyta and followed by Cyanophyta, and the predominate varieties are Chlorogonium elongatum and Scenedesmus of Chlorophyta and then are Microcystis, Merismopedia and Oscillatoria of Cyanophyta.

3.3.2.2 Aquatic Animal

1. Zooplankton

There are common protozoons such as Difflugia, Arcella and Tintindium, and usual rotifers include Asplanchna and Polyarthra trigla, common cladocerans falls into Chydoridae and Bosmina, and copepoda is represented by diaptomid.

2. Benthonic invertebrate

There are 6 benthonic invertebrates, which are commonly seen paludina, Limnoperna lacustris, Hyriopsis cumingii, Unio douglasiae, Lanceolaria gladiola and Corbicula fluminea, mainly inhabiting in rivers, rice fields or ponds rich of organic content.

3. Fish

There is no habitat distinctiveness of wetland in the assessment area. The dam built in the 1960s separated Zhuhu Lake from Poyang Lake, fishes in the Zhuhu Lake are those cultivated, for example, grass vehiclep, black vehiclep, silver vehiclep, bighead vehiclep, M.amblycephala, vehiclep and salangid. The region has no spawning, feeding or wintering ground.

3.4 Current Situation of Land Use

Interception ditches and constructed wetlands are rebuilt from former ditches, uncultivated lands, ponds or vegetable fields, and the sewage plant occupies non-cultivated land. The water environment monitoring room uses the building of Poyang Lake National Wetland Park Administration Committee instead of acquiring other lands. Automatic monitoring stations and forecast sites of water quality occupy non-cultivated land.

3.5 Environmental Quality Status

To know environmental quality of the project area, EIA entrusts Environmental Monitoring Station of Fangda Special Steel Technology Co Ltd to survey ambient air,

surface water and acoustic environment in the region.

3.5.1 Current situation of air environmental quality

(1) Monitoring Factor: TSP、NO_2.

(2) Monitoring Time: 12 June 2016-18 June 2016.

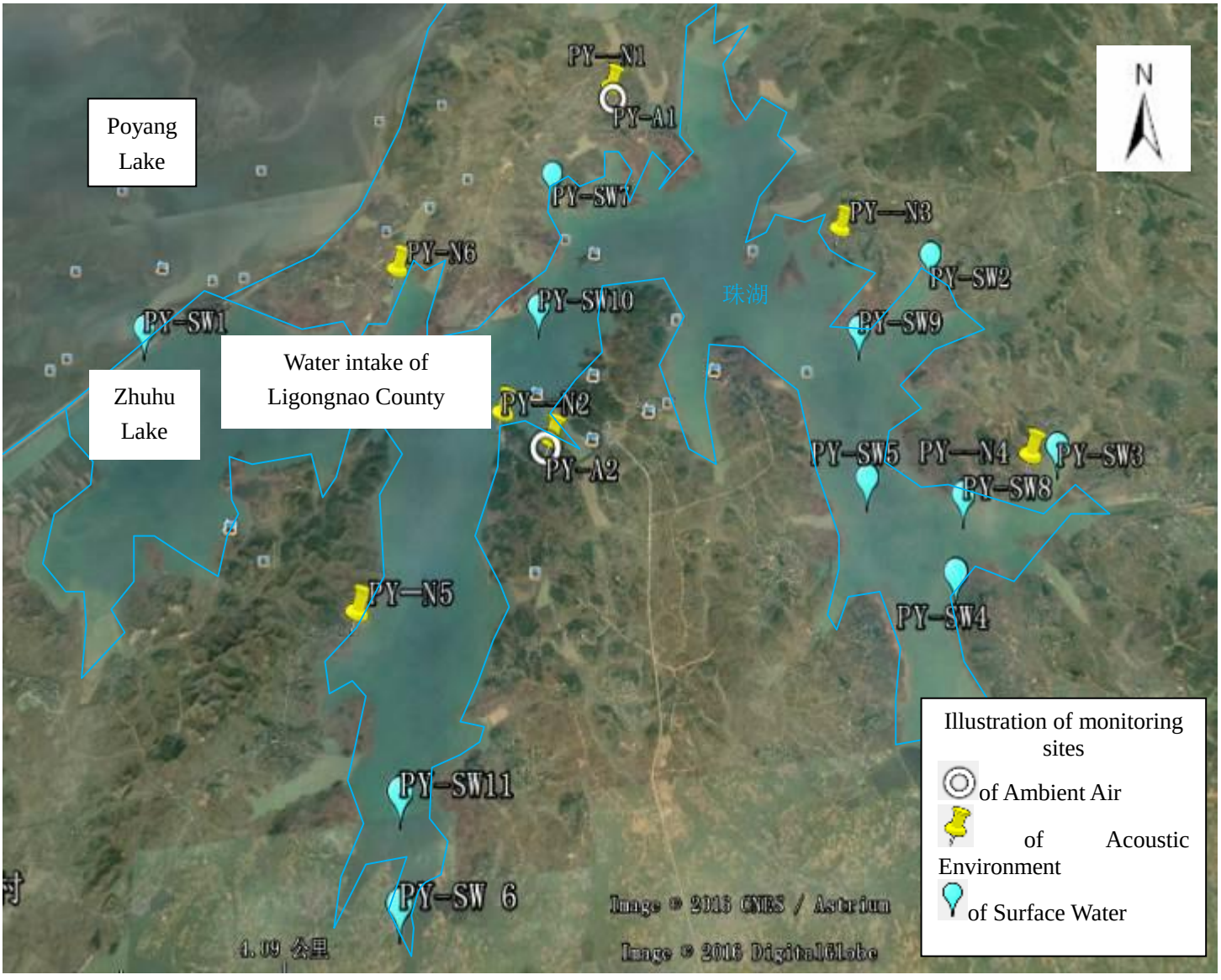
(3) Monitoring Frequency: The monitor lasted 7 days. Daily mean concentration of TSP is provided with valid data for 24 hours every day, daily mean concentration of NO_2 is ensured with valid date for 20 hours each day, over 45-minute sampling time of hourly NO_2 concentration is guaranteed. Monitoring time is Beijing time 2:00, 8:00, 14:00, 20:00.

(4) Monitoring Sites

Monitoring location of ambient air is shown in Table 3-2 and distribution of monitoring site see Fig. 3-1.

Table 3-2 Atmospheric Monitoring Sites

No.	Location	Monitoring Site in the County
A1	Zhuhu Township	N 29°11'12.34", E 116°40'52.81"
A2	Tuanlin Township	N 29° 7'51.15", E 116°39'57.16"



Map 3-1 Distribution of Monitoring Site

(5) Assessment Method

Assessment of atmospheric quality adopts single-index method, namely:

$$I_{ij}= C_{ij} /C_{si}$$

In which: Iij——index of No. i pollutant at No. J monitoring site;

Cij——mean value of No. i pollutant at No. j monitoring site (mg/m^3);

Csi——Assessment standard of No.i pollutant (mg/m^3).

(6) Assessment Standard

The project area applies Category II standard in *Ambient Air Quality Standards* (GB3095-2012).

(7) Monitoring and Assessment Results

Table 3-3 Monitoring and Assessment Results

Factor \ Item		Average Time	Monitoring Value Range (μg/m^3)	Maximum Concentration Value (μg/m^3)	Category II (μg/m^3)	over-limit ratio (%)	Standard Index	compliance
Zhuhu Township	TSP	Daily Mean Value	74~135	135	300	0	0.45	Complied
	NO_2	Daily Mean Value	19~31	31	80	0	0.39	Complied
		Hourly Value	11~48	48	200	0	0.24	Complied
Tuanlin Township	TSP	Daily Mean Value	66~118	118	300	0	0.39	Complied
	NO_2	Daily Mean Value	18~30	30	80	0	0.38	Complied
		Hourly Value	11~47	47	200	0	0.24	Complied

(8) Result Analysis

As the above Table reveals that standard index of TSP and NO_2 in two monitoring sites in Zhuhu and Tuanlin Township is less than 1, the monitoring result conforms to Category II standard in *Ambient Air Quality Standards* (GB3095-1996), indicating good ambient air

quality in the region.

3.5.2 Surface Water Environmental Quality Status

3.5.2.1 Profile of Poyang County Pollution Source

According to data of Jiangxi Province Environmental Protection Bureau, the following table shows wastewater and pollution sources in Poyang County (2011-2015).

Table 3-4 Poyang County Wastewater Emission 2011-2015 (10,000 t)

Year	Total	Industry	Daily Life	Others
2011	1511.5871	209.5591	1302.028	0
2012	1596.737175	229.885175	1366.852	0
2013	1728.791145	184.511145	1544.28	0
2014	1745.530122	154.980122	1590.55	0
2015	2116.134442	201.185642	1912.85	2.0988

Table 3-5 Poyang County COD Emission of Different Pollution Sources 2011-2015 (t)

Year	Total	Industry	Agriculture	Daily Life	Others
2011	14883.656	1622.008	3051.743	10209.905	0
2012	15083.6551	1489.77	2833.0551	10760.83	0
2013	14709.311	1360.768	2749.203	10599.34	0
2014	14271.7299	821.62	2607.6799	10842.43	0
2015	13759.5499	933.89	2108.7099	10549.05	167.9

Table 3-6 Poyang County NH3-N Emission of Different Pollution Sources 2011-2015 (t)

Year	Total	Industry	Agriculture	Daily Life	Others
2011	1780.314	49.137	501.94	1229.237	0
2012	1799.5695	41.217	464.2825	1294.07	0
2013	1781.78	42.82	454.34	1284.62	0
2014	1771.3818	37.22	426.8618	1307.3	0
2015	1641.9218	40.33	351.3018	1233.5	16.79

Note: Others refer to pollution source discharged after centralized treatment

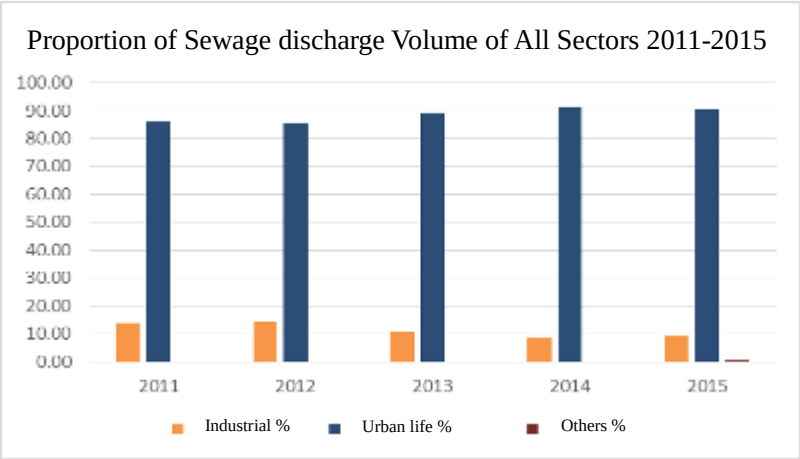


Fig. 3-2 Poyang County Different Sources Wastewater Ratio2011-2015

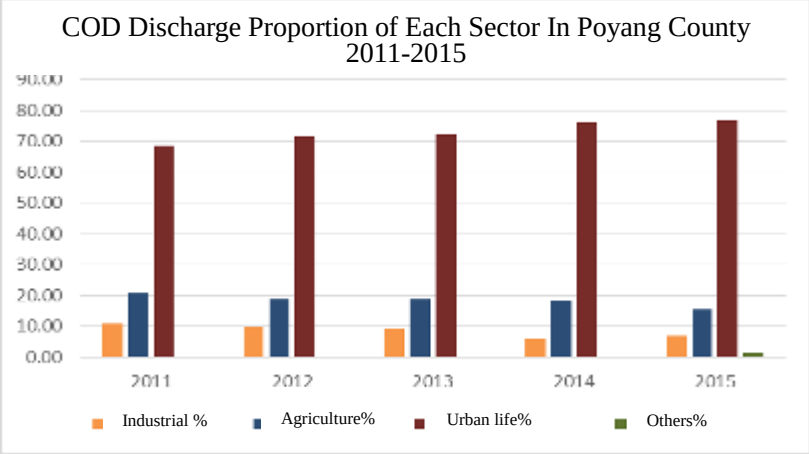


Fig. 3-3 Poyang County Different Sources Ratio of COD 2011-2015

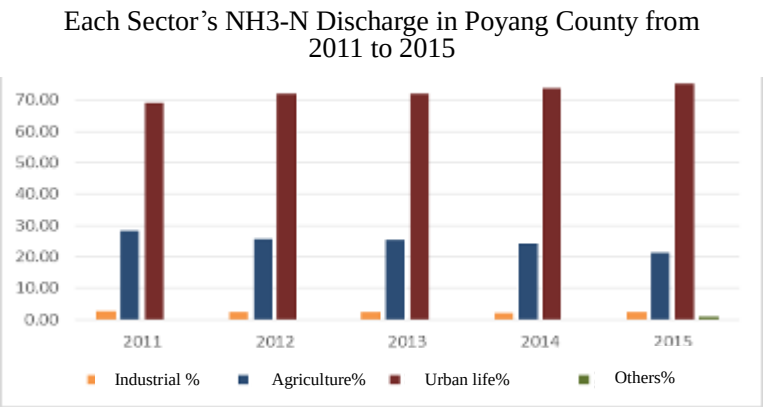


Table 3-4 Poyang County Different Sources Ratio of NH3-N 2011-2015

Statistics shows that annual sewage discharge in Poyang County is increasing, and domestic wastewater accounts for 80% which mainly comes from industry. Emission of COD and NH3-N also present similar trend, consisting of domestic>agriculture>industry>other pollution sources. Therefore, domestic pollution contributes most to emission of COD and NH3-N.

Plan of Poyang County will complete drainage system and will improve penetration rate of sewage facility to 90%. Now there is sewage treatment plan in industrial park, which

can collect and deal with pollution in the town effectively. Zhuhu Lake is not only a key water flowing to Poyang Lake but also is a vital source of drinking water for Poyang County. Currently, Poyang Lake Eco-Economic Zone presents strong momentum in economic and social development, Zhuhu Lake of Poyang County lies in lakeside development belt under control where conflicts between resources, environment and economic growth are prominent. Furthermore, construction of municipal facilities in Zhuhu Lake Basin lags far behind that in the town of Poyang County. Therefore, situated in Zhuhu Lake Basin, the project plays an immediate role in reducing pollutants into Poyang Lake.

3.5.2.2 Water Quality of Zhuhu Lake

(1) Monitoring Factors

There are 19 monitoring factors, which are pH, NH3-N, COD, TP, DO, fluoride, Cu, Zn, Fe, Mn, Cr6, Pb, cyanide, FN, petroleum, sulfide, sulfate, chloride, and nitrate.

(2) Frequency and Time of Monitoring

Monitoring time lasted three days from June 18, 2016 to June 20, 2016, sampling was conducted one time each day.

(3) Monitoring Method

Monitoring items, way of collecting samples, transportation and storage and analysis method of monitor were all in accordance with those in *Technical Specifications Requirements for Monitoring of Surface Water and Waste Water* (HJ/T91-2002).

(4) Monitoring Sites

See Table 3-7 for monitoring sites.

Table 3-7 Zhuhu Lake Surface Water Environmental Quality Monitoring Sites in Poyang County

No.	Location of Monitoring Sites
SW_1	Border between Poyang Lake and Zhuhu Lake
SW_2	Water intake of Gaojialing Town water plant
SW_3	Water intake of Yongchang, Sishilijie Town water plant
SW_4	Water intake of Zhongtang, Sishilijie Town water plant
SW_5	Water intake of Tuanlin Township water plant
SW_6	Water intake of Shuanggang Town water plant
SW_7	Water intake of Zhuhu Township water plan
SW_8	Juncture of water intake under secondary-protection area in Sishilijie Town and Tuanlin Township
SW_9	Area of water intake under secondary-protection in Gaojialing Town

SW_{10}	Juncture of water intake under secondary-protection area in Ligongnao and Zhuhu
SW_{11}	Area of water intake under secondary-protection in Shuanggang Town

(5) Assessment Method

Standard index evaluating method is applied to assess individual water quality parameter of assessment factors, using formula as below:

$$S_{ij}=C_{i,j}/C_{si}$$

In which, S_{ij}—standard index of Pollutant i in No. j point;

$C_{i,j}$—Pollutant i concentration in No. j point (mg/L);

C_{si}—Surface water water quality standard of Pollutant i (mg/L).

pH standard index:

$$S_{pH,j}=\frac{7.0-pH_j}{7.0-pH_{sd}}\left(pH_j \le 7.0\right)$$

$$S_{ppH,j}=\frac{pH_j-7.0}{pH_{su}-7.0}\left(pH_j > 7.0\right)$$

In which, $S_{pH,j}$—pH standard index at No. j point;

pH_j—pH of j point;

pH_{sd}—Minimum value of pH in Surface Water Water Quality Standard;

pH_{su}—Maximum value of pH in Surface Water Water Quality Standard;

DO standard index:

When $DO_j \ge DO_{oi}$, $P_i=|DOs-DO_j|/(DOs-DO_{0i})$

When $DO_j < DO_{oi}$, $P_i=10^{-9}DO_j/DO_{0i}$

In which: DOs——Saturation values of DO under monitoring water temperature (T℃), $DO_S=\frac{468}{31.6+T}$, T stands for water temperature of detection.

DO_j——Measured value;

DO_{0i}——Standard value.

Concentration of water quality parameter over 1 shows that water parameter has exceeded limit value of water quality and cannot meet functional requirement of water quality. The bigger the concentration index is, the more the water quality exceeds the standard value.

(6) Assessment Standard

Water quality of Zhuhu Lake applies Category III standard in *Environmental Quality Standard for Surface Water* (GB3838-2002).

(7) Monitoring and Assessment Results

According to the monitoring result, 14 substances including fluoride, Cu, Zn, Fe, Mn, Cr6, Pb, cyanide, FN, petroleum, sulfide, sulfate, chloride, nitrate are lower than the limit value, which are consistent with Category III standard in *Environmental Quality Standard for Surface Water* (GB3838-2002). Monitoring and assessment results of other factors are shown in the table below.

Table 3-8 Monitoring and Assessment Results of Zhuhu Lake Water Quality (mg/L, pH dimensionless)

No.	Item	pH	NH3-N	COD	TP	DO	Fluoride
SW_1	Monitoring Value	7.66~7.72	0.086~0.1	10.95~11.86	0.035~0.038	7.46~7.74	0.11~0.12
	Assessment Standard	6~9	≤1.0	≤20	≤0.05	≥5	≤1.0
	Over-limit Rate (%)	0	0	0	0	0	0
	Standard Index	0.33~0.36	0.086~0.1	0.55~0.59	0.7~0.76	0.25~0.16	0.11~0.12
	Compliance	Complied	Complied	Complied	Complied	Complied	Complied
SW_2	Monitoring Value	7.59~7.69	0.11~0.154	11.29~13.1	0.042~0.048	7.55~7.76	0.12~0.13
	Assessment Standard	6~9	≤1.0	≤20	≤0.05	≥5	≤1.0
	Over-limit Rate (%)	0	0	0	0	0	0
	Standard Index	0.295~0.35	0.11~0.15	0.57~0.66	0.84~0.96	0.22~0.16	0.12~0.13
	Compliance	Complied	Complied	Complied	Complied	Complied	Complied
SW_3	Monitoring Value	7.84~7.87	0.13~0.146	13.56~14	0.046~0.065	6.84~6.94	0.14~0.16
	Assessment Standard	6~9	≤1.0	≤20	≤0.05	≥5	≤1.0
	Over-limit Rate (%)	0	0	0	33.33%	0	0
	Standard Index	0.42~0.44	0.13~0.146	0.68~0.7	0.92~1.3	0.44~0.41	0.14~0.16
	Compliance	Complied	Complied	Complied	**Over-limit**	Complied	Complied
SW_4	Monitoring Value	7.58~7.69	0.14~0.165	11.07~12.89	0.042~0.057	6.92~7.71	0.12~0.14

	Assessment Standard	6~9	≤1.0	≤20	≤0.05	≥5	≤1.0
	Over-limit Rate (%)	0	0	0	33.33%	0	0
	Standard Index	0.29~0.35	0.14~0.165	0.55~0.65	0.84~1.14	0.41~0.17	0.12~0.14
	Compliance	Complied	Complied	Complied	**Over-limit**	Complied	Complied
SW_5	Monitoring Value	7.55~7.64	0.11~0.12	11.58~12.02	0.045~0.046	7.69~7.82	0.13~0.14
	Assessment Standard	6~9	≤1.0	≤20	≤0.05	≥5	≤1.0
	Over-limit Rate (%)	0	0	0	0	0	0
	Standard Index	0.28~0.32	0.11~0.12	0.58~06	0.9~0.92	0.18~0.14	0.13~0.14
	Compliance	Complied	Complied	Complied	Complied	Complied	Complied
SW_6	Monitoring Value	7.82~7.87	0.14~0.15	14.37~14.50	0.045~0.055	6.63~6.81	0.14~0.16
	Assessment Standard	6~9	≤1.0	≤20	≤0.05	≥5	≤1.0
	Over-limit Rate (%)	0	0	0	33.33%	0	0
	Standard Index	0.41~0.44	0.14~0.15	0.72~0.73	0.9~1.1	0.5~0.45	0.14~0.16
	Compliance	Complied	Complied	Complied	**Over-limit**	Complied	Complied
SW_7	Monitoring Value	7.63~7.72	0.095~0.13	12.84~14.75	0.044~0.047	6.85~7.05	0.12~-0.14
	Assessment Standard	6~9	≤1.0	≤20	≤0.05	≥5	≤1.0
	Over-limit Rate (%)	0	0	0	0	0	0
	Standard Index	0.32	0.095~0.13	0.66~0.74	0.88~0.94	0.44~0.37	0.12~-0.14
	Compliance	Complied	Complied	Complied	Complied	Complied	Complied
SW_8	Monitoring Value	7.72~7.78	0.12~0.137	12.03~12.97	0.040~0.043	6.87~7.2	0.14
	Assessment Standard	6~9	≤1.0	≤20	≤0.05	≥5	≤1.0
	Over-limit	0	0	0	0	0	0

	Rate (%)						
	Standard Index	0.36~0.39	0.12~0.137	0.6~0.65	0.8~0.86	0.43~0.33	0.14
	Compliance	Complied	Complied	Complied	Complied	Complied	Complied
SW_9	Monitoring Value	7.83~7.89	0.14~0.154	13.77~14.87	0.055~0.062	6.66~7.12	0.14~0.16
	Assessment Standard	6~9	≤1.0	≤20	≤0.05	≥5	≤1.0
	Over-limit Rate (%)	0	0	0	100%	0	0
	Standard Index	0.42~0.45	0.14~0.154	0.69~0.74	1.1~1.24	0.49~0.35	0.14~0.16
	Compliance	Complied	Complied	Complied	**Over-limit**	Complied	Complied
SW_{10}	Monitoring Value	7.63~7.72	0.12~0.148	11.26~13.84	0.036~0.048	7~7.73	0.12~0.14
	Assessment Standard	6~9	≤1.0	≤20	≤0.05	≥5	≤1.0
	Over-limit Rate (%)	0	0	0	0	0	0
	Standard Index	0.32~0.36	0.12~0.148	0.56~0.69	0.72~0.96	0.39~0.54	0.12~0.14
	Compliance	Complied	Complied	Complied	Complied	Complied	Complied
SW_{11}	Monitoring Value	7.77~7.91	0.15~0.163	13.02~14.89	0.057~0.066	6.67~7.04	0.14~0.16
	Assessment Standard	6~9	≤1.0	≤20	≤0.05	≥5	≤1.0
	Over-limit Rate (%)	0	0	0	100%	0	0
	Standard Index	0.39~0.46	0.15~0.163	0.65~0.75	1.14~1.32	0.49~0.38	0.14~0.16
	Compliance	Complied	Complied	Complied	**Over-limit**	Complied	Complied

As indicated in the above Table, among these monitoring factors TP exceeds standard value but other factors are all in accordance with Category III standard in *Environmental Quality Standard for Surface Water* (GB3838-2002). Among sites of over-limit TP, that (SW_3) of water plant intake in Yongchang, Sishilijie Town presents a standard index of 0.92-1.3 with an over-limit rate of 33.33%. SW_4 of Zhongtang, Sishilijie Town has a standard index of 0.84-1.14 with an over-limit rate of 33.33%. $SW_{6,}$ standard index of

Shuanggang Town water intake is 0.9-1.1 with an over-limit rate of 33.33%. And SW_9, the standard index of secondary protections area of Gaojialing Town water intake is 1.1-1.24 with an over-limit rate of 100%。

Survey on water quality indicates that water quality of each sites is desirable, and is basically in accordance with Category III standard in *Environmental Quality Standard for Surface Water* (GB3838-2002). TP indicators, however, some of them exceed Category III and reaches Category IV, sites over limit values mainly lie in villages of Gaojialing Town, Sishilijie Town and Shuanggang Town. As the source of drinking water for the county, Zhuhu Lake water safety will be threatened if pollutant source is not eliminated. Moreover, water ecosystem of Zhuhu Lake will be damaged and then will further affect water safety of Poyang Lake, therefore, it is of great urgency to improve water quality of Zhuhu Lake.

3.5.2.3 Identification of Pollutants Source Type in Zhuhu Lake Basin

Zhuhu Lake Basin is affected by two types of pollution, which are point source pollution and non-point source pollution. The former pollution comes from rural domestic sewage, tourism and port, the latter often stems from agriculture, livestock breeding, aquiculture and rural domestic waste.

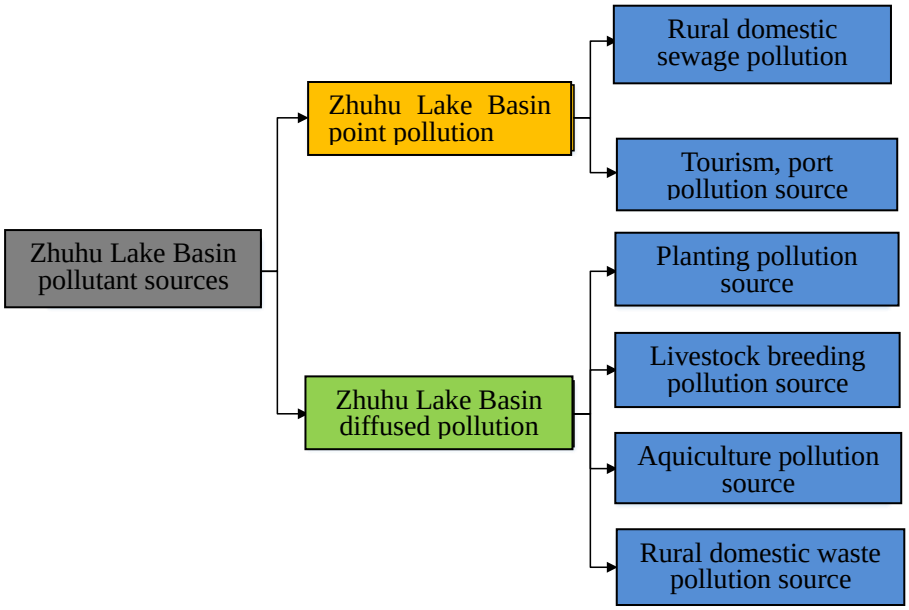


Fig. 3-5 Identification of Pollution Source

3.5.2.4 Pollution Emission in Zhuhu Lake Basin

1. Residents Domestic Pollution

Currently, drinking water in Zhuhu Lake Basin is supplied by lake water or distributed underground water. Nevertheless, there is no drainage facility, as a result, domestic sewage is

discharged along the terrain without treatment. Sewage output of township or towns in the Basin is calculated as following:

$$W_{生\,1p} = N_{城} \times \alpha_1$$

In which:

N 城 —— Population of cities (townships), towns;

Error! Reference source not found. —— Domestic discharge coefficient of pollutant in cities (townships), towns;

The following table shows discharge coefficient of domestic pollutant source in cities (townships), towns.

Table 3-9 Discharge Coefficient of Domestic Pollutant Source

Level	Sewage Output(L/capta•d)	Pollution Factor (g/capita•d)		
		COD	TN	TP
Urban Area	150	50	8.8	0.56
Rural Area	80	16.4	5	0.44

Amount of domestic sewage or pollutants flowing to rivers is calculated as below:

$$W_{生\,1} = \left(W_{生\,1p} - \theta_1\right) \times \beta_1$$

In which:

W 生1 —— Amount of domestic pollutants flowing to rivers;

W 生1P —— Emission amount of domestic pollutants;

Error! Reference source not found. —— Coefficient of domestic sewage into water as 0.9;

Error! Reference source not found. —— Amount of domestic pollutants eliminated by sewage plant.

There is no centralized sewage treatment plant in the project area, **Error! Reference source not found.** value is 0. Total population of the Basin in 2014 was 947,310,000, the number of people concerning domestic sewage is counted by permanent residents (coefficient as 0.8). Coefficient of flowing to the Lake is calculated by 0.9, then total domestic sewage load into the lake is as following table.

Table 3-10 Total Domestic Sewage Load into the Lake

Township/Town	Wastewater into Lake (10,000 t/a)	Amount of Pollutant Emission (t/a)		
		COD	TN	TP
Tuanlin Township	14.089	25.994205	7.9250625	0.6974055

Township/Town	Wastewater into Lake (10,000 t/a)	Amount of Pollutant Emission (t/a)		
		COD	TN	TP
Baishazhou Township	13.14	24.2433	7.39125	0.65043
Sishilijie Town	14.965	27.610425	8.4178125	0.7407675
Zhuhu Township	16.352	30.16944	9.198	0.809424
Gaojialing Town	16.1476	29.792322	9.083025	0.7993062
Shuanggang Town	146.5986	270.474417	82.4617125	7.2566307
Total	221.2922	408.284109	124.4768625	10.9539639

(2) Pollution Source of Planting

The following is calculation method of planting pollutants in the Basin:

$$W_{农} = W_{农P} \times \beta_2 \times \gamma_1$$

In which:

$W_{农}$ —— Amount of farmland pollutants into the lake;

$W_{农P}$ —— Amount of farmland pollution emission;

Error! Reference source not found. ——Coefficient of farmland into the lake, taking 0.3-0.5;

Error! Reference source not found. ——Coefficient of correction.

$$W_{农P} = M \times \alpha_2$$

In which:

M —— Cultivated area;

Error! Reference source not found. —— Coefficient of farmland pollution emission, see table below.

Table 3-11 Fertilizer Input

Township /Town	Chemical Fertilizer Folding Stock (t)	Nitrogen Fertilizer (t)	Phosphate Fertilizer (t)	Potash Fertilizer (t)	Compound Fertilizer(t)	Total Sown Area (hm^2)	Fertilizing Intensity (kg/hm^2)
Tuanlin Township	823	101	220	80	422	2689	306.06
Baishazhou Township	63	13	14	5	31	417	90.65
Sishilijie Town	330	73	53	38	166	2370	83.52

Township /Town	Chemical Fertilizer Folding Stock (t)	Nitrogen Fertilizer (t)	Phosphate Fertilizer (t)	Potash Fertilizer (t)	Compound Fertilizer(t)	Total Sown Area (hm^2)	Fertilizing Intensity (kg/hm^2)
Zhuhu Township	805	201	195	96	313	1818	265.68
Gaojialing Town	894	213	40	94	547	2622	204.58
Shuanggang Town	2844	1282	534	202	826	3775	451.93
Total	5759	1883	1056	515	2305	13691	420.64

Table 3-12 Coefficient of Farmland Pollution Emission (kg/ha•a)

Farmland	COD	TN	TP
Pollution Emission Coefficient	10	4	0.5

Table 3-13 Amount of Farmland Cultivation Pollution into the Lake (t/a)

Township/ Town	Amount of Loss			Amount of Entering the Lake		
	COD	TN	TP	COD	TN	TP
Tuanlin Township	403.35	161.34	20.1675	201.675	80.67	10.08375
Baishazhou Township	62.55	25.02	3.1275	31.275	12.51	1.56375
Sishilijie Town	355.5	142.2	17.775	177.75	71.1	8.8875
Zhuhu Township	272.7	109.08	13.635	136.35	54.54	6.8175
Gaojialing Town	393.3	157.32	19.665	196.65	78.66	9.8325
Shuanggang Town	566.25	226.5	28.3125	283.125	113.25	14.15625
Total	2053.65	821.46	102.6825	1026.825	410.73	51.34125

Planting area in the Basin reaches 13,691 hm^2, about 50% of farmlands in townships or towns are far away from the Lake. The coefficient of point pollution from farmland planting into the Lake is 0.5, then amount of pollutants entering the Lake in 2014 was COD of 1,026.825 t/a, TN of 410.73 t/a，TP of 51.34 t/a.

(3) Pollution Source of Livestock Cultivation

Amount of livestock cultivation pollution into rivers is calculated as below:

$$W_{畜禽} = W_{畜禽P} \times \beta_3$$

In which:

$W_{畜禽}$ —— Amount of livestock cultivation pollution into rivers;

$W_{畜禽P}$ —— Amount of livestock cultivation pollution emission;

Error! Reference source not found. —— Coefficient of livestock cultivation into rivers, taking 0.12.

$$W_{畜禽P} = \delta_1 \times t \times N_{畜禽} \times \alpha_3 + \delta_2 \times t \times N_{畜禽} \times \alpha_4$$

In which:

Error! Reference source not found. ——Daily manure output for individual livestock;

t —— Feeding period;

$N_{畜禽}$ —— Feeding quantity;

;**Error! Reference source not found.** —— Average pollutants in livestock manure;

Error! Reference source not found. —— Daily urine volume of individual livestock;

Error! Reference source not found. —— Average pollutant in livestock urine.

Table 3-14 Amount of Major Livestock on Hand in Townships/Towns of Zhuhu Lake Basin 2014

Townships/Towns	Livestock on Hand		
	Pig (herd)	Cattle (herd)	Poultry (hundred)
Tuanlin Township	4532.4	3273	555.6
Bashazhou Township	687.6	769.2	315
Sishilijie Town	8051.4	3445.8	531
Zhuhu Township	5048.4	2374.8	1069.2
Gaojialing Town	11017.8	2674.2	955.2
Shuanggang Town	6866.4	4776	1098.6
Total	36204	17313	4524.6

Table 3-15 Pollution Discharge Coefficient of Livestock Cultivation

Pollutant	Pig Manure	Pig Urine	Cattle Manure	Cattle Urine	Poultry
COD Equivalent Amount	20.7	5.91	226.3	21.9	1.165

Pollutant	Pig Manure	Pig Urine	Cattle Manure	Cattle Urine	Poultry
(kg/herd•a)					
TN Equivalent Amount (kg/herd•a)	2.34	2.17	31.90	29.20	0.28
TP Equivalent Amount (kg/herd•a)	1.36	0.34	8.61	1.46	0.15

Livestock feeding and discharge intensity of nutrient salt in townships or towns in the Basin is shown in following table, and coefficient of entering the Lake is estimated by 0.12. In 2014, pollution load into the Lake of livestock feeding pollution is COD of 631.89 t/a，TN of 146.68 t/a，TP of 28.39 t/a.

Table 3-16 Output of Livestock Manure and Urine and Amount into the Lake (t/a)

Townships/Towns	Output			Amount into the Lake		
	COD	TN	TP	COD	TN	TP
Tuanlin Township	933.61	220.58	40.75	112.03	26.47	4.89
Bashazhou Township	209.58	50.19	8.96	25.15	6.02	1.08
Sishilijie Town	1070.11	247.00	48.47	128.41	29.64	5.82
Zhuhu Township	725.01	168.17	32.66	87.00	20.18	3.92
Gaojialing Town	958.03	213.35	45.80	114.96	25.60	5.50
Shuanggang Town	1369.40	323.09	59.93	164.33	38.77	7.19
Total	5265.75	1222.37	236.57	631.89	146.68	28.39

(4) Pollution Source of Aquaculture

Calculation method of aquaculture pollutant flowing into rivers is as below:

$$W_{水产} = W_{水产P} \times \beta_4$$

In which:

$W_{水产}$ —— Amount of aquaculture pollutant flowing into rivers;

$W_{水产P}$ —— Amount of aquaculture pollution emission;

Error! Reference source not found. ——Coefficient of aquaculture into rivers, taking 0.1.

Coefficient of aquaculture pollution emission is revealed below.

Table 3-17 Coefficient of Aquaculture Pollution Emission (t/ 10,000 ha)

Farmland	COD	TN	TP
Coefficient of Pollution Emission	5	4.4	0.36

In 2014, aquaculture area in Zhuhu Lake amounts to 230 ha, large-scale aquaculture is separated from Zhuhu Lake by dams and small-size aquaculture scatters along the Lake. As estimated, COD, TN and TP emitted by aquaculture within the Basin in2014 was 1.73 t/a, 1.52 t/a, 0.12 t/a respectively.

Table 3-18 Volume of Aquaculture Emission (t/a)

Item	COD	TN	TP
Volume of Pollutant Emission	1.73	1.52	0.12

(5) Rural Domestic Waste Pollution

Output of domestic waste in the Basin is measured by 0.8kg/capita•d, by the end of 2014 total output of waste was 22,129 t/a.

$$Q=0.365\times A\times F$$

In which:

Q —— Output of domestic waste, ton/year;

A ——Population of year forecest, capita;

F —— Domestic waste output per capita，kg/capita•d，measured by 0.8 kg/capita•d.

Table 3-19 Domestic Waste Output in Zhuhu Lake 2014

Township/Town	Permanent Resident (capita)	Waste Output (t/a)
Tuanlin Township	4825	1408.9
Baishazhou Township	4500	1314
Sishilijie Town	5125	1496.5
Zhuhu Township	5600	1635.2
Gaojialing Town	5530	1614.76
Shuanggang Town	50205	14659.86
Total	75785	22129.22

(6) Tourism Port Pollution

Presently, tourism in the region has a large number of arrivals, but tourists usually do not board or lodge there, so domestic wastewater mainly comes from staffs of

Administration Committee. Now there is integral sewage treatment facility with designing capacity of 100m^3/d and the actual capacity is 30m^3/d. And water quality of outlet contains COD lower than 30mg/L and NH3-N less than 5mg/L, sewage after treatment can be discharged into Zhuhu Lake through purification of constructed wetland system.

Fig. 3-6 Sewage Treatment Facility of Wetland Park Administration Committee

(7) Summary

Based on survey and analysis on pollution in the Basin and surrounding areas, 6 townships or towns there fall into 6 control units. Estimation of pollution source in control units is shown in the table below. According to the summary table, among the 6 control units, Shuanggang Town tops in pollution emission and Baishazhou Township has the smallest volume. Among all those pollution sources, farmland planting presents the largest pollution load, followed by domestic pollution source and that of livestock cultivation, and aquaculture is the least one.

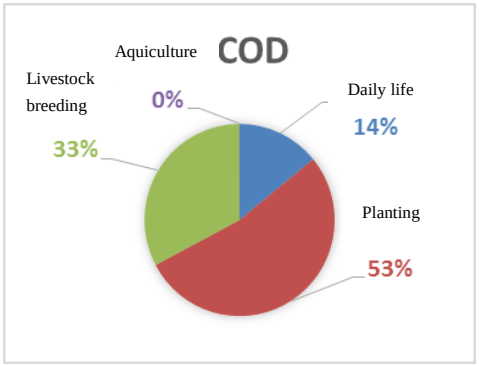
Table 3-20 Point Load Estimation of Rural Production and Domestic Pollution

Township/Town	Pollution into the Lake (t/a)		
	COD	TN	TP
Tuanlin Township	341.43	116.58	15.80
Baishazhou Township	80.67	25.92	3.29
Sishilijie Town	333.77	109.16	15.44
Zhuhu Township	253.52	83.92	11.55
Gaojialing Town	341.41	113.35	16.13
Shuanggang Town	717.93	234.48	28.60
Total	2068.72	683.41	90.81

Table 3-21 Pollutants Load of Various Sources into the Lake

Type of Pollution Source	Volume of Major Pollutant into the Lake (t/a)		
	COD	TN	TP
Domestic	408.28	124.48	10.95
Farmland Planting	1026.83	410.73	51.34
Livestock Cultivation	631.89	146.68	28.39
Aquaculture	1.73	1.52	0.12

Type of Pollution Source	Volume of Major Pollutant into the Lake (t/a)		
	COD	TN	TP
Total	2068.72	683.41	90.81



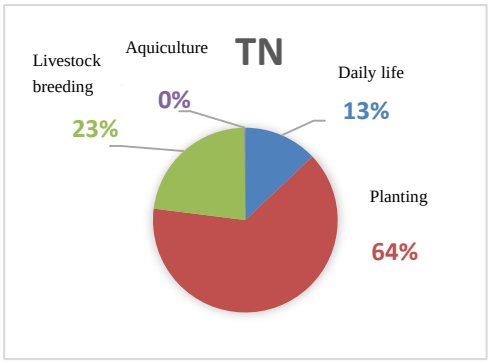


Fig. 3-7 Contribution of Pollution Source to COD Fig. 3-8 Contribution of Pollution Source to TN

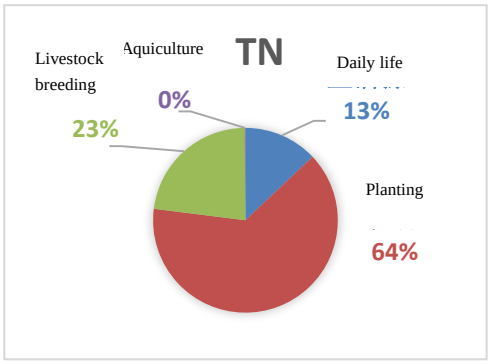


Fig. 3-9 Contribution of Pollution Source to TP

3.5.2.5 Problems of Water Environment in Zhuhu Lake Basin

1. Incomplete Pollution Control System along Zhuhu Lake

There is no industrial point sources but domestic point source and sewage from port in Zhuhu Lake Basin. Currently, membrane filter facilities are set up at ports, and domestic sewage will not be discharged into Zhuhu Lake before treatment of filter plant and wetland. Interception range along the Lake, at present, blocks and controls sewage in Wetland Park tourism service area instead of covering the whole region surrounding the Lake. Wastewater from nearby villages and tourist reception stations emits into Zhuhu Lake directly, which affects water quality close to the shore drastically. There are 6 townships or towns around the Lake, and about 300 natural villages within the periphery of 2 km. These townships, towns and villages are not equipped with road networks, only have discontinuous roadside ditches. Most of these ditches filled with rubbish and sludge are narrow and out of repair for years. The ditches cannot collect sewage and in some section of roads even have no drainage ditch, thus, sewage overflows. Moreover, there is no treatment system for sewage interception ditches. It is common that rural domestic sewage and wastewater of residents living in

mid-lake island are drained into the Lake directly, and consequently, organic pollution is concentrated in the Lake.

2. Serious Point Pollution in Zhuhu Lake Basin

The Lake maintains water quality as required in Category I-III of surface water standard, but the indicator of TP is likely to exceed the limit, and TP of some Zhuhu Lake water outside conservation area is above Category III. The pressure of over-limit TP is emerging gradually. Development of fishery and large-scale livestock feeding, especially cage culture of fish fry and fish feeding lead to rapid growth of phytoplankton. Heavy use of fertilizer in agriculture and low utilization of fertilizer and pesticide result in substantial increase of nitrogen and phosphorus pollutant in the Lake, whose water quality is deteriorating accordingly.

As analyzed, farmland planting is the biggest source of COD emission, taking up 53%. The next source is livestock feeding, accounting for 33%. The largest pollution source of TN is also farmland planting, making 64% of the total, and the following source is livestock cultivation, consisting of 23%. Farmland planting tops in the sources of TP emission, contributing to 59%, and the second source is livestock feeding, taking up 33%. Agricultural structure in rural area is simple, farmers have little access to become rich. There is a large proportion of planting in the Lake region, accounting for more than 60%. Point pollution of agriculture threatens ecosystem, water environment of Zhuhu Lake in particular.

3.5.2.6 Risks Threatening Water Environment in Zhuhu Lake Basin

In the 1980s, most water of Zhuhu Lake met Category I and II with little Category III water, presenting a tendency of gradually worsening. In recent years, Category III water rises due to development of tourism and towns, and accordingly proportion of Category I and II water decreases. Plenty of domestic pollution enters the Lake, concentration of organic pollution aggravates in some waters. As the source of drinking water for Poyang County, it is in dire need of taking measures to protect the ecosystem, to control pollution source and to cut down pollutant emission. As a result, eutrophication of some waters can be prevented, and the Lake can serve as the source of drinking water and maintain healthy ecosystem.

3.5.3 Acoustic Environment Situation

(1) Monitoring Sites

See the Table below for monitoring sites of acoustic environment.

Table 3-22 Monitoring Sites of Acoustic Environment

No.	Name of Sensitive Point	Longitude and Latitude of Monitoring Sites	Type
N_1	Zhuhu Township	N 29°11'12.34", E 116°40'52.81"	Community Noise
N_2	Tuanlin Township	N 29°7'51.15", E 116°39'57.16"	Community Noise
N_3	Gaojialing Town	N 29° 9'24.87", E116°42'57.74"	Community Noise
N_4	Sishilijie Town	N 29° 7'9.86", E 116°44'15.50"	Community Noise
N_5	Shuanggang Town	N 29° 6'41.49", E 116°38'10.93"	Community Noise
N_6	Baishazhou Township	N 29° 9'35.02", E 116°38'35.85"	Community Noise

(2) Assessment Standard: Assessment of acoustic environment status adopts Category 1 in *Acoustic Environment Quality Standard* (GB3096-2008) (55 dB (A) for the day, 45dB (A) for the night).

(3) Assessment Method: Monitoring data is selected through extremum method, and is assessed by comparing with standard value.

(4) Monitoring and Assessment Results

Table 3-23 Monitoring and Assessment Results of Acoustic Environment (dB(A))

No.	Name of Monitoring Sites	Monitoring Date	Monitoring Time	Monitoring Result	Limit Value	Assessment Result
N1	Zhuhu Township	2016.06.13	8:48-9:08	49.6	55	up to the standard
		2016.06.13	22:11-22:31	43.6	45	up to the standard
N2	Tuanlin Township	2016.06.13	11:15-11:35	51.4	55	up to the standard
		2016.06.14	00:18-00:38	43.6	45	up to the standard
N3	Gaojialing Town	2016.06.13	12:30-12:50	52.4	55	up to the standard
		2016.06.14	01:23-01:43	43.3	45	up to the standard
N4	Sishilijie Town	2016.06.13	11:58-12:18	54.7	55	up to the standard
		2016.06.14	00:49-01:09	42.2	45	up to the standard
N5	Shuanggang Town	2016.06.13	10:24-10:54	50.4	55	up to the standard
		2016.06.13	23:39-23:59	42.3	45	up to the standard
N6	Baishazhou	2016.06.13	9:30-9:50	53.9	55	up to the

	Township					standard
		2016.06.13	22:48-23:08	43.8	45	up to the standard

As the monitoring results shown, day and night data of all monitoring sites are in accordance with Category 1 in *Acoustic Environment Quality Standard* (GB3096-2008) (55 dB (A) for the day, 45dB (A) for the night), indicating desirable acoustic environment in the project area.

4 Analysis of Alternatives

The analysis on comparison and selection of alternatives of this project consists of three parts, namely, analysis on comparison and selection of Zero Alternative, Technical Plan and Treatment Process Plan. The general principles of this analysis are:

(1) Quantification comparison and selection: To each alternative, we should quantify effects which the project implementation exerts to the environment as much as possible.

(2) Comprehensive comparison and selection: We should comprehensively compare and analyze from environment, technology, economy, society and many other aspects.

(3) Conformity comparison and selection: The alternative we select should conforms to the related development plan and standard requirement, and adapts to the local conditions.

4.1 Comparison and Selection of Zero Alternative

From the perspective of environmental profit and loss and social economy, the evaluation on environmental influence of Zero Alternative conducts the analysis on comparison and selection about having this alternative or not, results are shown in Table 4-1.

Table 4-1 Analysis on Comparison and Selection of Zero Alternative

Type	Implementing the Project Alternative	Not implementing the Project Alternative (Zero Alternative)
Main Advantage	(1) Conforming to the national policy of municipal sewage treatment and pollution prevention technique; (2) According with the Plan of Poyang Lake Eco-Economic District; (3) Beneficial to protect the water quality of Zhuhu Lake, till 2023, three pollutants TN, TP and COD discharged in Zhuhu Lake are estimated reduced annually by 484.70t, 33.43t and 1886t. (4) Further improvement of pipe and net facilities surrounding the Lake.	(1) Maintaining the status quo, for instance, vegetation would not be damaged; (2) Not changing the utility value of land (no occupation of land, etc.); (3) No vegetation damage, raising dust and other environmental problems during construction period.
Main	(1) Occupation of land; Land acquisition	(1) Untreated waste water directly

Disadvantage	(2) Vegetation damage during construction period with dust raised, which affects ecological environment;	enters into surface water, seriously polluting the source of drinking water; (2) The trend of water quality deterioration currently could not be stopped at all.
Comprehensive Analysis	From the perspective of society and environment, implementation of this project alternative advantages over Zero Alternative.	

According to Table 4-1, although the effect of construction and operation environment do not appear in Zero Alternative, the source of drinking water would be seriously polluted undoubtedly with the existing sewage pouring into the natural environment. Though implementing this project alternative would bring about some certain environmental impacts, they could be avoided and reduced through corresponding environmental protection measures. Besides, the environmental influences during operation period are temporary, however, the social and environmental benefits brought by the implementation and operation of project are long-range, especially the positive effect in protecting and improving water quality in Zhuhu Lake valley, perfecting city infrastructure, etc. Therefore, from the view of promoting social and economic development and protecting environment, implementing this project alternative is superior to Zero Alternative. As a result, project construction is necessary.

4.2 Comparison and Selection of Technical Plan

4.2.1 Technical Plan of Rural Domestic Sewage Collection and Treatment Sub-project in Zhuhu Lake Basin

According to the scale and distribution characteristics of domestic sewage of national villages and towns, take Shuanggang Town as an example, two patterns could be applied to adjust the sewage treatments to local conditions. Alternative One: “Centralized” sewage treatment pattern among villages and towns or villages contacted; Alternative Two: “Decentralized” sewage treatment pattern in each village.

Table 4-2 Comparison and Selection of Domestic Sewage Treatment Pattern of Village and Town

Project	Alternative One	Alternative Two
Treatment Pattern	Relatively “centralized”	“Decentralized” sewage treatment

Project	Alternative One	Alternative Two
	sewage treatment	
Project Description (e.g. Shuanggang Town)	The sewage of eight villages along the line which out through pressure pipe eventually converge in the centralized sewage treatment facility.	Eight villages along the line respectively establish eight decentralized sewage treatment facilities. Sewage would drain into Zhuhu Lake when up to the standard.
Implementation Difficulty	The terrain at which the project situates is complex, and the construction is difficult.	The sewage drains into Zhuhu Lake nearby, and the implementation gets less difficulty.
Environmental Benefit	Farmland and cultivated land damage, low environmental benefit.	Small land occupation, high environmental benefit with decentralized sewage treatment.
Social Benefit	Pipes along the line involve farmland, dry land, watercourse and a wide range of residents, containing high construction risk.	Selecting sites in village, containing low construction risk.
Main Project Quantity (E.g. Shuanggang Town)	Pressure pipe: 20km; sewage lift pumping station: 7; centralized sewage treatment station: 1 (700t/d);	Decentralized sewage treatment station: 8 (50t/d~250t/d)
Project Investment (E.g. Shuanggang Town)	8.5 million yuan	5.15 million yuan
Operation Cost (E.g. Shuanggang Town)	3.0 yuan/t	1.2 yuan/t
Advantage	1. Suitable for the regions with high population density and sewage centrally generating; 2. The operation of reliable and efficient management and control of sewage treatment; 3. Consistent collection, transport and treatment.	1. Applied to various occasions and scales, flexible construction and treatment pattern, and short construction cycle; 2. Small floor space, low cost of capital construction and operation; 3. Flexible use of treatment techniques with good effect of nitrogen and phosphorus removal. 4. Locally collect, treat, discharge and recycle;
Disadvantage	1. Large investment of sewage pipe and high operation maintenance charge; 2. Long-term transport of sewage in pipes and nets would lead to sewage leakage which would result in soil and underground water pollution and difficult utilization of reuse water;	1. Many stations, involving lots of station site selections; 2. The amount of sewage treatment in each station is low.

Project	Alternative One	Alternative Two
	3. The polluted sludge produced by project is not suitable for agricultural reuse and needs innocent treatment.	
Conclusion		Alternative recommended

According to the site survey of the villages in Zhuhu Lake Basin, we find that villages surrounding Zhuhu Lake distribute dispersedly and are not included in the coverage area of municipal pipes and nets with relatively great fluctuation of sewage quality and quantity. Decentralized sewage treatment pattern drains sewage off locally, possessing many advantages, such as economical pipe and net construction and maintenance cost, small land occupation and low implementation difficulty with less environment influence. Therefore, it is more appropriate for this project to adopt decentralized sewage treatment pattern.

4.2.1 Technical Plan of Water System Ecological Restoration and Protection Project in Zhuhu Lake Basin

The ecological remediation and protection sub-project of water system of Zhuhu Lake Basin mainly aims to treat non-point source pollution with major treatment technical plans, namely, constructed wetland technique, artificial floating island technique and ecological slope protection technique. Comparison and selection of these three techniques are shown in the table below.

Table 4-3 Comparison and Selection of Diffused Source Pollution Treatment Techniques

Type	Constructed Wetland Technique	Artificial Floating Island Technique	Ecological Slope Protection Technique

Introduction	Through the optimization and combination of physical, chemical and biological effect of constructed wetland ecological system, treating sewage by making use of synergistic effect of physical, chemical and biochemical reaction in constructed wetland ecological system.	Simulating floating blanket swamp forming during the process of natural river and lake swampiness to create a special wetland sewage treatment technique.	Ecological service function is mainly realized through the interception, transpiration and permeation of vegetation canopy, dry layer, earth surface, litter layer and underground root layer.
Range Applied	All kinds of land mass	Mostly in swamp surrounding river and lake bank, etc.	Mostly in lake bank, etc.
Purification Mechanism	Optimization and combination of physical, chemical and biological effect	Physical effect	Physical effect
Advantage	Applied in wide range with strong shock resistance capability	Good landscape effect	Dual functions of ecological service and engineering protection
Disadvantage		Great maintenance difficulty	Limited construction site
Project Cost	Medium	Low	High
Maintenance Charge of Project	Medium	Medium	Medium
Alternative Recommended	Alternative recommended		

Compared with the technical plans of artificial floating island and ecological slope protection, constructed wetland plan possesses wider application range and stronger shock resistance capability with lower project cost and maintenance charge. Besides, taking terrain of Zhuhu Lake Basin into consideration, we recommend constructed wetland technique as main treatment alternative in water system ecological remediation project. As to the regions where surface runoff could not converge in existing ditch, ecological sewage interception trench would be set up to intercept and reduce pollutants.

4.3 Comparison and Selection of Technology

4.3.1 Comparison and Selection of Water Pollution Treatment Technology of Sewage Treatment Plant

The sewage treatment plant possesses three frequently-used technologies, that is, FMBR technology, biological contact oxidation technology and biological rotating disc technology. The comparison and selection of these three technologies are shown as follows.

Table 4-4 Comparison of Sewage Treatment Technology of Sewage Treatment Plant

Type	FMBR technology	biological contact oxidation technology	biological rotating disc technology
Introduction	sewage→grille →FMBR→effluent	sewage→grille→biological film+sand leach→effluent	sewage→regulating reservoir→ A^2/O+rotating disc→effluent
Feasible Use Scale	Proper size, appropriate centralization and decentralization	Proper size, appropriate centralization and decentralization	Proper size, appropriate centralization and decentralization
Organic Excess Sludge	No	Yes	Yes
Resistance to Impact Load	Strong	Strong	Strong
Effluent Quality	First-class A	First-class A	First-class A
Requirement for Professional Staff	No	No	No
Investment of Treatment Station (yuan/ton of water)	3500~4500	5000~6500	6000~7500
Floor Space (m^2/m^3)	0.3~0.4	0.3~0.4	0.3~0.4
Direct Operation Cost (yuan/ton of water)	1.0~1.2	1.0~1.2	1.0~1.2
Comprehensive Performance	Alternative recommended		

From the table above, all these three technologies could reach first-class A in terms of stable water output with fairly equal operation cost. Among these technologies, FMBR technology possesses low project cost and would not generate sludge through

auto-digestion, reducing the cost of sludge treatment. Therefore, FMBR technology is recommended in this project.

4.3.2 Comparison and Selection of Constructed Wetland

4.3.2.1 Comparison and Selection of Constructed Wetland Type

Common constructed wetlands include surface flow constructed wetland, horizontal subsurface flow constructed wetland, upward vertical subsurface flow constructed wetland and downward vertical subsurface flow constructed wetland. Different constructed wetland types differ in technology and function with relatively prominent advantage and disadvantage. The following part would select the wetland type which is proper for the project through the specific analysis and discussion towards each wetland on the basis of project site, investment, feasibility and other comprehensive indexes.

1. Surface Flow Constructed Wetland

Surface flow constructed wetland is most similar to the natural wetland among various constructed wetlands. Without any sand and gravel as matrix, surface flow constructed wetland could be formed through little transformation of existing watercourse and bottomland. Meanwhile, the transformation would not affect the flood control and flood discharge function of the original river network, as well as the land function of bottomland. Sewage overflows cross the matrix surface of surface flow constructed wetland with water surface exposing in air, getting oxygen supply through diffusion on surface. Between constructed wetland bodies or channels partitions are set, and sometimes on the bottom waterproof materials are paved in order to protect underground water from sewage infiltration. The reservoir is generally filled up with soil, sand, coal cinder or other matrix materials for aquatic plants to fix roots. With relatively shallow water level and slow water velocity, surface flow constructed wetland usually flows through each processing unit by horizontal flow. The removal of the majority of organic matters are completed by the biological films which grow on plant stems and stick under the water.

The water level of surface flow constructed wetland is higher than the constructed wetland matrix, usually with the depth of water of 0.20~0.40 m. In this kind of constructed wetland, sewage flows into the entrance in a certain depth and slow speed to cross the constructed wetland surface. After parts of the sewage evaporating or infiltrating into constructed wetland, the left sewage flows out through overflow weir.

2. Horizontal Subsurface Flow Constructed Wetland

Water level of horizontal subsurface flow constructed wetland lies under the base layer. As the most extensive researched and applied system of sewage treatment, this type of constructed wetland is featured by plant system using various filling such as reed bed.

Horizontal subsurface flow constructed wetland is constituted by upper layer and under-layer. The upper layer is soil planting with aquatic plants, hygrophytes and helophyte, including reed, Acorus calamus, cattail and Scirpus validus Vahl. The under-layer lies root zone making up by media for water flowing, such as gravel of large size, slag and sand. Impermeable layer or impermeable membrane is constructed under the wetland to prevent sewage leakage during the treatment process from contaminating surface water or underground water. Base of constructed wetland is slightly inclined. Entering water flows slowly from root zone, base layer to outlet horizontally, there is adjusting and water collecting device at the outlet to keep sewage contacting with plant roots. Since roots transfer or release oxygen and leads to aerobic process, oxygen deficit and anaerobic process in surrounding environment, which is a vital mechanism of eliminating pollutants such as nitrogen.

3. Vertical Flow Constructed Wetland

Water direction of vertical flow constructed wetland is vertical with the root zone, the current flows vertically from upper layer to the lower, and outlet device of this wetland usually lies in the bottom. Constructed wetland of this type is to transmit more oxygen to wastewater and base layer, and its top layer often consists of impermeable sand bed allowing water entrance intermittently. Sewage drained on the sand bed floods the surface and then seeps into the bottom gradually, and is collected by pipelines in the bottom of outlet and finally is discharged from treatment system of constructed wetland. Air enters the filler before another water intake, so wastewater will fully contact with the air and improve transmitting efficiency. Oxygen in the air can be conveyed into the treatment system of constructed wetland through irrigation discharge, ventilation and planting. In this way, removal of COD and nitrification of NH3-N can be strengthened, and wetland plants will also transfer some oxygen to root zone.

Vertical subsurface wetland falls into two modes, which are upward and downward. The upward mode is featured by denitrification ability and the downward is characterized nitrifying capacity.

Based on analysis and comparison of constructed wetland types and features as well as actual characteristics of the project, major technical indicators of the three constructed wetland treatment are shown as following:

Table 4-5 Comparison of Constructed Wetland Types

Parameter	SFW	HSF	Upward Vertical Flow Constructed Wetland	Downward Vertical Flow Constructed Wetland
Way of Water Flow	Surface Cross Flow	Horizontal Subsurface Flow	Upward Vertical Flow	Downward Vertical Flow
Load	Low	Relatively High	High	High
Area	Large	Medium	Small	Small
Structure	Simple	Medium	Complicate	Complicate
Construction Expense	Low	Relatively High	High	High
Season/Climate Impact	Great	Average	Average	Average
Sanitation	Poor	Good	Usual	Usual
Visual Effect	Good	Good	Not bad	Not bad
Organism Removal Ability	Ordinary	Strong	Strong	Strong
Nitrification Ability	Good	Good	Medium	Strong
Denitrification Ability	Weak	Strong	Good	Medium
Phosphorus Removal Capability	Weak	Good	Good	Good

According to the above Table, hydraulic loading of surface flow wetland is relatively low and is weak in treating pollutants. On the other hand, this type of wetland requires a large area but has a simple structure, low construction and maintenance cost. It also presents certain visual effect suitable for regions with large-scale ponds, which can be built from existing ponds or beach land.

Horizontal subsurface wetland boasts larger hydraulic loading and higher efficiency of pollution treatment and requires medium area of land. Moreover, it is capable of removing organism, TN and TP but costs more in construction and maintenance than surface flow constructed wetland.

Vertical subsurface wetland is classified into upward and downward mode, the former is featured by denitrification ability of TN and the latter by nitrifying capacity. Furthermore, vertical flow constructed wetland tops in hydraulic loading, pollutant treatment and occupies less land, but it has higher construction and maintenance and more complicated structure.

4.3.2.2 Identification of Constructed Wetland Types

On the basis of terrain survey, land features surrounding constructed wetland such as farmland, vacant area, pond and marsh land are summarized, among these land types farmland and vacant land are the representative ones, the former is predominate and the latter is smaller in size. Wetlands and marsh lands in the region have to be higher than nominal flooding level, and have certain area and ability of conserving water as well as are available.

Table 4-6 Features of the Project Regional Land

Wetland Direction No.	Land Type	Wetland Direction No.	Land Type
1	Farmland+Vacant land	52	Farmland+Vacant land+Marsh land
2	Farmland+Vacant land	53	Farmland+Vacant land
3	Farmland+Vacant land	54	Farmland+Vacant land
4	Farmland+Vacant land	55	Farmland+Vacant land
5	Farmland+Vacant land+Pond	56	Farmland+Vacant land
6	Farmland+Vacant land+Pond	57	Farmland+Vacant land
7	Farmland+Vacant land+Pond	58	Farmland+Vacant land
8	Farmland+Vacant land+Pond	59	Farmland+Vacant land
9	Farmland+Vacant land	60	Farmland+Vacant land
10	Farmland+Vacant land	61	Farmland+Vacant land
11	Farmland+Vacant land	62	Farmland+Vacant land
12	Farmland+Vacant land	63	Farmland+Vacant land
13	Farmland+Vacant land	64	Farmland+Vacant land
14	Farmland+Vacant land	65	Farmland+Vacant land
15	Farmland+Vacant land	66	Farmland+Vacant land
16	Farmland+Vacant land	67	Farmland+Vacant land
17	Farmland+Vacant land	68	Farmland+Vacant land
18	Farmland+Vacant land	69	Farmland+Vacant land
19	Farmland+Vacant land	70	Farmland+Vacant land
20	Farmland+Vacant land	71	Farmland+Vacant land
21	Farmland+Vacant land	72	Farmland+Vacant land
22	Farmland+Vacant land	73	Farmland+Vacant land
23	Farmland+Vacant land	74	Farmland+Vacant land
24	Farmland+Vacant land	75	Farmland+Vacant land
25	Farmland+Vacant land	76	Farmland+Vacant land
26	Farmland+Vacant land	77	Farmland+Vacant

			land+Marsh land
27	Farmland+Vacant land	78	Farmland+Vacant land
28	Farmland+Vacant land	79	Farmland+Vacant land
29	Farmland+Vacant land	80	Farmland+Vacant land
30	Farmland+Vacant land	81	Farmland+Vacant land
31	Farmland+Vacant land	82	Farmland+Vacant land
32	Farmland+Vacant land	83	Farmland+Vacant land
33	Farmland+Vacant land	84	Farmland+Vacant land
34	Farmland+Vacant land+Pond	85	Farmland+Vacant land
35	Farmland+Vacant land	86	Farmland+Vacant land
36	Farmland+Vacant land	87	Farmland+Vacant land
37	Farmland+Vacant land	88	Farmland+Vacant land
38	Farmland+Vacant land+Marsh land	89	Farmland+Vacant land
39	Farmland+Vacant land	90	Farmland+Vacant land
40	Farmland+Vacant land	91	Farmland+Vacant land
41	Farmland+Vacant land	92	Farmland+Vacant land
42	Farmland+Vacant land	93	Farmland+Vacant land
43	Farmland+Vacant land	94	Farmland+Vacant land
44	Farmland+Vacant land	95	Farmland+Vacant land
45	Farmland+Vacant land	96	Farmland+Vacant land
46	Farmland+Vacant land	97	Farmland+Vacant land
47	Farmland+Vacant land	98	Farmland+Vacant land
48	Farmland+Vacant land	99	Farmland+Vacant land
49	Farmland+Vacant land+Marsh land	100	Farmland+Vacant land
50	Farmland+Vacant land+Pond	101	Farmland+Vacant land
51	Farmland+Vacant land		

In line with the terrain and land features, the plan is to build 101 constructed wetlands of the above-mentioned three types. Based on their ability of removing pollutants, analysis of their area, cost estimation and operation cost is revealed as following.

Table 4-7 Comparison and Selection of Constructed Wetland

Wetland Type	Area (ha)	Cost Estimation (10,000 yuan)	Operation Cost (10,000 yuan/year)
Surface Flow Constructed Wetland	32	3200	32
Horizontal Subsurface Constructed Wetland	16	4800	400

Vertical Subsurface Constructed Wetland	11	6400	320

Because the project region mainly consists of farmland unavailable and has small-scale of vacant land, the plan prioritizes area of wetlands and adopts vertical subsurface constructed wetland occupying less land principally. Layout of this wetland is a combination of upward and downward to remove organism, TN and TP to the maximum extent. Although vertical subsurface constructed wetland costs highly in investment and operation, it is more feasible for requiring less land (no land acquisition) and avoiding unfavorable terrain.

Meanwhile, this kind of wetland can be rebuilt into surface flow constructed wetland by using advantageous terrain such as ponds and marsh land, sharing some or all of the pollution load and cut down engineering expanse by reducing the area of subsurface wetland.

Wetlands No. 5, 6, 7, 8, 34, 38, 49, 50, 52, 77 are surrounded by available fish ponds or marsh land and can be renovated into surface flow constructed wetland. And No. 38 and 49 possess certain scale and ability of cleaning, but do not meet the demand of dealing with sewage. Therefore, No. 38 and 49 can be a combination of vertical subsurface and surface flow constructed wetland to fulfill the requirement.

After the comparison and selection, the project is to adopt three wetland types or combination of wetlands, which are downward-upward vertical subsurface constructed wetland of type A, surface flow constructed wetland of type B, downward-upward vertical subsurface and surface flow constructed wetland of type C. Wetland types of regions are shown as below.

Table 4-8 Types of Constructed Wetlands

Wetland No.	Wetland Types	Wetland No.	Wetland Type	Wetland No.	Wetland Type
1	type A	35	type A	69	type A
2	type A	36	type A	70	type A
3	type A	37	type A	71	type A
4	type A	38	type C	72	type A
5	type B	39	type A	73	type A
6	type B	40	type A	74	type A

7	type B	41	type A	75	type A
8	type B	42	type A	76	type A
9	type A	43	type A	77	type B
10	type A	44	type A	78	type A
11	type A	45	type A	79	type B
12	type A	46	type A	80	type B
13	type A	47	type A	80	type B
14	type A	48	type A	81	type B
15	type A	49	type C	82	type B
16	type A	50	type B	83	type B
17	type A	51	type A	84	type B
18	type A	52	type B	85	type B
19	type A	53	type A	86	type B
20	type A	54	type A	87	type B
21	type A	55	type A	88	type B
22	type A	56	type A	89	type B
23	type A	57	type A	90	type B
24	type A	58	type A	91	type B
25	type A	59	type A	92	type B
26	type A	60	type A	93	type B
27	type A	61	type A	94	type B
28	type A	62	type A	95	type B
29	type A	63	type A	96	type B
30	type A	64	type A	97	type B
31	type A	65	type A	98	type B
32	type A	66	type A	99	type B
33	type A	67	type A	100	type B
34	type B	68	type A	101	type B

5 Environmental Impact Analysis and Mitigation Measures

5.1 Environmental Impact Analysis and Mitigation Measures during the Construction Period

5.1.1 Water Environmental Impact and Mitigation Measures during the Construction Period

5.1.1.1 Water Environmental Impact Analysis during the Construction Period

1. Relation Between the Project and the location of Drinking Water Sources

This project is set in the Zhuhu Lake basin of Poyang County. The construction goal of the project is to reduce water pollutants that are about to enter Poyang Lake Basin and improve water quality management. Zhuhu Lake waters fall within the range of Poyang Lake National Wetland Park. It is a first-grade protection zone and water source protection and conservation area of the wetland park. There are 7 centralized drinking water sources in the waters, namely Inner Zhuhu Lake Drinking Water Source Protection Area of Poyang County (Yangmei Bridge Water Plant), Water Intake of Zhongtang Water Plant of Sishilijie Town, Water Intake of Yongchang Water Plant on Sishilijie Street, Water Intake of Pozhong Water Plant of Poyang County (Gaojialing Town), Water Intake of Tuanlin Township Water Plant, Water Intake of Shuanggang Town, Water Intake of Zhuhu Township.

The objects of water environmental protection are listed in the following table.

Table 5-1 Objects of Water Environmental Protection

No.	Targets	Range	Water Intake Scale(*10^{4}m^3)	Contents of Construction Inside Protection Area	Distance Between Sewage Station and Boundary of Protection Area(m)	Relation Between Water Output of Sewage Station and the Targets
1	Zhuhu Lake Water Source Protection and	Zhuhu Lake Waters	/	None	/	wastewater shall be treated by

	Conservation Area of Poyang Lake Wetland Park						each plant and discharged into Zhuhu Lake after meeting relevant standards, to improve the situation where domestic water is discharged into Zhuhu Lake and reduce water pollutants
2	Inner Zhuhu Lake Drinking Water Source Protection Area of Poyang County	The first-grade protection area covers the waters and lands of 500m radius from the intake point and the second-grade protection area covers the waters and lands of 2500m radius from the boundary of the first-grade protection area	211.72	wastewater treatment plant	8 in total respectively in Lion Mountain, Ligongnao, Potangxu, Meihu Lake, Caojia Village, Zhongnao Village, Tangli Village, Bantang	100	In the protection area there are 20 wastewater treatment plants, whose outlets are 100m away from the second-grade protection area. There is no outlet set within the first-grade as well as the second-grade protection area.

					Village		
				Artificial Wetland	No.46, 47, 48, 49, 81 and 82, 6 in total	/	
3	Zhongtang Water Plant Water Source Protection Area of Sishilijie Town		3	Wastewater Treatment Plant	Caojiazui, Pantaozui, Penhu Village, Huangbi Spring, Chenli Village, Wangjia Village, Zhanjia Village, 7 in total.	100	
				Artificial Wetland	No.24, 29, 31, and 90, 4 in total.	/	
4	Yongchang Water Plant Water Source Protection Area of Sishilijie Town		20	Wastewater Treatment Plant	Luye Village, Caojiazui, Pantaozui, Penhu Village, Huang	100	

					bi Spring, Chenli Village, Wangjia Village, Zhanjia Village, 8 in total.		
				Artificial Wetland	No.25, 26, 27, 28, and 91, 5 in total.	/	
5	Panzhong Water Plant(Gaojialing) Water Source Protection Area		5.4	Wastewater Treatment Plant	Dazong Village, Zhuyundun, Luye Village, Caojiazui, Huangbi Spring, 4 in total.	100	
				Artificial Wetland	No.18, 19, 20, 21, 22, 23 and 88, 7 in total.	/	
6	Water Plant Water Source Protection Area of Tuanlin		3.8	Wastewater Treatment Plant	Pantaozui, Penhu Village,	100	

	Township				Huangbi Spring, Chenli Village, Wangjia Village, Zhanjia Village, 6 in total.		
				Artificial Wetland	No.24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 38, 39, 40, 41, 42, 43, 44, 95, 96 and 97, 21 in total.	/	
7	Water Plant Water Source Protection Area of Shuanggang Town		30	Wastewater Treatment Plant	Maojia Village, 1.	100	
				Artificial Wetland	No.53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65 and 99, 14 in total.	/	
8	Water Plant Water Source Protection		6	Wastewater Treatment	Dukou Village,	100	

	Area of Zhuhu Town			Plant	Zhoujia Village and Caojia Village, 3 in total.		
				Artificial Wetland	No.1, 2, 3, 4, 5, 6, 83, 84, 85 and 86, 10 in total.	/	

2. Water Environmental Impact Analysis during construction Period

Wastewater generated during construction period mainly includes domestic sewage and construction waste water generated by constructors. Main pollutants in wastewater include COD, BOD_5, SS, NH3-N and SS, and their generation is 4.8m^3/d; construction waste water mainly includes slime water from excavation of pipelines washing vehicles, which is in a small amount, and it also includes construction waste water generated from the process of sandstone washing, mixing and concrete placing etc., which mainly contains SS and petroleum etc.

The wastewater mentioned above, if arbitrarily discharged, will pollute the Zhuhu Lake waters. In particular, the wastewater produced in construction near the intake point, if not disposed properly, will seriously affect the quality of drinking water.

5.1.1.2 Mitigation Measures

Drinking water protection measures during construction period are proposed as follows:

1. Construction wastewater

(1) Constructors shall be informed that the water function of Zhuhu Lake waters is for drinking, and the range includes the centralized drinking water sources and the Zhuhu Lake water source reservation area of the wetland park. Strengthen the constructors' water protection education and improve their water protection awareness. Their behavior related to personal hygiene shall be strictly constrained, and swimming is also prohibited.

It is not allowed to arrange material stock yards, waste storage yards and construction camps etc. in the water source protection area, and they shall be set away from areas of

concentrated distribution of agricultural irrigation ditches as far as possible.

(3) Necessary drainage ditches shall be constructed for wastewater drainage. And sedimentation tanks shall be constructed for reuse of construction wastewater.

(4) When excavation is operated at rainwater and surface runoffs, temporary sedimentation tanks shall be set for sediment precipitation. Geotextile fences shall be set on the side of sedimentation tank outlet for a second sediment precipitation. Sedimentation tanks shall be bulldozered after construction.

(5) Smooth drainage of temporary roads for construction shall be ensured to prevent sediment from entering Zhuhu Lake during storms.

(6) It is not allowed to drain and dump wastewater, waste materials, earth and rocks, garbage and other solid wastes into Zhuhu Lake.

(7) Slurry produced during construction can't be discharged into Zhuhu Lake. It shall be pumped into sedimentation tanks by a grout pump and solidified through drainage and evaporation.

(8) Mechanical equipment flushing sewage will be sprinkled at the construction site for reducing dust after being treated in precipitation and oil separation tanks. It cannnot be discharged into water nearby, which will further pollute the water body of Zhuhu Lake.

(9) During construction, the land sections under construction shall keep clean, and sewage and pollutants shall be prevented from entering the ditches under excavation, which will result in sewage permeation.

(10) Try to construct in non-flood seasons as much as possible, which can reduce the effects of shallow depth to groundwater on the construction.

(11) Construction machines shall be inspected regularly to avoid leakage oil products.

2. Domestic Sewage

Houses of villagers will be rented at the construction campsite. Domestic sewage from constructors will be treated by the existing domestic sewage treatment facilities and shall not be discharged into Zhuhu Lake. In terms of temporary storage of domestic garbage, measures of seepage and loss prevention shall be carried out according to related requirements.

After taking measures stated above, sewage produced during construction will not have adverse impacts on the centralized drinking water source protection area as well as Zhuhu Lake water source conservation area of the wetland park.

5.1.2 Impact on the Ambient Air Quality and Mitigation Measures during the Construction Period

5.1.2.1 Analysis of Impacts on Ambient Air Quality during the Construction Period

(1) Dust generated by construction vehicles

According to related documents, air-borne dust produced by moving vehicles during construction take up over 60% of the total amount. Dust produced by moving vehicles, in a completely dry condition, can be calculated according to following empirical formula:

$$Q = 0.123(V/5)(W/6.8)^{0.85}(P/0.5)^{0.75}$$

Where: Q--dust generated from vehicles' transportation, kg/km · vehicle;

V--vehicle speed, km/h;

W--loading capacity, t;

P--dust amount on the road, kg/m^2.

Table 5-1 shows the different amount of air-borne dust that produced by a ten-ton truck when traveling through a 1-km road of different cleanliness in different speed. Thus it can be seen that, when traveling through roads of the same cleanliness, a truck in a higher speed will raise more dust; and when in the same speed, the dirtier the road is, the more dust a truck will raise. Therefore, limiting vehicle speed and keeping the road clean are the two most effective ways to reduce air-borne dust raised by vehicles.

Table 5-2 Air-borne Dust Amount under Different Vehicle Speed and Different Road Cleanliness

Amount of Dust / Vehicle Speed	0.1 kg/m^2	0.2 kg/m^2	0.3 kg/m^2	0.4 kg/m^2	0.5 kg/m^2	1.0 kg/m^2
5 (km/m^2)	0.0511	0.0859	0.1164	0.1444	0.1707	0.2871
10 (km/m^2)	0.1021	0.1717	0.2328	0.2888	0.3414	0.5742
15 (km/m^2)	0.1532	0.2576	0.3491	0.4332	0.5121	0.8613
25 (km/m^2)	0.2553	0.4293	0.5819	0.7220	0.8536	1.4355

Meanwhile, if roads are sprinkled with water frequently (4~5 times every day) during construction period, dust in the air can be reduced by about 70%, which shows a good dust suppression effect.

(2) Dust in the construction site

The other main source of dust during construction period is wind-blown dust from

open-air storage grounds and bare grounds. Building materials are stored in the open, the top soil of some construction sites needs to be hand-excavated and temporarily stacked. In a dry and windy climate, air-borne dust will certainly be raised. The amount of air-borne dust can be calculated according to the empirical formula for stockyard dust calculation:

$$Q = 2.1(V_{50} - V_0)^3 e^{-1.023W}$$

Where: Q--dust emission, kg/t·y;

V_{50}--wind speed at 50m from the ground, m/s;

V_0--dust-blown wind speed, m/s;

W--moisture content of dust particle, %

Wind speed is related to moisture content. Thus, an effective way to decrease wind-blown dust is to diminish open-air storage and bare grounds as well as to maintain certain moisture content. The diffusing dilution of dust in the air is related to meteorological conditions like wind speed, as well as its own sedimentation velocity. See Table 5-2 for speed of dust of different particle size. From the table, dust settling speed increases rapidly with the rise of dust size. When the particle size is 250μm, the sedimentation velocity is 1.005m/s. Therefore, we can think that when the particle size is less than 250μm, the main affected area is the close range of the downwind area of the dust source. What truly affects the outside environment is the dust with small particle size.

Table 5-3 Dust Settling Speeds of Dust in Different Sizes

Particle Size (μm)	10	20	30	40	50	60	70
Sedimentation Velocity (m/s)	0.003	0.012	0.027	0.048	0.075	0.108	0.147
Particle Size (μm)	80	90	100	150	200	250	350
Sedimentation Velocity (m/s)	0.158	0.170	0.182	0.239	0.840	1.005	1.829
Particle Size (μm)	450	550	650	750	850	950	1050
Sedimentation Velocity (m/s)	2.211	2.614	3.016	3.418	3.820	4.222	4.624

(3) Exhaust gas generated by construction machine and transportation vehicles

Certain exhaust gas which contains pollutants like HC, CO and NOx is generated by construction machine like bulldozers, diggers and transportation trucks during construction period and causes certain impacts on ambient air. Generally, discharge amount of exhaust

gas and emission concentration of pollutants are relatively small when the vehicle decelerates. Thus, in order to reduce impacts of exhaust gas, transportation vehicles, bulldozers and diggers shall slow down when passing through villages and construction area; meanwhile, maintenance of construction machine shall be done to keep normal operation and reduce exhaust gas emission.

5.1.2.2 Mitigation Measures

1. The advanced construction techniques are adopted like wet crushing adopted in sandstone and concrete systems and dust collection equipment. Vehicle speed, vehicle exhaust gas and coal-burning exhaust gas shall be controlled. Water is sprayed in the construction area in accordance with needs. Construction team adopts clean energies like liquid gas and electricity and strengthens afforestation in the construction area and labor protection of constructors. These measures will reduce impacts on ambient air.

2. Vehicle washing platforms are installed inside passageways for material and spoil transportation vehicles and shall meet the following requirements: overflow-proof stations are placed around truck washing platforms to prevent vehicle washing wastewater from flowing out of the construction site. Before vehicles drive out of the construction site, the tires and body shall be flushed on the vehicle washing platform and mud shall not be attached to the surface. The height of materials and spoil on the transportation vehicles shall not surpass vehicle ledge and vehicle hopper be covered with tarpaulin or sealed.

3. Concrete mixing station and asphalt mixing station shall not be installed in the construction site and commercial concrete and asphalt are adopted.

4. Transportation vehicles, bulldozers and diggers shall slow down when passing through villages and construction area; meanwhile, maintenance of construction machine shall be reached to keep normal operation and reduce exhaust gas emission.

5. Dust-proof screens shall be placed around the construction area, especially those places near the residential areas, hospitals and schools.

6. Dust and particulates shall be reduced as much as possible to avoid affecting the neighboring residents' life and commercial activities. The vulnerable populations shall be given key protection like kids and old people.

5.1.3 Impact on Acoustic Environment and Mitigation Measures during the Construction Period

5.1.3.1 Acoustic Environmental Impact Analysis during the Construction Period

Construction noise will disappear as the construction is finished. But because the noise is so strong that the surrounding environment would be affected seriously. As a result, noise produced during construction period must be strictly controlled. Because the equipment's position changes constantly during construction, and the number of running equipment are also different during different period of time, thus it is difficult to predict the level of noise of every construction site. According to the point sound source noise attenuation pattern, we can figure out the noise level of every piece of construction equipment at different distances. The point sound source attenuation pattern is as follows:

$LP = LPO - 20Lg(r/ro) - \Delta L$

where: LP--sound pressure level of the place that is r(m) from the sound source, dB(A);

LPO -- sound pressure level of the place that is ro (m) from the sound source, dB(A);

ΔL--all attenuation (except divergence attenuation), dB(A). Take the ΔL of noise source as 0.

Without considering the noise attenuation of trees and architectures, the prediction of noise level (not added with present value) of all kinds of construction machinery when at different distances can be seen from the following table.

Table 5-4 Prediction of Noise Level of All Construction Machinery at Different Distances (dB(A))

No.	Machinery Type	Noise Level Prediction								
		5m	10m	20m	40m	50m	80m	100m	150m	200m
1	Loader	90	84.0	78.0	72.0	70.0	66.0	64.0	60.5	58.0
2	Roller	81	75.0	69.0	63.0	61.0	57.0	55.0	51.5	49.0
3	Bulldozer	86	80.0	74.0	68.0	66.0	62.0	60	56.5	54.0
4	Excavator	84	78.0	72.0	66.0	64.0	60.0	58.0	54.5	52.0
5	Large-capacity Truck	86	80.0	74.0	68.0	66.0	62.0	60	56.5	54.0
6	Light Truck	75	69.0	63.0	57.0	55.0	51.0	49.0	45.5	43.0

By comparing with the table above, we can see that in the daytime, the noise level of a radius over 50m from the construction machinery can all reach *Emission Standard of*

Environment Noise for Boundary of Construction Site (GB12523-2011) (70dB(A)in the daytime, 55dB(A) at night), and basically the noise level within a radius of 200m will not reach the standard limit. As a result, the construction noise will have a great impact on the acoustic environment within a radius of 50m from the construction site, and it is even more serious if construction is carried out during nighttime. The impact area is the radius of 200m from the construction site. But the impact of noise is temporary. Once the construction is finished, the construction noise will also come to an end. This project will not operate at night, and measures will be taken to reduce the impact of the construction noise on environmental sensitive sites during the daytime.

5.1.3.2 Mitigation Measures

Noise mainly comes from material transportation, pipe and channel excavation, tubing loading and unloading, construction machine during the backfill process such as bulldozers, diggers, sandstone mixing plants and lorries. The following protection measures on acoustic environment are mainly adopted during construction period:

1. Horn prohibition warning boards are placed in the section sensitive to acoustic environment. Low-noise equipment is used to control noise point sources, modes of transmission and traffic noise. Noise-proof earplugs are provided and the rational construction schedule is arranged for constructors.

2. According to the requirements of *Standards for Ambient Noise Emission at Construction Site Boundary* (GB12523-2011), the construction schedule shall be arranged reasonably, in order to avoid simultaneous operation of multiple large-scale and high-noise machines at a same construction site and avoid the period when the neighboring environment is sensitive to noise. High-noise equipment shall operate at the day time as much as possible. Nighttime transportation shall be avoided and construction at the night time (22:00~6:00) is prohibited. For construction activities that must go on into the night time, the constructor must gain approval from the local relevant environmental protection department and communicate with residents prior to the operation. Meanwhile, noise reduction measures like noise barriers shall be used to reach minimum construction impacts on residents.

3. The speed of all construction vehicles shall not exceed 25km/hour outside

construction site.

4. The speed of vehicles shall not exceed 15km/hour in the construction site.

5. Noise of machine and equipment shall be kept below 90 decibels as much as possible.

6. Right measures shall be adopted to reduce construction noise and vibration on the neighboring environment.

7. Consult with schools and units near the construction site and adjust the construction time or take other measures, trying to reduce the impacts of construction noise on teaching and work.

8. The construction unit must select the construction machinery, tools and transportation vehicles meeting national related standards.

9. The construction charge unit shall instruct the construction unit to provide construction arrangement and complaint hot line at the construction site. The construction unit shall contact local environmental protection department upon receiving a case report, so as to handle all environmental disputes and ensure a smooth construction.

5.1.4 Impact of Solid Waste and Mitigation Measures during the Construction Period

5.1.4.1 Analysis on Impact of Solid Waste during the Construction Period

Solid waste generated during construction period is mainly domestic garbage generated by constructors and spoil as well as construction garbage during construction.

(1) Impacts of domestic garbage

The generation of domestic garbage during construction period is 60kg/d, mainly consisting of organic garbage. The domestic garbage thrown away randomly becomes easily decomposed and fermented. It not only pollutes water environment, but also propagates flies and mosquitoes due to fermentation and produces odorous exhaust gas. Thus, EIA suggests that garbage collection boxes be placed in the construction site during construction period and domestic garbage be collected, cleaned and transported by environmental sanitation departments.

(2) Impacts of construction garbage

In this project, the total excavation volume is 159237m^3, backfill volume is 19110m^3, and spoil volume is 140127m^3. Meanwhile, the construction will produce a certain amount of construction garbage, including cement concrete, brickbats, sand and gravel etc., Some of which can be reused. Other construction garbage that cannot be reused, the amount of which is 2110m3, shall be transported to the local refuse landfill.

If spoil grounds for construction garbage is not arranged properly or the construction unit stack waste slags at arbitrarily, it will lead to the situation where waste earth and waste slags are distributed randomly along both sides of the construction area and occupy a pretty large amount of urban land. This will make water losses and soil erosion out of control, and cause great impacts on the ecological systems around the waste slag point. Also, the landscape environment along the two sides will also be greatly influenced. The construction unit shall clear and transport the spoil to the specified site and leave it to the county office of environment and sanitation for unified deployment and apply it to other construction that needs soil; the construction garbage shall be transported to Jiujiang construction garbage landfill for treatment in time.

5.1.4.2 Mitigation Measures

Concerning solid wastes produced in the construction, we adopt the following mitigation measures:

1. Construction spoil

The construction spoil shall be temporarily stacked along the two sides of the excavated pipeline. The construction unit shall clear and transport the spoil to the specified site and leave it to the local county office of environment and sanitation for unified deployment and apply it to other civil projects in Poyang County that need soil. Spoil grounds produced by the project and the County Office of Environment and Sanitation will be handled as below:

① Temporary earth and stone dump sites shall be laid out properly away from environmental sensitive spots such as residential areas and schools and Zhuhu Lake Water Source Protection Area. It shall be set in the summer prevailing wind’s downwind or sidewind direction of the towns and residential areas;

② Occupy less land as much as possible. Besides, temporary occupied areas will be

restored based on the original land use types after the construction is completed.

③ Earth and stone stacked temporarily shall be rammed, rolled and covered with tarpaulin with water-proof and wind-proof measures well adopted.

④ Mud drains shall be built around the temporary spoil dump sites and mud detritus pits shall be built at the drains' outlet to slow down collected water and deposit silts.

⑤ Spoil shall be sealed during transportation to avoid scatter.

⑥ The operation of spoil work shall be conducted by specially-assigned persons in each section. Non-operating personnel shall be prohibited from entering into the operation area and operating personnel, vehicles and machine in the operation area follow managerial personnel’s directions. The vehicles shall discard earth in accordance with the routes and areas designated by managerial personnel and not discard earth randomly inside the temporary dump site, affecting normal earth discarding operation in the spoil ground and outside the construction site.

⑦ Water-proof and drainage treatment shall be made to ensure smooth drainage and avoid inundation around the spoil grounds and the operation site.

⑧ Safety standards on protection and construction in the spoil grounds shall be made based on the relevant construction standard requirements.

⑨ Specially-assigned people shall patrol the spoil grounds after work and handle and report potential safety hazards in time. Warning signs shall be set up; and the spoil on one day shall be handled on the same day as much as possible.

⑩ After completion of the subproject, the temporary facilities in the construction site shall be dismantled, spoil be cleaned up and the sites be leveled in time to restore the neighboring environment; During construction and shut-down period the sanitation in the construction site and the neighboring environment shall be maintained.

⑪ During the process of discarding earth, the operation shall be carried out through strictly paving and rolling, and the soil layer shall be rolled before being paved with the new one. During the paving of soil layer, the slope shall be high inside and low outside according to the construction progress. A certain number of runoff gathering pits shall be placed in the runoff ditches to deposit mud in water. Weather and local flood situation shall be mastered in time. Dredging work in drains and runoff gathering pits shall be ready and

drains be improved ahead of time.

⑫ When the spoil grounds are full and checked by relevant departments, equipment, surplus material, garbage and temporary facilities shall be cleared up in time.

2. Construction garbage

Recyclable wastes (scrap iron, steel scrap and material packing bags etc. sold to recycling station, and waste brick used as road substrate materials) shall be classified and recycled. Those cannot be recycled shall be transported to the construction garbage landfill, and they shall be sealed during the transportation to avoid scatter. Measures like water-proof and wind-proof etc. shall be taken for temporary stacking.

3. Domestic garbage

Collecting bins for domestic garbage shall be placed in the construction area. Garbage shall be cleaned, collected and classified and then transported by environmental sanitation departments.

5.1.5 Ecological Impact and Mitigation Measures during the Construction Period

5.1.5.1 Ecological Impact Analysis during the Construction Period

1. Impacts on Poyang Lake National Wetland Park

(1) Relation between the project and location of the wetland park

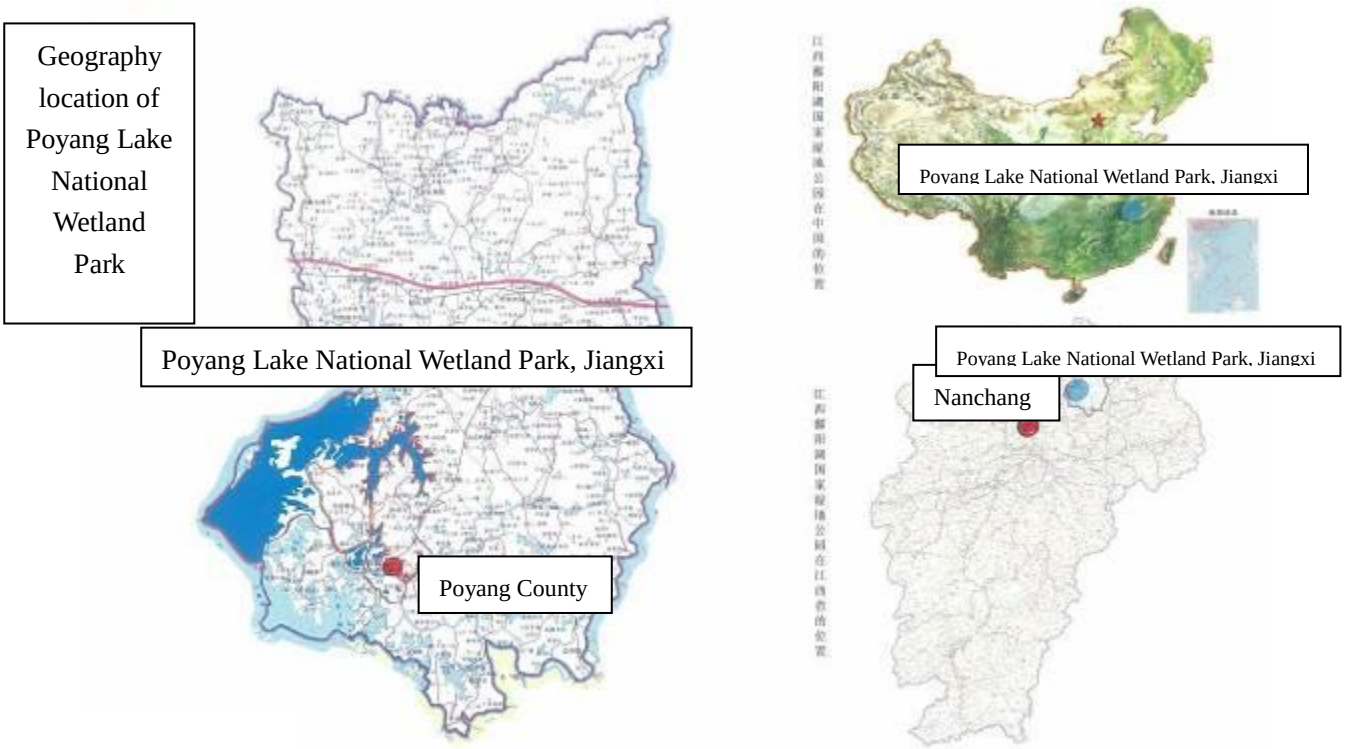
To improve the water quality of Zhuhu Lake, the Poyang County subproject uses project and non-project measures to handle the point as well as non-point pollution source of village in the Zhuhu Lake basin. The subproject will also establish 35 rural wastewater treatment plants whose treatment scale is 50t/d~250t/d; 101 pieces of artificial wetland, and a sewage intercepting ditch of 95.85km.

Zhuhu Lake waters falls within the scope of Poyang Lake National Wetland Park, which covers an area of 36,285km^2. Wetland covering 35,116.1km^2, taking up 96.8%. The park was approved by the State Forestry Administration to be a national wetland park in November, 2008. The park is *misty and vast*, and there are many meandering rivers, brooks and sprawling farmland. The main body of landscape is featured with wetland types like natural lakes, rivers, grass moor, mudflats, islands, washland and ponds etc. The wetland resources are abundant, type-numerous, and representative. As a habitat for many migratory birds, especially as a stopover and wintering area for the migratory birds in Northeast Asia to

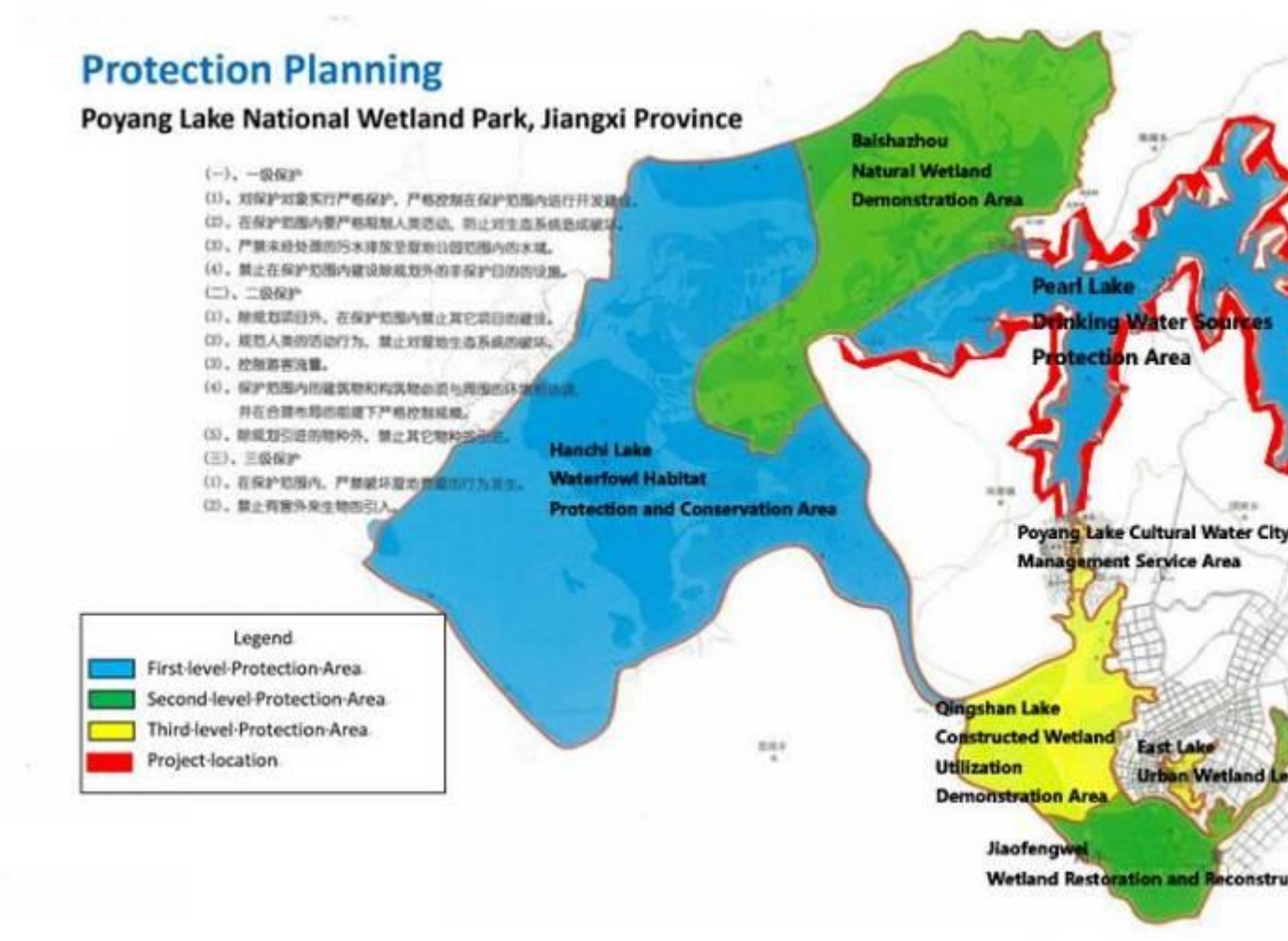
rest and feed during migration, the park is rich in bird resources.

According to *Poyang Lake National Wetland Park Master Plan*, the wetland park area comprises of seven functional areas, namely Hanchi Lake Waterfowl Habitat Protection and Conservation Area, Jiaofengwei Wetland Recovery and Restoration Area, Zhuhu Lake Water Source Wetland Protection and Conservation Area, Baishazhou Natural Wetland Display Area, Qingshan Lake Artificial Wetland Utilization Demonstration Area and Donghu Lake Urban Wetland Recreational Area as well as its administration and service area. The Poyang Lake subproject does not involve the land area of the wetland park and the waters near Zhuhu Lake, Water Source Protection and Conservation Area around Zhuhu Lake in this subproject, and is located in the east of Zhuhu Lake Water Source Protection and Conservation Area and Baishazhou Natural Wetland Display Area.

Zhuhu Lake Water Source Protection and Conservation Area is one of the most important parts of the park, mainly including Zhuhu Lake waters. Its functional orientation is to strictly protect the drinking water source of Poyang County, as well as recover and restore it to some extent based on the strict protection. It is a first-grade protection area of the park. Baishazhou Natural Wetland Display Area is the main area that shows to the public the typical wetland landscape and develops wetland eco-tourism, laying a good landscape foundation for displaying typical natural wetland scenery and developing wetland eco-tourism. It is a second-grade protection area of the park. Poyang Lake Cultural Water City, centered on landmarks with the park theme, is developing an artificial watercourse. Based on this watercourse, the Poyang Lake Cultural Water City featuring Poyang Lake wetland culture and display of history and customs is built. It is a third-grade protection area.



Map 5-1 Location map of Poyang Lake National Wetland Park



Map 5-2 Protection Schemer of Poyang Lake National Wetland Park

(2) Ecological impacts on wetland park

① Impacts on vegetation

The subproject is located in the east of the wetland park, mainly taking up the land area around Zhuhu Lake instead of the wetland park or other area. Vegetation of the wetland park will not be affected.

② Impacts on birds

The rare wintering migratory birds in the wetland park are of a great amount and numerous types. Their major habitats and concentrated distribution area are located in southwest of the wetland park, namely Hanchi Lake Waterfowl Habitat Protection and Conservation Area. The construction site of the subproject is set outside the outskirts of the wetland park. This area is centered on human activities and human living, and there is a dense population as well as frequent human activities. There are birds stopping over occasionally but no fixed bird habitats or concentrated distribution area. Among birds that are usually seen in the assessed area, Egretta garzetta and Ardeola bacchus are key wild animal species under provincial protection. Construction of the subproject has minor impacts on birds of the wetland park.

During the period of construction in the protection area, this subproject may have adverse impacts on birds for a short time, mainly reflected in:

A. Impacts on perching and feeding of the birds

a. Noise disturbance. Noise generated by construction transport vehicles, construction machinery, etc. is the main source of noise pollution during construction, and may bring impacts on the foraging and inhabitation of birds.

b. Light disturbance. During night construction, if hard light is used for illumination, the light of transport vehicles will bring negative effects to the inhabitation, foraging, flight positioning, etc. of birds.

c. Man-made disturbance. During construction, as there is a large amount of human activities, improper management of construction workers will cause relatively significant disturbances to birds and reduce their space for birds in the nature reserve to inhabit and

forage.

B. Impacts on bird migration

The main protection targets in the park are birds inside the protection area. Normally winter birds start to fly south to the protection area from their breeding place in late October, which will stabilize till mid-to-late December. The next year, from early March to early April, the birds will fly back to north by the strong updraft in warm weather. Birds of different kinds have different duration of stay, which ranges from 3 to 5 months. During the migration period, high-power lighting equipment and vehicle lights in nighttime construction will have a certain degree of impact on birds during migration. It is easy for them to lose their direction, especially in terrible weather conditions.

Main habitat for migratory birds are located in Hanchi Lake, which is in the west of the wetland park, and the subproject is located in the east outside the wetland park. Thus the impact on migratory bird habitat will be minor. The subproject comprises of 35 buried wastewater treatment plants, 101 pieces of artificial wetland, and an ecological sewage intercepting ditch of 95.85km. It is a small-sized project whose construction period is relatively short. Construction related staff, machinery and equipment are of a small number, and nighttime construction is prohibited. Therefore, impacts on birds are relatively minor.

③ Impacts on structure and function of the wetland park

The subproject is located outside the outskirts of Zhuhu Lake, and will not have impacts on the structure and function of the wetland park.

④ Conclusion

The subproject is located in the east of the wetland park, and the construction is located in the land area around Zhuhu Lake. Thus it will not have impacts on the structure and function of the wetland park, as well as animals and plants in the wetland park. Main habitat for migratory birds are located in Hanchi Lake, which is in the west of the wetland park, and the subproject is located in the east outside the wetland park. The impacts on migratory bird habitat will be minor. Therefore, the construction will not have great adverse effects on Poyang Lake National Wetland Park.

2. Impacts on plants in the construction area

The subproject mainly occupies ditches, wasteland, ponds and vegetable fields.

Ancient and famous trees are not found in the construction area. Temporary occupied areas will be restored based on the original land use types after the construction is completed. Thus impacts on plants in the construction area will be minor.

3. Impacts on Amphibians, Reptiles and Beasts

Impacts on amphibians, reptiles and beasts within the assessment area during construction are mainly reflected in the following two aspects: on the one hand, land occupation for construction, excavation and construction activities increase the disturbance factors, thus will narrow the inhabitation space for animals. Vegetation deterioration decreases habitat of animals, thus affects the activity area, migratory route, foraging scope, etc. of some animals, and will further have certain impacts on the living of animals; on the other hand, the noise caused by constructors and construction machinery and lighting of the construction site, will force animals to migrate, as a result of which the species and amount of animals in the construction area will drop, and the distribution of animals will change. In addition, the construction has certain effect on activities of amphibians and reptiles. Svehicleed by the construction noise, some varieties of beasts are forced to leave their original habitat. No key wild amphibians, reptiles and beasts under national or provincial protection can be seen in the assessed area. The ecological habitat is not single, and the food source is diverse. Meanwhile, animals have migration abilities, most kinds of animals can return to their habitat when it is restored after the construction.

4. Impacts on Aquatic Creatures

Basically this subproject only constructs around Zhuhu Lake. As long as the domestic sewage, construction wastewater and domestic garbage are treated properly, the water environment along the construction line, as well as fish and other aquatic creatures in the lake will not be affected.

It can be seen that this subproject has a minor impact on aquatic creatures. Besides, the impact is temporary, and it will subside, even disappear as the construction is finished.

5. Impacts of Water Losses and Soil Erosion

During construction, the building of construction site will damage surface vegetation, increasing soil erosion modulus. Not only will Temporary dump sites bury surface vegetation, but also stacked waste slag will become new water and soil erosion area,

resulting in water and soil erosion in the rainy season.

Damages on ecology and landscape during construction period are limited and temporary. On the condition that constructors do a good job in the management and the restoration in the temporary site after construction, the impacts on ecology and landscape during the subproject construction period are acceptable.

5.1.5.2 Mitigation Measures

1. Ecological impacts on Poyang Lake National Wetland Park and mitigation measures

(1) Preventive measures of impacts on beasts and amphibians

① The construction shall be divided into several sections. Distance between every section shall be long enough

② During construction, sewage shall be discharged away from the protection area as far as possible, to diminish the impacts on beasts and amphibians.

③ During construction, silencing pads shall be applied to relevant machinery like mixing systems and sand systems etc., and sound-proof booths or shields shall be built, in order to reduce noise; regular equipment inspection and maintenance shall be carried out in strict accordance with the running requirements, in order to reduce noise caused by improper lubrication and diminish the impacts of noise on beasts and amphibians.

④ Publicity and education shall be intensified to improve constructors' awareness of wildlife conservation and eliminate hunting, which will diminish constructors' interference on beasts and amphibians.

(2) Preventive Measures of Impacts on Birds

Based on the analysis of the construction's impacts on the birds of the wetland park, measures below are adopted:

① During construction, tasks shall be arranged during the period of time (October~March of next year) when key protected birds gather as few as possible; during the period when birds leave the protection area, construction intensity shall be enhanced in order to finish the construction on time.

② During the period of time when protected birds gather, nighttime construction shall be avoided.

③During construction, silencing pads shall be applied to relevant machinery like mixing systems and sand systems etc., and sound-proof booths or shields shall be built, in order to reduce noise; regular equipment inspection and maintenance shall be carried out in

strict accordance with the running requirements, in order to reduce noise caused by improper lubrication; transportation vehicles shall be prohibited from honking to reduce the impacts of noise on birds.

④ The construction living quarters shall be away from the protection area as far as possible, and curtain shall be installed to shelter from lamp light, so as to reduce impacts of light on birds.

⑤ During construction, construction and personnel management shall be enforced, and publicity of environmental regulations shall be strengthened. Manuals on knowledge of birds in the protection area can be compiled for knowledge popularization, in order to improve constructors' consciousness of bird protection and reduce human disturbances to birds.

2. Preventive measures on water and soil erosion

(1) The construction period shall be selected properly, avoiding rainy season and rainy days. Fences shall be placed along the construction belt to prevent construction materials and waste materials from entering into surface water.

(2) Based on landform in the construction site, mud drains shall be built around the site and mud detritus pits be built at the drains' outlet to slow down collected water and deposit mud.

(3) Key management on soil and water conservation is combined with surface protection and engineering measures with vegetation measures. Engineering measures serve as a leading role, playing a quick-acting and guarantee role. Vegetation measures serve as supplementary measures on soil and water conservation, conserving soil and water in the long term and making the environment around the subproject area green and beautiful.

(4) Leaf litter and organic matters in topsoil shall be protected and backfilled to the damaged area to promote the growth of indigenous plants.

(5) The eroded barren area shall be covered with local grass seeds and vegetation or be hardened in the topsoil.

(6) Erosion control measures shall be taken prior to rainy seasons to prepare for the subsequent construction. And corresponding erosion control measures shall be taken when construction in each construction point completes.

(7) Sediment control facilities shall be placed in construction site to slow down runoff speed, change flow direction and deposit mud before restoration of vegetation. The facilities include stockpiles, stone pathways, detritus pits, straw bales, hedgerows and slag heaps.

(8) Water currents shall be prevented from flowing into construction site and interfering

with construction site by building ditches, berms and grass fences and stacking stones.

(9) Erosion control measures shall continue to be adopted until the complete restoration of vegetation.

(10) If necessary, water shall be sprayed on dirt road, excavated areas, packing and soil storage areas to decrease wind erosion.

3. Other Ecological Impacts and Mitigation Measures

(1) Construction site shall be laid out scientifically, occupying less land as much as possible. Besides, temporary occupied areas will be restored based on the original land use types after the construction is completed.

(2) Publicity and education shall be intensified, and deforestation as well as wildlife killing shall be prohibited. During construction, if rare and endangered wild plants, ancient or famous trees and local endemic plants are found, relevant departments shall be reported and in-situ protection measures be adopted; control shall be taken on construction noise, reducing its interference on animals.

(3) During construction topsoil shall be excavated and stacked in different layers. After the construction is completed, temporary facilities shall be dismantled, hardened and impervious soil be loosed, topsoil be backfilled in different layers and vegetation be restored. Proper vegetation type shall be selected based on the local climatic features, slope rate and geological conditions.

(4) The construction area involved with forest land shall be monitored for fire risks; investigations on regional key protected plants and ancient or famous trees shall be strengthened, and construction that might lead to forest fires shall be strictly managed. During the forest fire prevention season, fire shall not be used in the field.

5.1.6 Impacts on Social Environment and Mitigation Measures during the Construction Period

5.1.6.1 Analysis of Social Environmental Impact during the Construction Period

1. Impacts of subproject occupied land

The subproject will permanently cover an area of 127.19 mu, including wasteland 52.35 mu and unused land 74.84 mu; temporarily cover an area of 10 mu, which is mainly state-owned roads. 652 people of 142 households are affected by land acquisition. House demolition is not included here. The construction unit of the subproject will specifically set

up an office and make plans for land resettlement. With cooperation of local government and relevant department and in the general interest of the construction, the construction unit shall make overall arrangements and full consultations, properly resettle the affected people, and make corresponding compensations according to national and local demolition policies. In order to prevent land--confiscated peasant households from losing their land forever and agricultural production income from being greatly affected, the subproject shall strictly implement the resettlement scheme. After the policies above are fully implemented, local residents' life will not be affected greatly because of land acquisition.

The temporary occupied land mainly comprises of roads, unused land and wasteland inside the village, and the original land use types are restored after the construction is completed, almost having no impact on the land.

2. Impacts on transportation

Sewage treatment plants of the subproject have pipelines of 101.22km (diameter is DN300~DN400) as supporting facilities. Among the pipelines, pressure pipes are 42.1km long. Landforms are fully utilized in the design. Principal main pipelines as well as main pipelines are laid in the low discharge area, to make it easier for branch pipes to insert in. The pipelines are usually placed along the village road in the form of gravity flow. Compared to urban pipeline projects, generally rural pipeline projects will not cause temporary drainage interruption and power cuts, and have minor impacts on municipal facilities and services. However, road excavation will cause travel inconvenience to the residents. During construction period, the transportation volume of raw materials (such as sandstone and cement) and spoil will increase traffic flow in a short time.

5.1.6.2 Mitigation Measures

1. Mitigation measures to subproject occupied land

Construction site shall be laid out scientifically, occupying less land as much as possible. Besides, temporary occupied areas will be restored based on the original land use types after the construction is completed.

The construction unit of the subproject will specifically set up an office and make plans for land resettlement, meanwhile making corresponding compensations according to national and local demolition policies.

Temporary earth and stone dump sites shall be laid out properly away from environmental sensitive spots such as residential areas and schools.

2. Impacts of pipeline projects on municipal services and mitigation measures

(1) Inform the public of service interruption (including of water, electricity, fuel gas, and public traffic lines) at least five days ahead by putting up a notification at project site, public traffic stops, as well as affected residents and enterprises;

(2) Guarantee the construction progress on the basis of fulfilled construction organization. Try to shorten the construction period and pay attention to construction safety. Finish the construction and restore municipal services as soon as possible.

3. Mitigation measures of impacts on transportation and safety

(1) The construction contractor shall inform the public of the construction plan, and the construction unit shall provide information like construction time and project schedule etc. on the construction bulletin;

(2) Warning signs shall be set up in front of every construction area, cross road, turning point, lane-change spot and entrance of a traffic passage, specifying the construction area, speed limit, height limit and other relevant restrictions.

(3) In principle, construction is prohibited during nighttime (22:00~6:00). For construction activities that must go on into the night time, the constructor must gain approval from the local relevant environmental protection department and communicate with residents prior to the operation. Meanwhile, noise reduction measures like noise barriers shall be used to reach minimum construction impacts on residents.

(4) For works with construction period of more than 30 days, the boundary of construction site shall be enclosed according to local conditions and have color plate enclosure; the enclosure shall be at equal to or more than 2.5m/ 3m at construction site of common areas/ key areas respectively;

(5) The enclosure set up shall be straight, orderly, clean, beautiful, and damage-free, and the appearance shall be harmonious with surrounding environment;

(6) The enclosure constructed on road shall be within 5m range of visibility at crossroad. Straight and rigid enclosure of metal mesh panel shall be set up without blocking the visual line of drivers and pedestrian, and in the precondition of guaranteeing traffic

safety. Within 5m range of visibility, it's forbidden to stack any article;

(7) In case the enclosure is equal to or less than 5m from residence, or the construction point is equal to or less than 15m from sensitive buildings like residence, hospital and school, etc., proper measures shall be taken to lower the noise, such as raising the enclosure, etc., and the enclosure in sensitive areas shall be up to 3m high; and the scope of 5m outside the enclosure shall be kept clean;

(8) Never stack materials, tools and earthwork, etc. within the scope of 1m at the internal side of enclosure;

(9) Never use the enclosure as retaining wall or the support of other facilities and equipment;

(10) When construction passes through residential entrances and exits, half-width construction and quick construction shall be carried out to diminish the impacts on residents traffic nearby as much as possible. The half-width construction shall be covered with soil when it is finished, and the one that cannot be finished that day shall be covered with steel sheets to ensure a normal passing and safety.

(11) Hire a full-time "traffic director" and set up specialized traffic safety and civil construction teams, in order to ensure the implementation of traffic safety measures, manage and maintain the traffic safety measures during construction, maintain traffic order of the construction area and help to solve traffic problems during construction period.

(12) During construction period, vehicles and staff in or out shall strictly follow traffic rules and management of the traffic administration department and accept supervision from the traffic administration department and the construction unit. Once discovering problems that may affect the traffic, rectify and improve them as soon as possible.

(13) Pay attention to implementation of safe and civil construction as well as preventive measures of disturbance on residents, especially implementation of dust prevention measures, noise control measures and management measures of slurry and earthwork. Contact with villages along with the construction area in advance, and try to obtain their understanding and support, in order to ensure a smooth construction.

(14) When compiling the work construction organization design, make coordination with traffic arrangements one part of the content. Before construction, contact with traffic

department, introduce and report the subproject overview, the construction scheme, as well as material and soil transportation plans. Traffic department will give its support and guidance to improve the transportation plan and formulate detailed implementation rules.

(15) In case hidden well cover is opened or raised for construction on urban road maintained open to traffic, folding construction curb fender shall be adopted;

(16) Never use red and white flag, safety isolation rope, or other materials to replace the construction curb fender;

(17) Whether the setting of construction curb fender surely makes the long-side section of channel steel on the foundation face towards construction area; in case construction passageway is set up between construction curb fender and construction area, whether the passageway is equal to or more than 0.6m wide;

(18) Whether construction curb fender is removed before the road construction takes interim passing measures or the works is completed;

(19) In key areas, road pipeline shall be constructed by means of "excavating a section, paving a section, and renovating a section", and the whole pipeline shall never be excavated simultaneously.

(20) Construction unit shall observe the license regulations on construction period strictly, and shall never execute construction by occupying road or exceeding the licensed construction period;

(21) Whether interim road is set up according to regulations for construction occupying rural road and impacting the travel of vehicles and pedestrian, and whether the construction unit builds up solid, flat and continuous pedestrian shortcut with safety edge enclosure at the access side in order to guarantee the safe passing of the pedestrian;

(22) The construction site shall be strictly closed, and children are not allowed to enter the construction area;

(23) The construction unit shall adopt sheet flattening method for construction in case the ditch or pipeline slot is excavated, and the works cannot be completed on the very day;

(24) The supporting and consolidation scheme shall pass safety argumentation, and be reported to construction unit for approval; the steel plate covering road shall be at least equal to or more than 0.03m thick. The edge of the steel plate and metal slope rack adopted

shall be burnished to remove sharp edges and burrs, in order to ensure the safety of personnel and vehicles;

(25) Metal shape shall be adopted for supporting and consolidating the lower end of covering steel plate in case the excavation width of ditch (pit) is equal to or more than 0.8m.

5.1.7 Health and Safety during the Construction Period

There is a small quantity of works and constructors in the subproject, but living conditions and sanitary conditions are relatively poor and workers' labor intensity is huge, easily causing prevalence of diseases. The constructors in the construction site shall be given comprehensive physical examination to ensure safe construction. Those who have contracted severe infectious diseases shall be banned from entering into the construction site; canteen staff shall be given regular physical examination and those who are found to have contracted epidemic diseases shall be treated in time and transferred from the canteen to avoid prevalence of infectious diseases. In the construction site, centralized water supplying facilities shall be built or municipal water supply be utilized; sanitary facilities and medical personnel shall be provided. Constructors' labor protection shall be ensured to protect their health and safety and ensure smooth implementation of the subproject.

5.2 Analysis of Environmental Impact and Mitigation Measures during the Operation Period

5.2.1 Positive Impacts

Implementation of the subproject can effectively collect the rural domestic sewage in Zhuhu Lake basin, which effectively controls the rural non-point source pollution, intercept the sewage and reduce water pollutants. As a result, it will improve the water quality of Zhuhu Lake, ensure water security, enhance regional ecological safety, promote sound cycle of basin eco-system, improve people's living ecological environment and life quality, and ensure sustainable development. It is significant to improving the investment environment. The subproject will also strengthen the water environment management of Zhuhu Lake in

Poyang County and establish an effective water quality monitoring system to interact with the public.

After the subproject is completed (by 2023), it will reduce a large amount of pollutants that will be discharged into Poyang Lake every year: COD by 1886 tons, TN by 484.70 tons and TP by 33.43 tons, with 331,570 immediate beneficiaries of which 165,785 are women.

5.2.2 Surface Water Environmental Impact and Mitigation Measures during the Operation Period

5.2.2.1 Impacts on Water Environment during the Operation Period

Combining project measures and non-project measures and through the treatment of point source pollution and non-point source pollution in severely polluted area around Zhuhu Lake, the subproject will reduce water pollution in Zhuhu Lake basin, ensure water quality and safety of the drinking water source in Zhuhu Lake, so as to reduce the pollutant volume. The subproject will establish 35 sewage treatment plants, supporting pipelines of 101.22km, 101 pieces of artificial wetland, and a sewage intercepting ditch of 95.85km. Every year, the subproject will reduce a large amount of pollutants that are discharged into Poyang Lake: COD by 1,886 tons, TN by 484.70 tons and TP by 33.43 tons, which, in a normal situation, will improve the water quality of Zhuhu Lake and ensure drinking water safety.

The subproject will establish 35 rural sewage treatment plants, among which 22 are with the treatment scale of 50t/d, 11 of 100t/d, 1 of 150t/d and 1 of 250t/d. The total treatment scale is 2600t/d. The domestic sewage discharged into Zhuhu Lake by the 35 villages around the lake will be collected to sewage treatment plants of the subproject for treatment. After the treated sewage meets *Water Pollutant Discharge Standard for Poyang Lake Eco-Economic Zone* (DB36/852-2015) and the water pollutants discharge limit of the sewage treatment system of lakeside development zone under control, will be discharged into Zhuhu Lake, which will have relatively minor impacts on Zhuhu Lake Water Source Protection and Conservation Area of Poyang Lake National Wetland Park.

In the waters there are 7 centralized drinking water sources, namely Inner Zhuhu Lake Drinking Water Source Protection Area of Poyang County (Yangmei Bridge Water Plant), Water Intake of Zhongtang Water Plant of Sishilijie Town, Water Intake of Yongchang Water Plant on Sishilijie Street, Water Intake of Pozhong Water Plant of Poyang County (Gaojialing Town), Water Intake of Tuanlin Township Water Plant, Water Intake of

Shuanggang Town, Water Intake of Zhuhu Township. The outlets of wastewater treatment plants in this project are all set outside the water source protection area and have relatively small effect on the water source protection area.

The volume of domestic sewage generated by working staff from the operating room for water environment monitoring system is 0.2m^3/d, 51t/a. The operating room for this system belongs to the current properties of the wetland park management station. The domestic sewage will be treated by the existing sewage treatment system of the wetland park management station. The treatment scale of this treatment system is designed to be 100m^3/d, while the current treatment scale is 30m^3/d. Integrated sewage treatment equipment is adopted. The treated sewage will be discharged into Zhuhu Lake after being water-purified by the artificial wetland system, which have relatively minor impacts on water environment.

5.2.2.2 Mitigation Measures

1. Supporting pipeline networks

(1) Clear the pipes and replace broken pipes in time, lest the sewage leaks pollute the water body around and the groundwater.

(2) appropriate measures to be taken before repair and cleaning:

① Before pulling out the inspection well, a warning sign shall be set up in advance, barriers shall be removed to guarantee smooth traffic; and non-operation personnel shall be evacuated before opening the cover.

② The cover of methane-generating pit shall not be pried by steel chisel and anvil in order to avoid spark and cause burns and explosion;

③ When motor is used for pumping or draining sewage, leakage of motor, power source, line and switch, etc. shall be checked to avoid shock accident;

④ Operating personnel should use natural ventilation to remove harmful gases such as carbon monoxide, carbon dioxide, hydrogen sulfide, methane before dredging, and use instrument to detect, and conduct pit operation after confirming harmless and safe. ;

⑤ Operators under pit shall wear anti-static clothing, and shall not wear hard metal objects such as a key;

⑥ Operators above the pit shall hold seat belts in hands and contact with under-pit staff at any time;

⑦After finishing clearing work, well cover shall be recovered and repaired in a timely

manner; and warning signs or protection shall be set up in case of failing to finish the very day.

(3) appropriate measures to be taken during maintenance and management:

① Inspection wells shall be cleaned periodically, inspected frequently, and repaired in time, in order to ensure the smoothness and soundness of sewage interception pipelines and inspection wells;

② Garbage, sewage and sundries shall not be poured into inspection well, and debries shall not be piled on the septic tank, and blow-off line shall not be rebuilt without permission;

③ Inspection wells shall be covered airtight in order to prevent stink and accidents;

④ Fire use shall be prohibited nearby the inspection wells;

⑤ Mud residue cleared off from inspection wells shall be transported to the specialized treatment factory specified by the municipal environmental health authorities, with relevant records made, in order to avoid cross contamination.

2. Wastewater Treatment Plant

(1) Pipeline network maintenance measures

In order to ensure a stable operation of the sewage treatment project, maintenance and management of the pipeline networks shall be enhanced to avoid the impacts of grit jam on discharge capability of the pipeline. The sewage treatment project shall be designed, constructed and operated with the interception pipeline network at the same time. Links of the interception pipeline network shall avoid leakage and environment problems like groundwater pollution as well as hollow ground base etc..

(2) Operation management inside the treatment plant

In order to ensure that the effluent water quality meets the standard, the sewage treatment plant can operate efficiently, operating cost can be reduced and energy utilization rate can be improved, operation management inside the plant shall be enhanced.

① Operation staff shall receive professional training and do corresponding job with certificate;

② Specify duties and roles of every position and systematize every process as well as operation and maintenance of the major equipment;

③ Enhance routine chemical analysis. Operation staff must be able to comprehend the changes of water quality according to the water analysis, in order to change the operation situation, achieve the optimum operating condition and reduce operation costs;

④ Set up a comprehensive management unit and a comprehensive set of management measures;

⑤ Establish a relatively advanced automatic control system;

⑥ Systematize inspection and maintenance of the equipment. Regular inspection and maintenance can improve the intact rate of equipment.

3. Operating room for water environment monitoring system

(1) Domestic Sewage

Domestic sewage generated by operation staff will be treated by the existing sewage treatment system of the wetland park management committee. Maintenance of the treatment system shall be carried out to ensure its function;

(2) Experimental waste liquid

① Hazardous wastes shall be sorted out and put into impermeable and leakage-proof sealed containers with clear color identification on;

② Arrange a temporary storage room with anti-seepage and anti-leakage measures for the hazardous wastes to avoid storage in open air;

③ Hazardous wastes shall be collected, transported and treated by units with operation license for hazardous waste, and disposal cost shall be paid;

④ Hazardous waste transfer permit system and duplicate forms for transfer of hazardous waste shall be implemented;

⑤ it is prohibited to discard or drop hazardous wastes during transportation; to dump or stack hazardous wastes at non-storage site, or mix them into domestic sewage or domestic garbage; to collect, store, transport and treat hazardous wastes without license.

5.2.3 Impacts on the Ambient Air Quality and Mitigation Measures During the Operation Period

5.2.3.1 Impacts on the Ambient Air Quality during the Operation Period

Waste gas of this subproject mainly comes from the odor generated during operation of the sewage treatment plant, whose main pollutants are NH_3 and H_2S. The sewage treatment plants built in this subproject are small-sized rural domestic sewage treatment plants with treatment scale of 50t/d-250t/d. Process of treatment Facultative Anaerobic FMBR is adopted, screens as well as regulating reservoir and integrated equipment are buried underground. Every treatment unit is covered up to avoid open water surface. Therefore, odor pollutants generated are of a small amount and a low concentration. Besides, all residential areas are over 100m away from the plant. As a result, odor from the sewage treatment plant have relatively minor impacts on ambient air and sensitive spots.

5.2.3.2 Mitigation Measures

1. Enhance the operation management of the sewage treatment plant, and frequent inspection as well as prompt repair shall be carried out;

2. Strengthen afforestation of the sewage treatment plant and plant green odor-removing plants such as canna in surrounding areas.

5.2.4 Noise Environmental Impact and Mitigation Measures during the Operation Period

5.2.4.1 Analysis of impacts on Acoustic Environmental during the Operation Period

Noise during operation period mainly comes from sewage treatment stations and equipment in the artificial wetland. The treatment scale of the sewage treatment plant is relatively small. The power of water pumps is 0.45kw~3kw, and the noise level is usually at 65dB(A)~75dB(A). Besides, they are all placed underground, and through flexible connection, vibration reduction and building sound insulation, the noise level will become about 40dB(A)~50dB(A), which has relatively small impacts on the acoustic environment.

5.2.4.2 Mitigation Measures

1. Choose low-noise equipment.

2. Place rubber shock pads at the bottom of the submersible pump, adopt measures like flexible connection, vibration reduction and sound elimination, and keep regular maintenance;

3. The plant area shall be laid out rationally. High-noise equipment shall be placed in the middle part as much as possible to reduce impacts of noise on the plant boundary.

5.2.5 Impact of Solid Waste and Mitigation Measures During the Operation Period

5.2.5.1 Impact of Solid Waste During the Operation Period

Sewage treatment plants of the subproject adopt process of treatment Facultative Anaerobic FMBR. Sludge will digest itself and no sludge will be discharged. Therefore, solid wastes from the subproject mainly come from domestic garbage of the operating room for water environment monitoring system and experimental waste liquid of the laboratory.

The operating room for water environment monitoring system will generate domestic garbage of 2.5kg every day and 0.64t every year. Domestic garbage will be classified and collected by Office of Environment and Sanitation for uniform process, and then transported to domestic garbage landfill for treatment, which have few impacts on environment.

During operation period, the testing laboratory will generate waste acid (HW34), alkali waste (HW35), waste organic solvents (HW42), which are hazardous wastes. Compared with laboratories of the same scale, generation of the waste liquid above is about 500kg/a. If the waste liquid is treated by units with qualification of hazardous waste treatment after uniform collection, impacts on environment will be relatively minor.

5.2.5.2 Mitigation Measures

1. Domestic garbage

After being classified and collected, domestic garbage of the operating room for water environment monitoring system will be cleared and transported to the county garbage landfill by local department of environment and sanitation.

2. Waste liquid of testing laboratory

During operation period, the testing laboratory will generate waste acid (HW34), alkali waste (HW35), waste organic solvents (HW42), which are hazardous wastes. The preventive measures are listed below:

(1) Hazardous wastes shall be sorted out and put into impermeable and leakage-proof sealed containers with clear color identification on;

(2) Arrange a temporary storage room with anti-seepage and anti-leakage measures for the hazardous wastes to avoid storage in open air;

(3) Hazardous wastes shall be collected, transported and treated by units with operation license for hazardous waste, and disposal cost shall be paid;

(4) Hazardous waste transfer permit system and duplicate forms for transfer of hazardous waste shall be implemented;

(5) it is prohibited to discard or drop hazardous wastes during transportation; to dump or stack hazardous wastes at non-storage site, or mix them into domestic sewage or domestic garbage; to collect, store, transport and treat hazardous wastes without license.

5.2.6 Ecological Environmental Impact Analysis and Mitigation Measures During the Operation Period

5.2.6.1 Ecological Environmental Impact Analysis and Mitigation Measures during the Operation Period

1. Impacts on amphibious animals, reptiles and beasts

After completion of the subproject, the original ecological environment would be partially restored and amphibians, reptiles and beasts would gradually return, and the adverse effect will be minor.

2. Impacts on birds

After completion of the subproject, with the improvement of water quality and the restoration of ecological environment, a sound living environment for birds will be established gradually. Meanwhile, the water is sufficient and the food is ample. It is predicted that the bird population would increase over time after completion of the subproject.

3. Impacts on aquatic plants

After operation of the subproject, with the improvement of water quality, the environment is easier for aquatic plants to survive.

4. Impacts on aquatic animals

After operation of the project, with the water quality improvement, there would be more suitable foraging grounds and habitats for aquatic animals. From a long-term perspective, implementation of the subproject would facilitate the existence of aquatic animals.

5. Analysis of foreign species invasion

The impacts of subproject implementation on biological invasive species include two conditions: the first, whether the subproject implementation may create conditions for biological invasion and cause new biological invasion; the second, whether the subproject implementation can cause further transmission and diffusion of existing alien invasive species. The above two problems are to be analyzed by combining subproject features, and from aspects such as transmission means of alien invasive species, factors affecting invasion of alien species, biological features of existing invasive species in the subproject areas and transmission mechanism, etc.

① Whether the subproject implementation causes new biological invasion

Standards for defining the invasive species: introduced to one non-source area through conscious or unconscious human activities; form the natural regeneration capacity in local natural or constructed ecosystem; caused obvious damage or impacts to local ecosystem or geographical structure. Alien species successfully invade mainly through two means: the first is the species introduced for the purposes of farming, forestry, husbandry and fishing production, ecological environment construction and ecological protection, etc., then developing into invasive species (conscious introduction); the second is the species introduced with trades, transportation, tourist and other activities (unconscious introduction). Main construction of this project aims at rural waters, and the project does not involve any international trade, so no unconscious introduction because of the international trade will be made; furthermore, the project has a small scale and won't cause large change of ecological environment and land utilization way, so no conscious introduction will be made. The subproject implementation won't cause new biological invasive species based on above analysis.

② Whether the subproject implementation causes further transmission and diffusion of existing alien species

According to *List of Alien Invasive Species of China* (the first group, the second group and the third group), and combined with field investigation, it can be guaranteed that there are no alien species in Zhuhu Lake basin. Therefore, the possibility that the subproject implementation causes further transmission and diffusion of existing alien invasive species does not exist.

5.2.6.2 Mitigation Measures

1. The plant design shall be centered on aquatic plants and terrestrial plants. All measures concerned shall be adopted in consideration of plant species diversity and local conditions. Try to use native plants as much as possible, and it is prohibited to introduce alien species.

2. After completion of the subproject, regular investigation and monitoring of species amount and composition in the subproject area shall be carried out. Upon finding out evident increases in the quantity of a species, identification shall be conducted in a timely manner to judge whether it is a foreign species. If this species has potential invasion risks or has invaded, clearing, curbing or control measures shall be taken as soon as possible to reduce its negative impacts.

3. Management shall be strengthened. The employer shall send staff to take charge of afforestation and management. Corresponding rules and regulations shall be formulated to protect Zhuhu Lake basin and its ecological environment.

5.2.7 Analysis of Impacts on Social Environment and Mitigation Measures During the Operation Period

After operation of the subproject of Rural Domestic Sewage Collection and Treatment, the problem of domestic sewage being discharged outward into Zhuhu Lake will be solved effectively; after completion of the subproject of Ecological Restoration and Protection of Basin Water System, farmland water and rainwater will be discharged into Zhuhu Lake after effective purification, which will greatly reduce the pollutants discharged into Zhuhu Lake and diminish the impacts on the water body of Zhuhu Lake. As a result, the water quality of the drinking water source protection area and the wetland park, and water safety

will be guaranteed. The subproject has distinct social environment benefits, and it is a civil project that will benefit the people.

6 Environmental Risks Analysis and Mitigation Measures

6.1 Identification of Environmental Risks

According to special environmental impact analysis, the main results of environmental risk identification are:

(1) The sewage collecting pipelines are buried underground. During the process of sewage conveyance, if anti-seepage measures at the pipeline joint are not properly taken or the pipe is broken, it will cause a sewage leakage.

(2) When there are power cuts or equipment failure in the sewage treatment plant, the sewage processing capacity will be reduced and the quality of treated water will decline; power cuts will lead to the situation where domestic sewage will be discharged into Zhuhu Lake without being processed;

(3) Safety issues of constructors during pipeline and equipment repair or maintenance.

6.2 Impact Analysis of Environmental Risk Accidents

(1) Wastewater pipeline network

When sewage leaks from the pipe seep into the ground, they will not only pollute the soil and sanitary environment around, but also have adverse impacts on the quality of groundwater. According to the operation of the current rain and water pipe network, if not because of long-time disrepair, aging, illegal construction and sabotage, there will be little probability that the pipes will break.

(2) When the pump station is out of running because of power cuts or equipment failure, sewage will be discharged into the drinking water source protection area, which will not only pollute the drinking water body, but also cause damages on people, animals and plants from the drinking water source area. However, if enhancing equipment

inspection and maintenance, the probabilities of such events are low.

(3) Health and safety of maintenance workers

When sewage pipe networks are blocked or accidents occur in some structure, they shall be ruled out immediately. At that time, the maintenance workers need to operate in the sewage pipes, collecting wells or sewage tanks, where some toxic gases of high concentration like hydrogen sulfide, methane, ad carbon dioxide etc., will emerge and accumulate. If protective measures are not taken properly, maintenance workers will inhale toxic gases and feel dizzy and short of breath etc., or worse, even die, because of poor ventilation; or flammable gases like methane meet with open fires and cause explosion, which will jeopardize human life and safety.

6.3 Mitigation Measures of Risk Accidents

1. Preventive measures of sewage collecting pipe leakage risks

(1) When designing pipeline networks, proper pipe materials shall be selected according to the specific condition and features of the village, and quality as well as long operation life shall be guaranteed. The base of the sewage pipe networks shall meet the requirements of mechanical properties of the design. Those don't qualify shall be handled accordingly. The base construction shall strictly follow the requirements of width, thickness and intensity, and guarantee quality.

(2) Before entering the pipelines, corresponding inspections shall be done properly. On the one hand, pipe materials to be used shall be checked carefully to rule out those with cracks and holes; on the other hand, it shall be examined carefully whether the center line, sideline of the pipe base, and size, intensity of the well base etc. meet the requirements; last, it shall be checked whether the well location, well distance, concrete intensity of all parts and the impermeable mortar mixing meet national standards and requirements.

(3) During pipe installation, the cement mortar that wipe belt making needs shall be modulated according to the set mixing ratio. Concave joints will appear because of pressure when implementing the joint of two pipes. In order to ensure a smooth drainage of the pipe, the concave joints shall be handled as soon as possible, lest stream cross sections are reduced, water-flow velocity is affected, and even the pipeline is blocked by waste piles.

(4) Ditch backfilling shall be carried out after the concrete cradle and mortar for the wipe belt form a certain degree of intensity, and sandstones cannot directly hit the pipe.

There cannot be large brickbats and rubbles in sandstones. Both sides of the pipeline shall be backfilled and tamped simultaneously. The part over the pipe top shall be backfilled and tamped in layers to form a mechanical whole, which can unload the force on the top and protect the pipe.

(5) During operation period of the subproject, the construction unit shall establish a comprehensive pipeline network supervision system to clear the pipes and replace broken pipes in time, lest the sewage leaks pollute the water body around and the groundwater.

In conclusion, during construction, the subproject will produce pollutants like sewage, noise and solid wastes etc., but if corresponding measures are taken, the impacts on ambient air quality, water body and acoustic environment around will be minor. Therefore, the subproject is feasible.

2. Risk prevention measures of wastewater treatment plant

(1) Control measures of unstable water quality and water yield shall be taken into consideration during the process design.

Enhance the management of the power plant to ensure normal operation of power supply facilities and circuits;

(3) Increase the frequency for inspections for water transport pipelines to timely discover and solve problems;

(4) Establish the operation management and operation responsibility system for wastewater treatment stations;

(5) Strengthen maintenance and management of equipment and facilities, standbys shall be adopted for key equipment to ensure two-way power supply.

3. Preventive measures of health and safety risk of conservation workers

It is vital to take measures to prevent toxic gases from causing damage to the operation staff and ensure their safety of life. Ventilation measures shall be taken to dissipate the toxic gases and refill the working space with fresh air, which is the most effective way to prevent poisoning accidents. If full ventilation cannot be achieved, then entering dangerous space shall be avoided. But if entering dangerous space is required, effective protective equipment shall be carried along. Protective equipment includes gas masks and supplied air respirators etc., and inspecting equipment includes gas detectors and test strips.

6.4 Contingency Plans for Accidental Risks

In this subproject, the emergency treatment for unexpected environmental risk

accidents is related to many units and departments including environmental protection departments, public security departments, health administrations and fire departments. If risk accidents take place, the contingency plans shall be launched immediately in accordance with Jiangxi Provincial Contingency Plans for Environmental Emergencies.

Contingency organizations in the subproject mainly consist of offices under leading group and various contingency groups which include first-aid group, liaison unit, logistics unit and automobile unit. Division of responsibilities is provided below.

(1) Leading group shall draw up and implement contingency treatment pans based on environmental risks. It also shall be responsible for overall field command and coordinate work with external units.

(2) Offices shall be responsible for dividing, supervising, urging and inspecting work to assist leading group.

(3) First-aid group shall be responsible for work such as specific implementation of risk accidents treatment and maintenance of relevant equipment under the uniform command of leading group.

(4) Liaison unit shall be responsible for the coordination among first-aid group, logistics unit and automobile unit.

(5) Logistics unit is responsible for assist in rescuing poisoned personnel, adopting corresponding rescue measures, going through the procedures for observation and treatment in hospital and attending to poisoned personnel as well as assembling relevant rescue items.

(6) Automobile unit shall be responsible for mobilization and use of automobile such as delivering poisoned personnel to be admitted to the hospital for treatment and transporting rescue items.

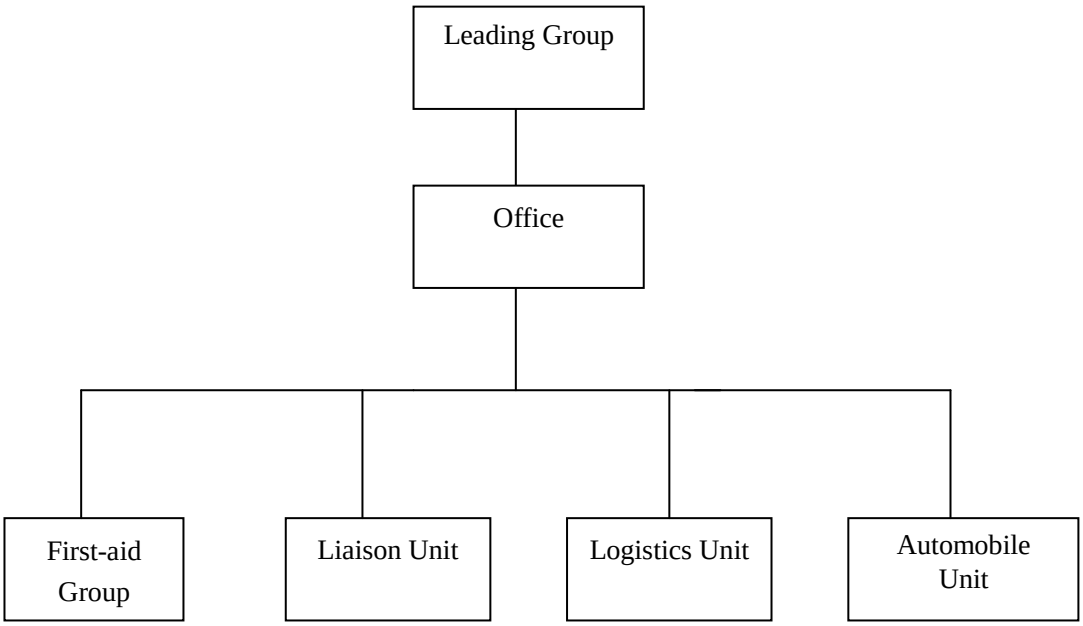


Fig. 6-1 Contingency Organizations in the Subproject

7 Analysis of Industrial Policy and Location Rationality

7.1 Analysis on the Compliance of Industrial Policies

The project belongs to water pollution control in Environmental Control Industry (N7721) as listed in the second category of the Encouraged Category in *National Catalogue of Industrial Structures* (version of 2015)—Article 26, Category two: aquatic ecosystems and groundwater protection and restoration project. Therefore, it is in line with national industry policy.

7.2 Analysis on the Compliance of Urban Planning

The project will build 35 wastewater treatment plants and sewage collection pipe networks, and construct a number of artificial wetlands to trap non-point source sewage. It is in line with the *General Planning of Poyang County* Town (2010-2030) and *Special Planning for Poyang County Urban Area Drainage Works* (2010-2020).

7.3 Analysis on the Compliance of Regional Protection

7.3.1 Analysis on the Compliance of the Protection Area of Poyang Lake National Wetland Park

1. Analysis on the Compliance of Laws and Regulations

The project complies with such laws and regulations as *National Policies on Wetland Park* (Trial) and *Regulations of Jiangxi Province on Wetland Protection*. The detailed analysis is shown as below.

Table 7-1 Analysis on the Compliance of Relevant Laws and Regulations

No.	Relevant Laws and Regulations	Relevant provisions	Design and Status Quo of the Project	Compliance
1	*National Policies on Wetland Park* (Trial)	Apart from conducting activities concerned with wetland protection and monitoring, the wetland protection area shall not do anything that is irrelevant to	Point and non-point source pollution of villages around Zhuhu Lake will be treated using engineering or non-engineering measures to	comply with standards

No.	Relevant Laws and Regulations	Relevant provisions	Design and Status Quo of the Project	Compliance
		wetland ecology protection and management.	protect the water quality of the source of Zhuhu Lake. Altogether 35 country wastewater treatment plants shall be built, with a treatment capacity of 50 t/d~250 t/d. And 101 artificial wetlands will also be constructed, with 95.85 km of ecological sewage interception ditches. Besides, one water quality automatic monitoring station will be built, with 8 automatic measuring and reporting places.	
2	*Regulations of Jiangxi Province on Wetland Protection*	Article 27 People engaged in production and business activities in wetlands shall conform to wetland protection plan and maintain the sustainable use of wetland resources. He/they shall not affect the basic functions of wetland ecosystem, go beyond the regeneration capacity of wetland resources, or cause devastating damage to wild species.		comply with standards

2. Analysis on the Compliance of Wetland Park's Planning

The project conforms to the requirements of the *Overall Planning of Poyang Lake National Wetland Park*. The detailed analysis is shown as below.

Table 7-2 Analysis on the Compliance of Wetland Park's Planning

Relevant Laws and Regulations	Relevant Provisions	Design and Status Quo of the Project	Compliance
Overall Planning of Poyang Lake National Wetland Park	Provisions of first grade protection zones: 1. Strictly protect the park and control project development and construction within the protected environs. 2. Strictly restrict human activities within the protected environs and prohibit the destruction of wetland ecosystem. 3. Strictly prohibit untreated sewage to be discharged to waters with the wetland park. 4. Prohibit the construction of facilities out of the protection plan.	Point and non-point source pollution of villages around Zhuhu Lake will be treated using engineering or non-engineering measures to protect the water quality of the source of Zhuhu Lake. Altogether 35 country wastewater treatment plants shall be built, with a treatment capacity of 50 t/d~250 t/d. And 101 artificial wetlands will also be constructed, with 95.85 km of ecological sewage interception ditches. Besides, one water quality automatic monitoring	comply with standards

Relevant Laws and Regulations	Relevant Provisions	Design and Status Quo of the Project	Compliance
		station will be built, with 8 automatic measuring and reporting places. The sewage treatment plants will treat rural point source sewage and discharge the treated sewage into the waters of Zhuhu Lake.	
	Provisions of second grade protection zones: 1. Apart from planned projects, prohibit the construction of other projects within the protected environs. 2. Regulate human activities and prohibit the destruction of wetland ecosystem.	No construction	comply with standards
	Provisions of third-grade protection zones: 1. Prohibit destructing wetland resources within the protected environs. 2. Prohibit introducing harmful exotic species.	No construction	comply with standards

7.3.2 Analysis on the Compliance of Drinking-water Source Protection Area

By implementing this project, the domestic sewage in rural areas of Zhuhu Lake can be effectively collected, and the non-point source pollution can be effectively controlled from the source. After the quality of sewage treated by wastewater treatment plants reach the *Water Pollutant Discharge Standard for Poyang Lake Eco-Economic Zone*, they will be discharged into the waters of Zhuhu Lake. There are no sewage outlets in each centralized drinking water source protection area. The project complies with the *Law of the People's Republic of China on the Prevention and Control of Water Pollution* (2008.6), *Pollution Prevention and Control Regulations of Drinking Water Source* (revision, 2010.10), *Methods of Jiangxi Province* for *Prevention and Control of Pollution to Domestic Drinking*

Water Source (revision, 2012.11) and other relevant statutory and regulatory requirements. The detailed analysis is shown as below.

Table 7-3 Analysis on the Compliance of Relevant Laws and Regulations

No.	Relevant laws and regulations	Relevant provisions	The design and status quo of the project	Compliance
1	*Law of the People's Republic of China on the Prevention and Control of Water Pollution*	Article 57 Prohibit setting sewage outlets within drinking water source protection areas. Article 58 Prohibit constricting, reconstructing and expanding projects irrelevant to water supply and water source protection within the first grade protection zones of water source conservation areas. Projects already constructed that are irrelevant to water supply and water source protection shall be demolished or closed under the order of governments above county level. Prohibit conducting such activities as cage culture, tourism, swimming and fishing within the first grade protection zones of water source conservation areas, which may pollute the drinking water. Article 59 Prohibit constricting, reconstructing and expanding projects irrevelant to water supply and water source protection within the first grade protection zones of water source conservation areas. Projects already constructed that are irrelevant to water supply and water source protection shall be demolished or closed under the order of governments above county level.	Point and non-point source pollution of villages around Zhuhu Lake will be treated using engineering or non-engineering measures to protect the water quality of the source of Zhuhu Lake. Altogether 35 country wastewater treatment plants shall be built, with a treatment capacity of 50 t/d~250 t/d. And 101 artificial wetlands will also be constructed, with 95.85 km of ecological sewage interception ditches. Besides, one water quality automatic monitoring station will be built, with 8 automatic	comply with standards
2	*Pollution Prevention and Control Regulations of Drinking Water Source*	Article 11 The following regulations must be observed within all grades of conservation areas and quasi-protection zones: 1. Prohibit conducting any activities that may destruct the ecological balance of water environment, water sources protection forest,		comply with standards

No.	Relevant laws and regulations	Relevant provisions	The design and status quo of the project	Compliance
		bank protection forest or vegetation relevant with water source conservation. 2. Prohibit dumping industrial solid waste, municipal refuse, faeces and other wastes to the waters of Zhuhu Lake. 3. Ships and vehicles that transport hazardous substance, oil and faeces are not allowed to enter the protection area. Ships and vehicles that have to enter the protection area must apply for permission and get approved, and take measures to prevent seeping, spilling and leaking. 4. Prohibit using highly toxic and highly persistent pesticides, abusing chemical fertilizers, and using explosives and drugs to kill fishes. Article 12 Protection zones and quasi-protection zones of surface drinking water and water sources at all levels must abide by the following provisions: Prohibit projects construction or expansion that would discharge waste water in second grade protection zones. Reconstruction projects must reduce waste water discharge. Original sewage outlets must cut waste water discharge to ensure that the water quality of protected areas meet standards. Prohibits setting up piers to handle garbage, faeces, oil and toxic substances.	measuring and reporting places. The outlet of sewage treatment plants shall be located outside the second grade protection zones of each water source conservation area.	
3	*Methods of Jiangxi Province* for *Prevention and Control of Pollution*	Article 17 Prohibit conducting the following activities in second grade protection zones of surface water: set up sewage outlets; discharge oil, acid, lye, toxic waste and other contaminated waste water to the waters of Zhuhu Lake; wash vehicles or containers that		comply with standards

No.	Relevant laws and regulations	Relevant provisions	The design and status quo of the project	Compliance
	to Domestic Drinking Water Source	have stored oil or toxic pollutants; discharge or dump industrial waste, urban garbage and other wastes; pile or deposit solid wastes and other pollutants under the highest water level of beaches and bank slopes; and do other activities prohibited by laws, regulations and rules. Article 18 Prohibit conducting the following activities in first grade protection zones of surface water constricting apart from above mentioned activities: discharge pollutants; conduct tourism, swimming or other activities that may pollute drinking water; construct, expand project irrelevant to water supply and drinking water source protection; and do other activities prohibited by laws, regulations and rules.		

7.4 Analysis on the Rationality of Site Selection

There are no industrial point pollution sources within the waters of Zhuhu Lake. As there are six towns, including Tuanlin Township, Baisha Township, Zhuhu Township, Shuanggang Town and Gaojialing Town, domestic sewage is usually directly discharged into rivers. Besides, agricultural pollution is also widespread in these towns. The waters of Zhuhu Lake is the conservation area of the source of Zhuhu, and involves seven centralized drinking water sources. If such measures are not taken, the water quality will gradually deteriorate, causing contamination to drinking water sources.

To protect the water quality of the source of Zhuhu Lake, the project intends to use the engineering and non-engineering measures to treat rural point and non-point source pollution by building 35 rural wastewater treatment plants, whose treatment capacity would reach 50t/d to 250t/d. Besides, 101 artificial wetlands and 95.85km of ecological sewage

interception ditches will be constructed to reduce pollutants discharged to the lake. The project will also build one water quality automatic monitoring station with 8 automatic measuring and reporting places in the intakes of waterworks to strengthen water environment management in water sources. In sum, there is only one site for the project and the only site is reasonable.

8 Public Consultation and Information Disclosure

8.1 Purpose and Approaches

During its construction and operation period, World Bank-financed Poyang County water environment management subproject has environmental impacts on the neighboring areas and directly involves the vital interests of the neighboring people. Thus, in accordance with the *Interim Measures to Public Participation in Environmental Impact Assessment (Huan Fa [2006] No.28), Circular of the Department of Environmental Protection of Jiangxi Province on Further Strengthening Public Participation and Monitoring Management in Environmental Impact Assessment (Gan Huan Ping Zi [2014] No.145)* and *World Bank's Safeguard Policy on Environmental Assessment (OP4.01)*, two rounds of public consultation and information disclosure were carried out. The first round mainly provided the affected residents with subproject overview and potential environmental impacts and collected public comments over the subproject before completion of the outline of EIA report. The second round disclosed the whole report after completion of the draft EIA and offered the main contents and conclusions for public consultation so as to gain public understanding and support for the subproject construction and the adopted mitigation measures.

Public consultation and information disclosure are a type of two-way information sharing between the project implementing agency and the public, are an important component of environmental impact assessment and plays a critical role in improving decision-making. The purposes of public consultation and information disclosure are to disclose relevant project information to the project areas and the public who are concerned about the project, keeping the public informed of the project's type, size, location and main contents, as well as status of pollutant discharge in the project areas and proposed management measures; help assessment staff identify issues or problems, confirm all significant environmental issues or problems triggered by the project have been analyzed and assessed in the EIA; confirm the feasibility of environmental protection measures and

implementation of optimal measures. The EIA institutes feedback to environmental protection administrations and the implementing agency attitude, views and suggestions of the general public so as to facilitate further improvements and stronger rationality of the sub-project's design and implementation, thereby maximizing comprehensive and long-term benefits of the subproject.

8.2 Public Consultation

The subproject carried out two rounds of public consultation. The first round is carried out before completion of the outline of EIA report, and the second round is after completion of the draft EIA. The relevant documents are provided in annex I.

8.2.1 First-round Public Consultation

8.2.1.1 First-round Public Consultation

The first-round public consultation is listed in the following table.

Table 8-1 Time, Participants and Approaches of the First Round

Stage	Consultation Approach	Time	Sites	Consultation Participants	Consultation Contents
The first round	① Site visit; ② Questionnaire survey	December, 2015 and January, 2016	The six towns and townships in Poyang County	Site visit and questionnaire: resident representatives from 35 villages along the lake of Shuanggang Town, Sishilijie Town, Gaojialing Town, Baishazhou Town, Tuanlin Town and Zhuhu Town	Provided the affected residents with subproject overview and potential environmental impacts and collected public comments or suggestions over the subproject

8.2.1.2 Public Feedback

Table 8-2 Public Comments and Feedback in the First-round Public Consultation

Stage	Consultation Approach	Public Issues and Comments	Construction Unit's Feedback on Public Comments
The first round	①Site visit; ② Questionnaire	1. The general public indicated to support the construction, raised no objection.	Construction unit and EIA unit expressed thanks for public understanding and support.

Stage	Consultation Approach	Public Issues and Comments	Construction Unit's Feedback on Public Comments
	survey	2. Hope that the construction is carried out in non-rainy seasons, and some protective measures will be taken to conserve water and soil.	The subproject will better the water and soil conservation measures, and bring the relevant requirements and measures into Environmental Management Plan (EMP).
		3. Compensation will be made for land expropriation and demolition.	Compensation will be made according to relevant national and local policies, and will bring the relevant requirements and measures into EMP.

8.2.2 Second-round Public Consultation

8.2.2.1 Second-round Public Consultation

The second-round public consultation is listed in the following table.

Table 8-3 Time, Participants and Approaches of the Second Round

Stage	Consultation Approach	Time	Sites	Consultation Participants	Consultation Contents
The second round	①Site visit; ② Distributing questionnaires; ③ Discussion meeting	May, 2016	The six towns and townships where the subproject is located	① Site visit and distributing questionnaires: Site visit and questionnaire: resident representatives from 35 villages along the lake of Shuanggang Town, Sishilijie Town, Gaojialing Town, Baishazhou Town, Tuanlin Town and Zhuhu Town; representatives from Water Conservancy Bureau of Poyang County, Poyang Lake National Wetland Park Administration Committee and Environment Protection Bureau of Poyang County; ②Discussion meeting: three times.	Consult with the public about the main contents and conclusions of the EIA so as to gain public understanding and support for the subproject construction and the adopted mitigation measures.

8.2.2.2 Public Feedback

Feedback and comments in the second-round public consultation are listed in the following table.

Table 8-4 Public Comments and Feedback

Stage	Consultation Approach	Public Issues and Comments	Construction Unit's Feedback on Public Comments
The second round	①Site visit; ②Distributing questionnaires; ③Discussion meeting	1. The public supported the subproject construction and accepted environmental protection measures to be adopted.	Construction unit and EIA unit expressed thanks for public understanding and support and strictly implement various environmental protection measures of EMP in the subproject.
		2. Proper publicity and promotion shall be carried out before the construction and informed the public of the construction plan and arrangement, in order to avoid the unnecessary conflicts caused by the construction team's abrupt entry into the village.	Bring the requirements for publicity and promotion before the construction into EMP.
		3. The construction team shall accelerate and finish the construction as soon as possible.	Try to start construction and put it into service as early as possible.
		4. Resettlement and compensation for the demolition shall be carried out properly to avoid conflicts.	Compensation will be made according to relevant national and local policies, and will bring the relevant requirements and measures into EMP.
		5. Suggest starting construction in the second half of the year, avoiding flood and rainy seasons.	Advice has been brought into EMP. The construction period will be selected properly, avoiding rainy season and rainy days. Meanwhile, water and soil conservation measures will be taken.

8.3 Information Disclosure

8.3.1 First-round Information Disclosure

Time, sites and approaches of the first-round information disclosure are shown in the following table.

Table 8-5 Time, Sites and Approaches of the First-round Information Disclosure

Stage	Notice Forms	Time	Sites	Notice Contents
The first round	On-site Notice	January, 2016	Government and village committee bulletin boards in Shuanggang Town, Sishilijie Town, Gaojialing Town, Baishazhou Town, Tuanlin Town and Zhuhu Town	Mainly including subproject content and potential environmental impact

8.3.2 Second-round Information Disclosure

Time, sites and approaches of the second-round information disclosure are shown in the following table.

Table 8-6 Time, Sites and Approaches of the First-round Information Disclosure

Stage	Notice Forms	Time	Sites	Notice Contents
The second round	Full EIA disclosure	May, 2016	1. County Agricultural Foreign Capital Utilization Office (Floor 13, Poyang Lake Building); 2. Civilian service centers in towns and townships of Shuanggang, Zhuhu, Sishilijie, Tuanlin, Baishazhou and Gaojialing	Full EIA draft
	On-site Notice	May, 2016	Government and village committee bulletin boards in Shuanggang Town, Sishilijie Town, Gaojialing Town, Baishazhou Township, Tuanlin Township and Zhuhu Township	(1) Subproject overview; (2) Environmental protection measures to be adopted; (3) conclusion of EIA draft; (4) Sites and methods for accessing the full EIA

Picture 8-1 First-round On-site Notice

Picture 8-2 Second-round On-site Notice

Picture 8-3 Full EIA Disclosure

9. Immigrant Settlement and Social Assessment

The following contents are quoted from World Bank Financed Migration Resettlement Plan for Jiangxi Poyang Lake Basin Water Environmental Management Project and World Bank Financed Social Assessment Report on Jiangxi Poyang Lake Basin Water Environmental Management Project by Hohai University.

9.1 Migration Resettlement Plan

9.1.1 Impacts of Land Occupation

Land acquisition and demolition of the project involves 6 townships or towns. Impact on migration is connected with permanent land acquisition and temporary land occupation, but there is no house demolition and no minority groups in the area of land acquisition. See Table 9-1 for the project impacts.

Table 9-1 Impacts of Project Migration

County	Project Name	Townships/Towns (number)	Villages (number)	Collective Land Acquisition (ha)		State-owned land aquisition (ha)	Temporary land occupation (ha)		Directly affected population		Indirectly affected farmer, shops	
				Total	Paddy filed/ dry land		Collective Land	State-owned land	Households	Population (capita)	Number	Population (capita)
Poyang County	Comprehensive Treatment of Zhuhu Lake	6	35	3.35				266.04	35	146		
			101	176.82					59	205		
	Water Environment Monitoring System					3						

9.1.2 Measures of Reducing Impacts

To reduce the project's social and economic impacts, the design agency and

project owner take effective measures as below during the stage of planning and designing:

(1) When selecting project plans, impacts on local society and economy should be prioritized and be regarded as key elements in optimization and comparison of plans to avoid land occupation effectively.

(2) Optimize design to reduce demolition and migration by using existing national or local roads to planned construction areas.

(3) Optimize design by using uncultivated and state-own land to cut down occupation of farmland.

During the plan and implementation of migration, adopting following measures to reduce impacts on local region when demolition and resettlement are avoidable.

(1) To further analyze local social-economic status and future development by collecting more basic information, formulate feasible migration plan based on local conditions and ensure that people affected by the engineering will not suffer loss.

(2) Encourage public participation and accept public supervision.

(3) Enhance internal and external monitoring by establishing highly-efficienty feedback mechanism and channels. Try to shorten time of information processing to ensure that problems in the implementation will be solved timely.

(4) Plan construction area reasonably and try to occupy less land, and restore temporarily occupied lands according to their original types.

(5) Arrange site of earth-work storage reasonably by keeping it away from environmental sensitive sites such as residential, schools and etc.

9.2 Social Assessment

9.2.1 Social Assessment

Social assessment of this project consists of items below:

(1) Generally, the project is of high economic and social benefit, consistent with medium or long-term development plan for representative counties of each sub-project. Meanwhile, it will have positive influence on improving regional

environment and boost regional economic and social development.

(2) Majority farmers/residents of representative counties will be benefited directly from the project, since the project covers extensively and various beneficiaries.

(3) The disadvantaged groups will be direct beneficiaries of the project. Basically, contents of the project have little impact on livelihood of such groups, on the contrary, the project can create some jobs for them to live a better life.

(4) Because the project is in line with the region's customs, culture and religion, there is no relevant risks.

(5) Project management system of high enforcement capability provides institutional guarantee for the project to operate and implement smoothly.

The project will alleviate pollution in Poyang Lake Basin and improve living, ecological and social environment for residents in the project area. Purpose of the project is in accordance with China's plan of making use of foreign investment and pollution control. Local governments of all-level and beneficiary groups are supportive and cooperative with the project.

Sewage treatment and ecological restoration engineering have been spread in many provinces for years and are equipped with sound technology. Moreover, regions of the project have conduct similar projects on pollution control and have formed full-time technological team, boasting good working foundation. And staffs of project offices of all-level are experienced in project management. All of these are favorable for completing the project successfully.

Implementation of the project will contribute to favorable social benefit. For example, the project can improve people's living environment and livelihood; create more jobs for vulnerable groups and farmers; decrease incidence of disease and improve fitness; promote urbanization of rural areas and transform farmers into city residents; facilitate industrial restructuring and growth of green economy.

Any project may encounter risks in the implementation. This project will undergo risks in the construction, difficulty of land acquisition and subsequent maintenance. For this reason, the project has to pay attention to the development of beneficiary groups and also attend to social equity. Undoubtedly, more integral project design and high-quality project management will reduce potential social risks and prevent negative social impacts in the area.

9.2.2 Advice

Due to difference and complexity of project contents in various cities or towns and distinct economic and social development, we have to face with potential risks brought by project engineering. Those risks can be avoided through two methods. Firstly, optimize engineering design on the basis of no extra quantity. Secondly, owners should consult with stakeholders before, during and after the project construction to know their needs and desires, and communicate with different departments:

1. General Advice

(1) Optimal design

Project owners and feasibility study agencies are suggested to cut down scale of land acquisition and demolition in the design, and to adopt advanced measures of environmental protection to avoid secondary pollution brought by environmental project;

(2) Conduct participatory activity

Involving major stakeholders in the design, implementation, management and supervision of the project. Project owners, project office and social assessment group formulate outline for beneficiary participation and initiate monitoring and evaluation of the activity to ensure that major stakeholders join in the whole process of the project, including the preparation, design, implementation, monitoring and supervision, and equip them with awareness of protection the environment;

(3) Carry out training on environmental knowledge and public health education

Relevant government departments are advised to organize public training on national and regional laws and regulations on environmental protection as well as environment indicators under the assistance of propaganda department, bureau of education, environmental protection bureau, bureau of radio and television, newspaper, sub-district office, town/township, residents' committee and village committee. Launch training on water conservation, treatment of sewage and waste, control of point pollution, prevention of water-mediated diseases and recycle of waste. Publicize life-styles that may affect surrounding environment and help residents in the project area to realize that their way of living may have impacts on surrounding environment;

(4) Formulate reasonable plan for resettlement of affected residents

On the basis of public consultation, the project office, resettlement plan group and project owners are advised to ensure that migrants livelihood will not be affected by the project construction;

(5) Create new jobs

The project office, owners, construction agency, joint bureau of civil affairs, social security bureau will provide works for migrants, poverty-stricken family and women in cities and rural areas to get them involved in the project construction;

(6) Establish and enact preferential charging policy for impoverished groups

Advise the project office, owners and price bureau to establish charging policy for local impoverished groups on the basis of public hearing;

(7) Safety and convenience during the construction

Advise the project owners and construction agencies to schedule the construction by taking residents need and habits into consideration;

(8) Institutional capacity building

The project manager and constructor are advised to launch training on World Bank social and safeguard policies to better implement the project;

(9) Mechanism of follow-up project management

The advice is to get residents involved in the follow-up management. Establish a community team of following project management based on the management group during the construction. Members of following management team will be elected by villagers, which should include female representatives. Environmental institutions should strengthen lawmaking on environmental protection and law enforcement and enhance environmental education for residents in the project area so as to achieve sustainable effect.

2. Advice on sub-projects

(1) Sewage pipelines

①Pipeline engineering construction will affect residents rest, shop business and industry operation on the two sides of roads. Therefore, laying of pipes is advised to shorten construction duration to reduce unfavorable impact. If possible, offer certain compensation for affected residents and show owners; ②Try to collect sewage within construction and residential area from the origin; ③ Since the project area enjoys abundant water system and water resource, drainage engineering should be in accordance with local conditions to ensure construction quality and life time.

(2) Advice on lake treatment project

①Fall of surface water level results in that many wetlands are reclaimed as field for vegetable or crop, which blocks exchange of water in lake. Meanwhile, fertilizer in farmland will contaminate waters. Therefore, consultation with residents occupying wetlands is advised as a way to turn field into lake and to improve ecological system of wetland; ②Carry out non-engineering measures to control lake pollution, and issue regulations on economic activities within lake area to strengthen lawmaking on lake treatment and enhance green administration ability to reduce emission fundamentally; ③Integrate technology to promote common development of ecological protection and economic growth in the lake area.

10. Environment Management Plan

See the independent document of World Bank-financed Poyang Water Environment Management Project.

11 Analysis of the Environmental Economic Profit and Loss

11.1 Estimated Costs of Investment in Environmental Protection

The total investment of the project is RMB 300,864,600, among which the total cost of planned environmental management is about RMB 2,099,000, accounting 0.7% of the whole project.

Table 11-1 List of Cost Estimation of Project Environmental Management (RMB)

Environmental Management	Environment monitoring		Personnel Training	Total EMP Implementation Cost
	Construction Period	Operation Period		
142	7.4	52.5	8	209.9

11.2 Environmental Economy Profit and Loss Analysis

11.2.1 Environmental Benefits

The project covers the construction of wastewater treatment plants, sewage collection pipe network, ecological sewage interception ditches and artificial wetlands. The principal benefit of the project is its environmental benefits, including the reduction of pollutants loads, water quality improvement and improvement in environmental management capacity.

(1) Reduction of Pollutants Loads

By implementing this project, the domestic sewage in rural areas of Zhuhu Lake can be effectively collected, and the non-point source pollution in rural areas can be effectively controlled from the source. It is expected that when the construction of the project completes in 2023, there will be a reduction of 1,886t/a of COD, 484.70t/a of TN and 33.43t/a of TP discharged to the waters of Zhuhu Lake every year.

(2) Water Quality Improvement

Through the implementation of this project, sources of water pollution in farmland cultivation and life residual are controlled, water of Zhuhu Lake is purified and conserved, and pollutants charged into the lake are greatly reduced. Therefore, the

impact of pollutants on local drinking water sources is reduce, the water quality of the waters of Zhuhu Lake is improved, and the waters is protected in a fundamental way, which result in the significant improvement of environment and water security in Poyang County.

(3) Improvement in Environmental Management Capacity

By implementing environmental monitoring and environmental management capacity projects, powerful technical measures and regulatory means are available to promote local environmental protection, effectively prevent environmental pollution accidents, and reduce environmental risks. Managerial and technical measures can be taken to reduce the pollution of waters of Zhuhu Lake to a maximum extent and to improve regional environment.

11.2.2 Social Benefits

As a social welfare project, the project aims to continuously improve people's living environment, coordinate urban development, improve water security, strengthen water environment management and protection, comprehensively improve the level of ecological civilization in the waters of Zhuhu Lake, and promote the sound sustainable economic and social development of the region. It plays a very important role in building a moderately prosperous society in Poyang County and protecting the ecological environment of Poyang Lake Basin, bringing about very significant social benefits.

After the completion of the project, water pollution in waters of Zhuhu Lake would be treated to some degree. The project will exert positive influence in further improving the water environment of Zhuhu Lake region, improving the quality of life of residents, especially in developing eco-tourism in Poyang County, enhancing its overall tourism competitiveness, and further improving its investment environment.

The project combines the construction of ecological project with Poyang County's economic restructuring, economic development and poverty alleviation, and realizes the harmonious development of man and nature. The project will not only contribute to the construction of an environment-friendly society, but also set an example in the green development of Poyang Lake Ecological Economic Zone.

The project also enables the masses to fully aware of the necessity and urgency

to protect the environmental, improves the ecological awareness of urban and rural cadres, helps to form a good atmosphere of public participation in ecological and environmental protection. It helps people to abandon the extensive growth pattern that pursue economic development at the expense of the environmental destruction and resources consumption. It will facilitate establishing the concept of harmonious development between man and nature, and remind the people to protect ecological environment while developing the economy.

11.2.3 Economic Benefits

Water environment treatment and control engineering itself does not create economic profits directly, however, implementation of the project will play a crucial role in protecting environment of townships and towns within Zhuhu Lake Basin. Integration of social-economic growth and environmental protection goals will contribute to economy of townships and towns greatly, mainly in the following aspects:

(1) Added-value of land price

The implementation of water environment treatment project will improve water quality of Zhuhu Lake. The improvement of environment can make land prices rise, and therefore promote the development of tourism.

(2) Reduction of diseases, improvement of health

The implementation of the project will reduce the breeding ground for bacteria, reduce diseases, thereby reducing the costs of medical expenses and raising Poyang County's sanitation standards.

(3) Improvement of ecological environment

The implementation of the project will greatly improve the ecological environment of Zhuhu Lake region and safeguard the safety of drinking water sources.

11.3 Summary

The project is part of the phased program to improve the environment of Poyang

County and promote the water environment management of Zhuhu Lake region. The project will greatly influence the region's infrastructure construction, ecological environment and even national economy and social development.

① Help to consolidate the achievements of environmental governance within the region and further improve local environment;

② Help to improve local residents' production and living conditions, and improve the quality of life and the health of the residents;

③ Help to promote Poyang County' infrastructure construction and management marketization, and achieve the positive self-development of urban infrastructure by introducing the advanced international technologies and management experience;

④ Encourage the construction of water environment safety in Zhuhu Lake region, safeguard the sustainable development of economic and social development with the sustainable development of the environment, and create favorable conditions for the realization of Poyang Lake Ecological Economic Zone' sustainable development and ecological civilization. Therefore, the project enjoys good environmental, social and economic benefits.

12 Conclusions

Conclusions on the project environmental impact assessment are as following:

(1) This project will improve the water environment of Zhuhu Lake Basin in Poyang County and enhance the infrastructure. The project enables effective collection of rural sewage in Zhuhu Lake Basin and control of rural non-point pollution, which helps protect the receiving water quality of Zhuhu Lake, improve environmental health conditions in Poyang County to some extent and greatly better residents' living conditions so as to protect the adjacent headwaters, to beautify surrounding environment, to build a more comfortable and beautiful living environment and to enhance residential environment for people.

(2) The project construction conforms to national laws and regulations as well as the urban master plan and environmental protection plan at the project site, which serves as policy and law basis of the project.

(3) This project construction involves some environmental protection targets (sensitive points) such as villages, Poyang National Wetland Park and centralized drinking water source within Zhuhu Lake Basin. In the environmental assessment, unfavorable impacts of the project on such environmental protection targets (sensitive points) can be further reduced and eliminated through mitigation measures, formulation and implementation of environmental management plans and public participation. Also, possible impacts can be controlled in compliance with national environmental laws, regulations and standards.

(4) This project may make some adverse effects on the surrounding environment, mainly including those during construction.

1) During construction, its negative impacts include impact of dust on ambient air quality, impact of construction vehicles and machinery noise on the surrounding environment, impact of the construction sewage, impact of soil erosion brought by temporary piling of earthwork, impact of construction on water sources and ecological environment, etc..

2) During operation, its negative impacts include impact of equipment noise and sludge of the sewage treatment plant. Noise of equipment in operation will make fewer impacts on the surrounding environment with sound insulation and shock absorbing measures. Sludge will have a relatively small influence on environment with reasonable treatment.

(5) Possible negative impacts of the project can be controlled within the range and level as permitted the national laws, regulations and standards through mitigation measures, implementation of environmental management plans, public participation and information disclosure.

In conclusion, after adopting the countermeasures proposed in the project such as mitigation measures, environment management plans, public consultation and information disclosure, the implementation of the project is feasible in terms of environment.

Annex

Annex I: Symposium Minutes

I. The Symposium in Sishilijie Town

(1) Time: 9:30 am, May 13, 2016

(2) Location: Meeting Room, 2/F, Sishilijie Town government building

(3) Content: Public consultation and information disclosure symposium on the environmental impact assessment of World-Bank-financed Poyang County water environment management project

(4) Presented by: Secretary Hong of Sishilijie Town, representatives of Huangbiquan, representatives of Nuanshui Zhanjia Village, representatives of Nuanshui Wangjia Village, representatives of Chenli Village, representatives of Pantaozui Village, representatives of Qinglong Village, representatives of Xinlu Village, representatives of Hupen Village and related members of EIA Institute etc..

(5) Hosted by: Secretary Hong (Sishilijie Town Government)

(6) Minutes

At the symposium, public consultation was conducted on the completed first draft of Environmental Assessment Report of Poyang County Water Environment Management Project. Consensus was reached on mitigation measures for the project environmental impacts after a discussion. Relevant agenda minutes were as follows:

① The host introduced those who presented at the symposium and handed out questionnaires.

② EIA Institute briefed on the purpose of public consultation.

According to national environmental protect laws and regulations as well as the World Bank policy (OP4.01), two rounds of public consultation and information disclosure were launched concerning the project. The first round, in the period between environmental question selection and the completion of the project's EIA outline, was mainly to provide the affected mass with project overview and possible environmental impacts. The second round, during the completion of the first draft of EIA report, was to exchange ideas on environmental questions that the mass had shown concern for in the first round and their mitigation measures so as to gain the

public understanding of the project construction and mitigation measures adopted. It was to publicize information of the project for the public in the project area or concerned about the project in order to inform them of main conditions, operation features and major environmental problems of the project, to help evaluators spot problems and ensure that all the major environmental problems generated by the project are analyzed and evaluated in the EIA report, to confirm feasibility of environmental protection measures and implementation of optimization measures and plans.

③ EIA Institute presented general conditions, environmental impacts, prevention and treatment measures of the project and conclusions of the first draft of environmental assessment.

The planned project aims to cut pollutants discharged into Zhuhu Lake water bodies by constructing rural sewage collection and treatment work in the basin, river system recovery and protection work, water quality monitoring system and other non-engineering measures, which will effectively control pollutant discharge upon its completion. The project is related to not only sustainable economic and social development of Poyang County, but also drinking water safety concerning people relying on Zhuhu Lake water bodies as their drinking water source including those from Sishilijie Town, Tuanlin Township, Shuanggang Town, Gaojialing Township, Ligongnao, Zhuhu Township and others. The project adopts a mode of "water bodies purification by reducing pollution from the source, controlling in the middle and treating at the terminal" so that pollution of Zhuhu Lake water environment is under control and prevention from the very source. The project is feasible in terms of the environment with measures mentioned in this assessment report such as mitigation measures, environmental management plans and public participation.

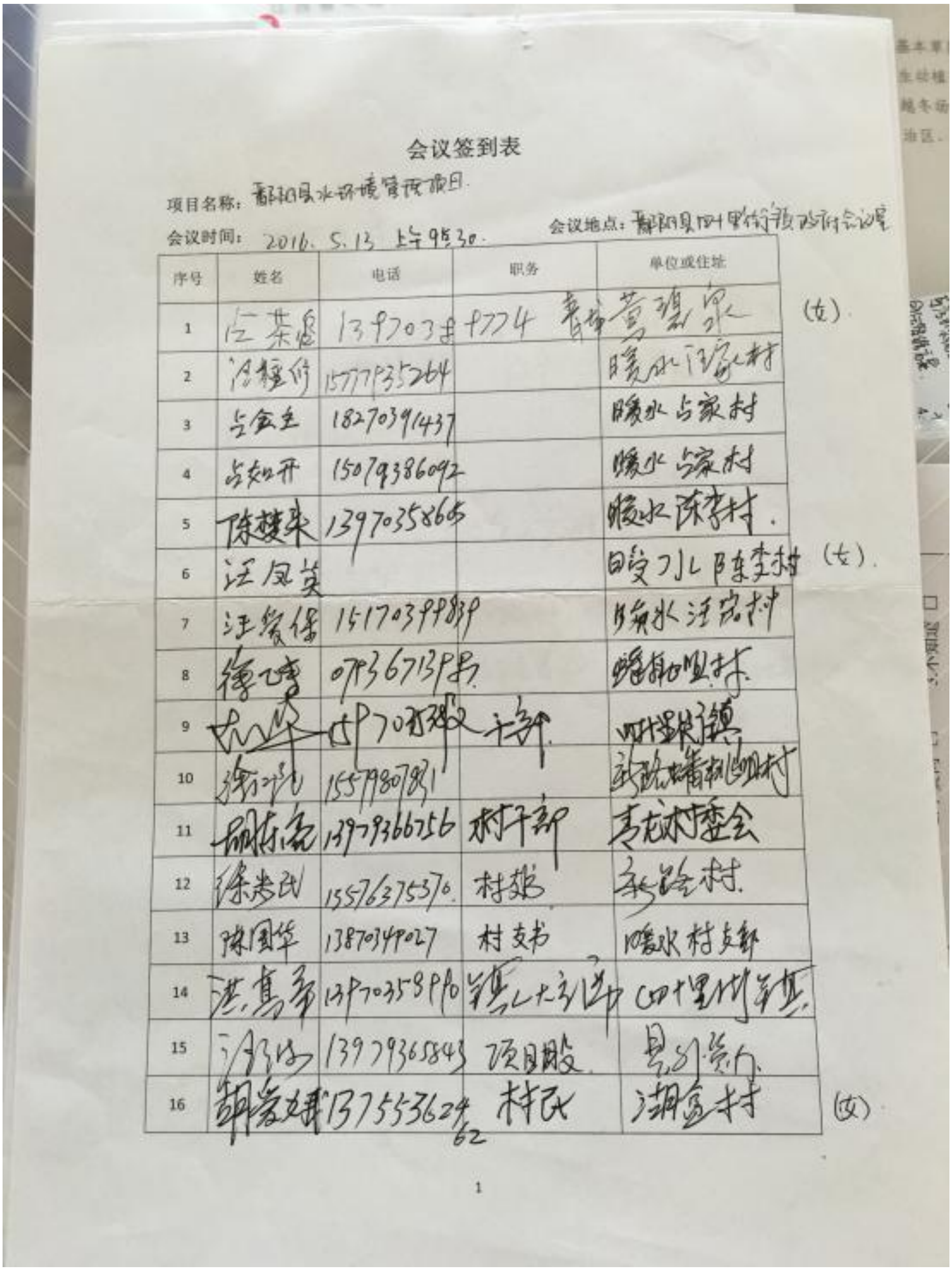
④ Representatives at the symposium all supported the project construction and acknowledged all the environmental protection measures proposed by EIA Institute. They also proposed that attention should be paid to publication and promotion prior to construction to avoid unnecessary disputes arising out of the construction team's entering villages and to replacement and reimbursement of ground acquisition and house removal to avoid disputes caused by ground acquisition and house removal.

They recommended to start construction in the second half year to keep off the flood and rainy season.

⑤ Feedback on public opinions: The Project Office and EIA Institute appreciated public understandings and support. All the environmental protection measures will be implemented rigidly as mentioned in EMP. Requirements for publication and promotion before construction will be included in EMP. Reimbursement for ground acquisition and house removal will be carried out pursuant to national and local policies, of which requirements and measures will be included in EMP. Reasonable construction period will be chosen to avoid construction in rainy season and days and attention is also paid to soil and water conservation.

⑥ The host concluded the symposium and the symposium ended.

Fig.1 Photos of the Symposium at Sishilijie Town, Poyang County



会议签到表

项目名称：鄱阳县水环境管理项目

会议时间：2016. 5. 13 上午9点30.　　会议地点：鄱阳县四十里街镇政府会议室

序号	姓名	电话	职务	单位或住址
1	[illegible]	[illegible]	[illegible]	[illegible] (女)
2	[illegible]	15779135264		暖水汪家村
3	占金生	18270391437		暖水占家村
4	占知开	15079386092		暖水占家村
5	[illegible]	13970358665		暖水陈李村.
6	汪凤英			暖水陈李村 (女).
7	汪[illegible]	15170399839		暖水汪家村
8	[illegible]	[illegible]		[illegible]
9	[illegible]	[illegible]	干部	[illegible]
10	[illegible]	15579807891		[illegible]
11	[illegible]	13979366756	村干部	青龙村委会
12	[illegible]	15576375370.	村[illegible]	新路村.
13	陈国华	13870349027	村支书	暖水村支部
14	[illegible]	[illegible]	[illegible]	四十里街镇
15	[illegible]	13979365843	项目股	[illegible]
16	[illegible]	[illegible]	村民	湖[illegible]村 (女)

1

Fig.2 Attendance Sheet of the Symposium at Sishilijie Town, Poyang County

II. The Symposium in Tuanlin Township

(1) Time: 1:30 pm, May 13, 2016

(2) Location: Meeting Room, 2/F, Sishilijie Town government building

(3) Content: Public consultation and information disclosure symposium on the environmental impact assessment of World-Bank-financed Poyang County water environment management project

(4) Presented by: Director Li of Tuanlin Township, representatives of Shatang Village, representatives of Bantian Village, representatives of Bantang Village, representatives of Jiangqiao Village, representatives of Meihu Village, representatives of Tongqian Village, representatives of Sheshan Village and related members of EIA Institute etc..

(5) Hosted by: Director Li Guihan (Tuanlin Township Government)

(6) Minutes

At the symposium, public consultation was conducted on the completed first draft of Environmental Assessment Report of Poyang County Water Environment Management Project. Consensus was reached on mitigation measures for the project environmental impacts after a discussion. Relevant agenda minutes were as follows:

① The host introduced those who presented at the symposium and handed out questionnaires.

② EIA Institute briefed on the purpose of public consultation.

According to national environmental protect laws and regulations as well as the World Bank policy (OP4.01), two rounds of public consultation and information disclosure were launched concerning the project. The first round, in the period between environmental question selection and the completion of the project's EIA outline, was mainly to provide the affected mass with project overview and possible environmental impacts. The second round, during the completion of the first draft of EIA report, was to exchange ideas on environmental questions that the mass had shown concern for in the first round and their mitigation measures so as to gain the public understanding of the project construction and mitigation measures adopted. It was to publicize information of the project for the public in the project area or concerned about the project in order to inform them of main conditions, operation features and major environmental problems of the project, to help evaluate spot

problems and ensure that all the major environmental problems generated by the project are analyzed and evaluated in the EIA report, to confirm feasibility of environmental protection measures and implementation of optimization measures and plans.

③ EIA Institute presented general conditions, environmental impacts, prevention and treatment measures of the project and conclusions of the first draft of environmental assessment.

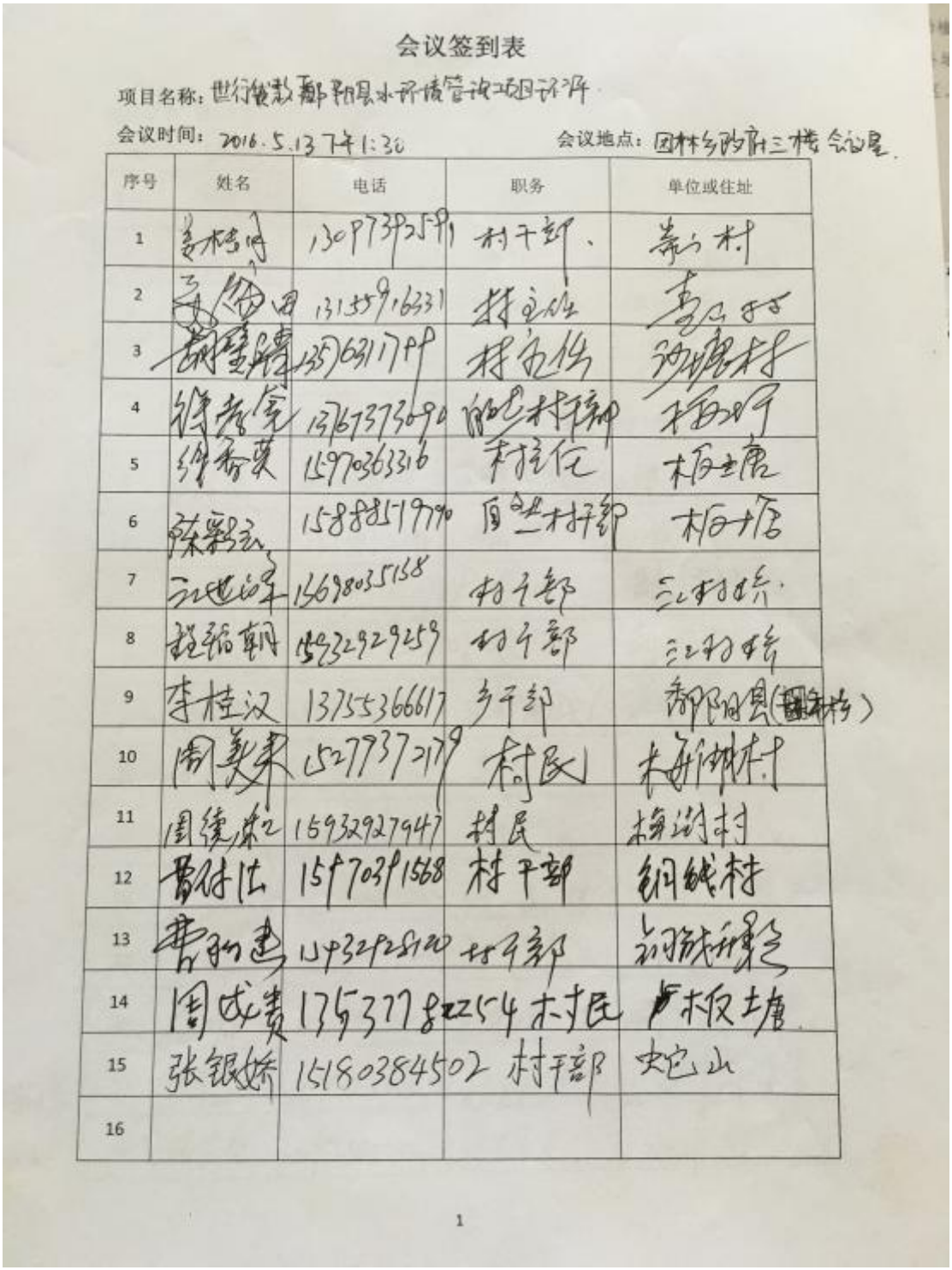
The planned project aims to cut pollutants discharged into Zhuhu Lake water bodies by constructing rural sewage collection and treatment work in the basin, river system recovery and protection work, water quality monitoring system and other non-engineering measures, which will effectively control pollutant discharge upon its completion. The project is related to not only sustainable economic and social development of Poyang County, but also drinking water safety concerning people relying on Zhuhu Lake water bodies as their drinking water source including those from Sishilijie Town, Tuanlin Township, Shuanggang Town, Gaojialing Township, Ligongnao, Zhuhu Township and others. The project adopts a mode of "water bodies purification by reducing pollution from the source, controlling in the middle and treating at the terminal" so that pollution of Zhuhu Lake water environment is under control and prevention from the very source. The project is feasible in terms of the environment with measures mentioned in this assessment report such as mitigation measures, environmental management plans and public participation.

④ Representatives at the symposium all supported the project construction and acknowledged all the environmental protection measures proposed by EIA Institute. They proposed that reimbursement for ground acquisition should be done well.

⑤ Feedback on public opinions: The Project Office and EIA Institute appreciated public understandings and support. All the environmental protection measures will be implemented rigidly as mentioned in EMP. Reimbursement for ground acquisition and house removal will be carried out pursuant to national and local policies, of which relevant requirements and measures will be included in EMP.

⑥ The host concluded the symposium and the symposium ended.

Fig. 3 Photos of the Symposium at Tuanlin Township, Poyang County



会议签到表

项目名称：世行贷款鄱阳湖水环境管理项目评评

会议时间：2016.5.13 下午1:30　　会议地点：团林乡政府三楼会议室

序号	姓名	电话	职务	单位或住址
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Fig. 4 Attendance Sheet of the Symposium at Tuanlin Township, Poyang County

III. The Symposium in Shuanggang Town

(1) Time: 4:00 pm, May 13, 2016

(2) Location: Meeting Room, 2/F, Shuanggang Town government building

(3) Content: Public consultation and information disclosure symposium on the environmental impact assessment of World-Bank-financed Poyang County water environment management project

(4) Presented by: Director Yu of Shuanggang Town, cadre representatives of Shuanggang Town, representatives of Jingtang, representatives of Xinmin Village, representatives of Zhushan Village, representatives of Jinghua Village, representatives of Xiaohua Village, representatives of Sheshan Village and related members of EIA Institute etc..

(5) Hosted by: Director Yu (Shuanggang Town Government)

(6) Minutes

At the symposium, public consultation was conducted on the completed first draft of Environmental Assessment Report of Poyang County Water Environment Management Project. Consensus was reached on mitigation measures for the project environmental impacts after a discussion. Relevant agenda minutes were as follows:

① The host introduced those who presented at the symposium and handed out questionnaires.

②EIA Institute briefed on the purpose of public consultation.

According to national environmental protect laws and regulations as well as the World Bank policy (OP4.01), two rounds of public consultation and information disclosure were launched concerning the project. The first round, in the period between environmental question selection and the completion of the project's EIA outline, was mainly to provide the affected mass with project overview and possible environmental impacts. The second round, during the completion of the first draft of EIA report, was to exchange ideas on environmental questions that the mass had shown concern for in the first round and their mitigation measures so as to gain the public understanding of the project construction and mitigation measures adopted. It was to publicize information of the project for the public in the project area or concerned about the project in order to inform them of main conditions, operation features and major environmental problems of the project, to help evaluators spot

problems and ensure that all the major environmental problems generated by the project are analyzed and evaluated in the EIA report, to confirm feasibility of environmental protection measures and implementation of optimization measures and plans.

③ EIA Institute presented general conditions, environmental impacts, prevention and treatment measures of the project and conclusions of the first draft of environmental assessment.

The planned project aims to cut pollutants discharged into Zhuhu Lake water bodies by constructing rural sewage collection and treatment work in the basin, river system recovery and protection work, water quality monitoring system and other non-engineering measures, which will effectively control pollutant discharge upon its completion. The project is related to not only sustainable economic and social development of Poyang County, but also drinking water safety concerning people relying on Zhuhu Lake water bodies as their drinking water source including those from Sishilijie Town, Tuanlin Township, Shuanggang Town, Gaojialing Township, Ligongnao, Zhuhu Township and others. The project adopts a mode of "water bodies purification by reducing pollution from the source, controlling in the middle and treating at the terminal" so that pollution of Zhuhu Lake water environment is under control and prevention from the very source. The project is feasible in terms of the environment with measures mentioned in this assessment report such as mitigation measures, environmental management plans and public participation.

④ Representatives at the symposium all supported the project construction and acknowledged all the environmental protection measures proposed by EIA Institute. They are all concerned about drinking water safety of Zhuhu Lake and hope that the project starts and completes as soon as possible to ensure drinking water safety.

⑤ Feedback on public opinions: The Project Office and EIA Institute appreciated public understanding and support. All the environmental protection measures will be implemented rigidly as mentioned in EMP. Efforts will be made to ensure that the project gets started and operated as soon as possible.

⑥ The host concluded the symposium. That was the end of the symposium.

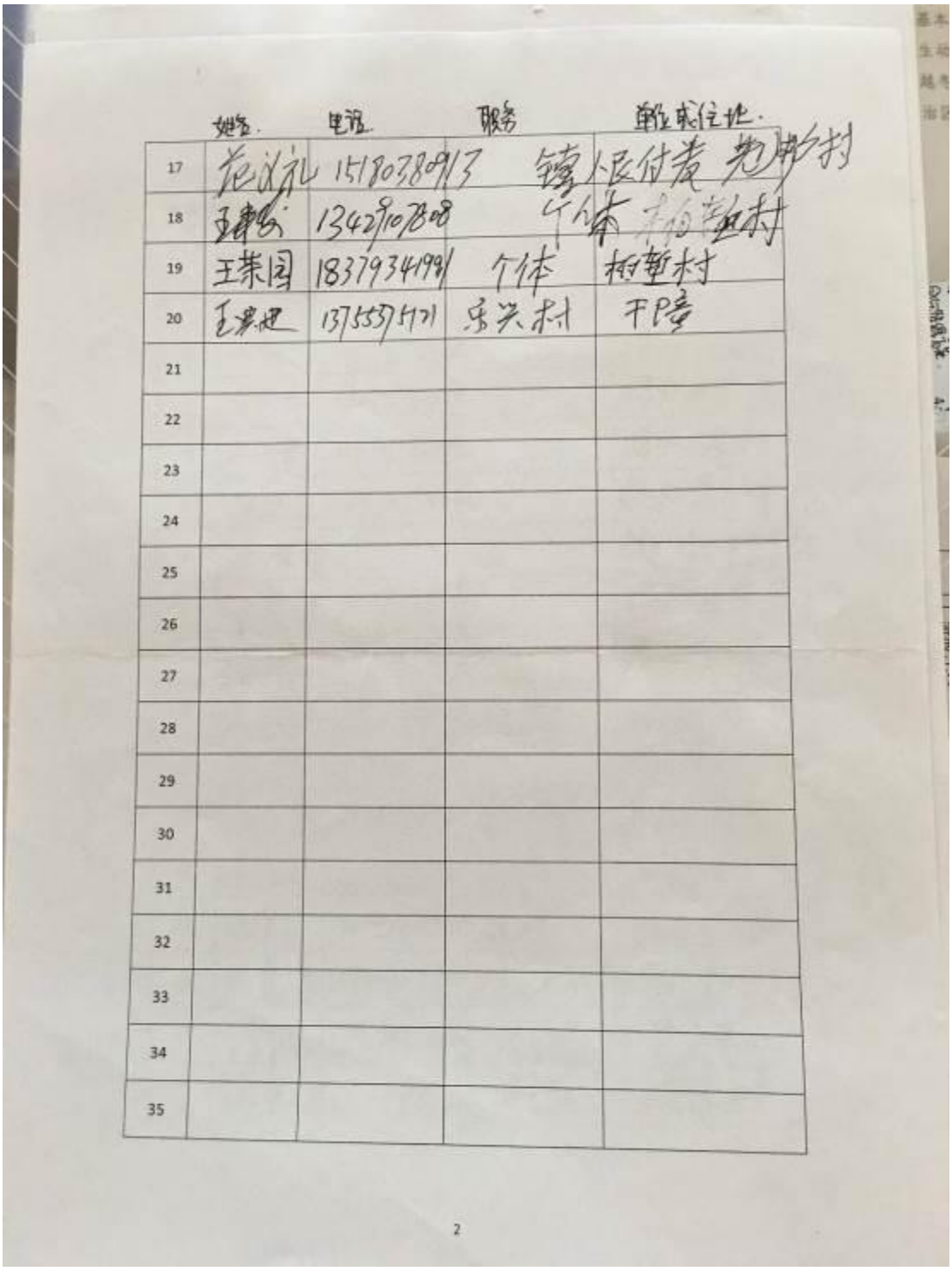
Fig. 5 Photos of the Symposium at Shuanggang Town, Poyang County

会议签到表

项目名称：世行贷款移民项目

会议时间：2016.5.13 下午4点　　会议地点：双港镇政府会议室

序号	姓名	电话	职务	单位或住址
1	[illegible]	13755737846	干部	双港镇政府
2	方小琴	15579267133	镇人民代表	双港荆竹村
3	[illegible]	13779292182	群众代表	双港荆竹村
4	龙神男	15170360219	群众代表	双港荆竹
5	[illegible]	13700225688	支部书记	双港荆竹村
6	胡美华	15939112891	农田	荆竹
7	龙海波	13679485089	农田	荆竹村
8	王木香	13755723301	农田	荆竹村
9	[illegible]	13970318730	支部书记	荆竹
10	[illegible]	13579276988	支书	小华
11	罗光发	13870303581	支书	新民
12	[illegible]	13607408888	计生员	竹林
13	[illegible]	18870912697	支书	长坡
14	[illegible]	15079392050	新村组	双港镇政府
15	荆华村	15932938076	村计生员	荆华村
16	胡芳香	13970345332	计生专干	小华村



	姓名	电话	服务	单位或住地
17	花述礼	15180380913	镇人民代表	勃湖乡村
18	王建飞	13429107808	个体	勃湖乡村
19	王荣国	18379341991	个体	勃湖村
20	王荣进	13755374171	东关村	干部
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Fig. 6 Attendance Sheet of the Symposium at Shuanggang Town

Map

Map I Geographical Location of the Project

Location of Poyang

Map II Layout of the Project