World Bank-financed Jiangxi Poyang Lake Basin and Ecological Economic Zone Small Town Development Demonstration Project –

Ruijin City Mianjiang River (Lucao Lake) Wetland Protection and Utilization Subproject

Environmental Impact Assessment

Institute of Poyang Lake Eco-economics, Jiangxi University of Finance and Economics
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1 Overview

1.1 Subproject Background

In December 2009, China’s State Council approved the Poyang Lake Ecological and Economic (Eco-economic) Zone Program, indicating that construction of Poyang Lake Ecological and Economic Zone has been elevated to the national strategy. The program includes Poyang Lake Basin Eco-economic Zone Master Plan and a number of specific plans, including the Plan for Management of Five Watersheds in Poyang Lake Basin Eco-economic Zone. The Poyang Lake basin comprises five water systems (five rivers), namely the Gan River, Fu River, Xin River, Rao River and Xiu River. Water from these five rivers confluent flows into the Poyang Lake and eventually into the Yangtze River. Management of five years is both the foundation and an important part of environmental protection and management for the Poyang Lake Basin Eco-economic Zone.

As one of the cities in the Gan River watershed, Ruijin has achieved rapid socioeconomic development in the last ten years. However, due to historical, economic, technical and other reasons and in comparison with the needs for socioeconomic development, management of the basin still lags far behind. As the origin of the Gan River, the Mianjiang River watershed gathers some untreated industrial wastewater, domestic sewage, water drained from farmland, wastewater from livestock and poultry farming and rainwater runoff, which result in a range of environmental and ecological problems including gradual deterioration of water quality, damage of aquatic ecological functions and deterioration of mudflats along the river, among others. As a consequence, water quality in the river deteriorates from Category I-II in the Ridong Reservoir and Chenshi Reservoir upstream to Category III at Yeping Section and further to Category III-IV at Ruijin Section. With further socioeconomic development and increasing needs of the people for higher environmental quality, water quality assurance and ecological protection for the Mianjiang River face enormous challenges during the 12th Five Year Plan.

In order to protect ecological environment in the Mianjiang River watershed, ensure different sections of the river meet corresponding requirements for different water environment function zones, protect ecological environment in the Gan River Basin and promote development of Poyang Lake Eco-economic Zone, Ruijin City Government has planned to implement the proposed Ruijin City Mianjiang River (Lucao Lake) Wetland Protection and Utilization Subproject, which comprises three components of Mianjiang River Upstream Wetland Protection and Purification, Mianjiang River Midstream and Downstream Wetland Ecology Restoration and Utilization, and Lucao Lake Wetland Ecological Environment Protection. Total cost estimate of the subproject is RMB143.80 million yuan, which includes a proposed World Bank loan of RMB71.90 million yuan (or 50% of total cost) and RMB71.90 million yuan (or 50% of total) of counterpart funding.

Given the features and nature of the subproject, the assessment needs to meet both relevant requirements of the World Bank and China’s procedures and requirements for environmental impact assessment. The EIA Team conducted careful analysis of and discussions about the main contents, nature and construction plan of the subproject, carried out in-depth site investigations, collected a large amount of data on the current social, economic and environmental status relating to the subproject, and monitored environmental quality in the subproject areas. Building on these activities, EIA for the subproject was prepared.

1.2 Objectives and Contents of Environmental Impact Assessment (EIA)

1.2.1 EIA Objectives

The objectives of environmental impact assessment are to compare different feasible alternatives (including the no-project alternative), propose necessary measures to prevent, minimize or offset mitigate potential negative impacts or necessary compensation measures, and improve environmental performance, taking into account environmental features in the project areas, following provisions in the Environmental Impact Assessment Law of the People’s Republic of China, Regulations for Management of Environmental Protection under Development Projects, Circular on Strengthening Administration of Environmental Impact Assessment for Development Projects Financed by International Financial Organizations (Huan Jian [1993] No. 324 Document) issued by former State Environmental Protection Administration and the World Bank’s Safeguard Policy on Environmental Assessment (OP4.01), as well as environmental impact assessment procedures of China and the World Bank, and building on analysis of both positive and negative impacts in EIAs for each of the subprojects/components of the project. Environmental impact assessment also provides 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.

1.2.2 EIA Contents

Main contents of the EIA include:
(1) Assessing regional status quo environment quality in the project areas through collecting data and carrying out polluting source survey and status quo environment monitoring;
(2) Assessing project impacts during implementation on environmental media such as surface water, atmospheric, acoustic and ecological environment;
(3) Analyzing potential environmental impacts of the project after its completion;
(4) Proposing pollution control and ecological protection measures to address adverse environmental impacts of the project during its implementation and operation;
(5) Developing EMP and environmental management training plan;
(6) Conducting public consultation.

1.3 Standards for EIA

1.3.1 Environmental Quality Standards

(1) Surface Water

Category III Standard in Surface Water Environment Quality Standards (GB3838-2002) is applied for Mianjiang River sections covered in the EIA. Specific standard limits are presented in Table 1.3-1.

<table>
<thead>
<tr>
<th>Item</th>
<th>Category III Standard Limit</th>
<th>Source of Standard</th>
</tr>
</thead>
<tbody>
<tr>
<td>pH</td>
<td>6-9</td>
<td>GB3838-2002</td>
</tr>
<tr>
<td>DO</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>Permanganate Index</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>COD</td>
<td>20</td>
<td></td>
</tr>
<tr>
<td>BOD5</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>NH3-N</td>
<td>1.0</td>
<td></td>
</tr>
<tr>
<td>TP</td>
<td>0.2 (Lake and reservoir: 0.05)</td>
<td></td>
</tr>
<tr>
<td>Petroleum</td>
<td>0.05</td>
<td></td>
</tr>
</tbody>
</table>

(2) Groundwater

Category III Standard in Groundwater Environment Quality Standards (GB/T14848-93) is applied for groundwater quality in the project areas. Specific standard limits are shown in Table 1.3-2.
(Unit: mg/L, excluding pH)

<table>
<thead>
<tr>
<th>Item</th>
<th>Standard Limit</th>
<th>Source of Standard</th>
</tr>
</thead>
<tbody>
<tr>
<td>pH</td>
<td>6.5-8.5</td>
<td></td>
</tr>
<tr>
<td>Total Hardness (measures by CaCO₃)</td>
<td>450</td>
<td>GB/T14848-93</td>
</tr>
<tr>
<td>Total Dissolved Solids (mg/L)</td>
<td>1000</td>
<td></td>
</tr>
<tr>
<td>Permanganate Index</td>
<td>3.0</td>
<td></td>
</tr>
<tr>
<td>NH₃-N</td>
<td>0.2</td>
<td></td>
</tr>
<tr>
<td>Hg</td>
<td>0.001</td>
<td></td>
</tr>
<tr>
<td>Cr (VI)</td>
<td>0.05</td>
<td></td>
</tr>
</tbody>
</table>

(3) Ambient Air

Classified according to functional zones of ambient air quality, areas covered by the EIA belong to Category II Zone and Category II Standard in Ambient Air Quality Standards (GB3095-1996) and its Revised List (2000) is applied. Specific standard limits are given in Table 1.3-3.

Table 1.3-3 Category II Standard Limits in Ambient Air Quality Standards

<table>
<thead>
<tr>
<th>Pollutant Factor</th>
<th>Concentration Limit</th>
<th>Source of Standard</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1-hour Average</td>
<td>Daily Average</td>
</tr>
<tr>
<td>SO₂</td>
<td>0.50</td>
<td>0.15</td>
</tr>
<tr>
<td>TSP</td>
<td>/</td>
<td>0.30</td>
</tr>
<tr>
<td>PM₁₀</td>
<td>/</td>
<td>0.15</td>
</tr>
<tr>
<td>NO₂</td>
<td>0.24</td>
<td>0.12</td>
</tr>
</tbody>
</table>

(4) Acoustic Environment

Category II Zone Standard in Acoustic Environment Quality Standards (GB3096-2008) is applied for acoustic environment. Specific standard limits are provided in Table 1.3-4.

Table 1.3-4 Category II Zone Standard Limits in Acoustic Environment Quality Standards

<table>
<thead>
<tr>
<th>Category</th>
<th>Daytime</th>
<th>Nighttime</th>
<th>Source of Standard</th>
</tr>
</thead>
<tbody>
<tr>
<td>II</td>
<td>60</td>
<td>50</td>
<td>GB3096-2008</td>
</tr>
</tbody>
</table>
1.3.2 Pollutant Discharge Standards

(1) Water pollutant discharge standards

Dry Farming Standard in Farmland Irrigation Water Quality Standards (GB5084-2005) is applied for septic tank wastewater discharge in protection and conservation zones of Ridong Reservoir wetland and emission of wastewater from washing activities at garbage collection stations under the project while Category I Standard in Table 4 of Comprehensive Wastewater Discharge Standards (GB8978-1996) is applied for discharge of other types of wastewater. Specific standard limits are provided in Table 1.3-5 and Table 1.3-6.

Table 1.3-5 Standard for Dry Farming in Farmland Irrigation Water Quality Standards

<table>
<thead>
<tr>
<th>Item</th>
<th>Crop Type</th>
<th>Source of Standard</th>
</tr>
</thead>
<tbody>
<tr>
<td>BOD₅</td>
<td>100</td>
<td>GB5084-2005</td>
</tr>
<tr>
<td>CODₐ</td>
<td>200</td>
<td></td>
</tr>
<tr>
<td>SS</td>
<td>100</td>
<td></td>
</tr>
<tr>
<td>pH</td>
<td>5.5-8.5</td>
<td></td>
</tr>
</tbody>
</table>

Table 1.3-6 Category I Standard Limits in Comprehensive Wastewater Discharge Standards

<table>
<thead>
<tr>
<th>Item</th>
<th>Standard Limit</th>
<th>Source of Standard</th>
</tr>
</thead>
<tbody>
<tr>
<td>pH</td>
<td>6-9</td>
<td>GB8978-1996</td>
</tr>
<tr>
<td>SS</td>
<td>70</td>
<td></td>
</tr>
<tr>
<td>CODₐ</td>
<td>100</td>
<td></td>
</tr>
<tr>
<td>BOD₅</td>
<td>20</td>
<td></td>
</tr>
<tr>
<td>Petroleum</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>Animal and plant oil</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>NH₃-N</td>
<td>15</td>
<td></td>
</tr>
<tr>
<td>Phosphate (measured by P)</td>
<td>0.5</td>
<td></td>
</tr>
</tbody>
</table>

(2) Atmospheric pollutant emission standards

Category II Standard in Table 1 of Odorous Polluant Emission Standards (GB14554-93) is applied for odor emission under the project and standards in Table 2 of Comprehensive Atmospheric Polluant Emission Standards (GB16297-1996) are applied for fugitive emission of other waste gases (see Table 1.3-7 and Table 1.3-8 for specific limits).
Table 1.3-7 Standard Limits at Boundaries of Odorous Polluants

<table>
<thead>
<tr>
<th>Control Item</th>
<th>Concentration Limit</th>
<th>Source of Standard</th>
</tr>
</thead>
<tbody>
<tr>
<td>NH₃</td>
<td>1.5</td>
<td>GB14554-93</td>
</tr>
<tr>
<td>H₂S</td>
<td>0.06</td>
<td></td>
</tr>
<tr>
<td>Odor concentration (dimensionless)</td>
<td>20</td>
<td></td>
</tr>
</tbody>
</table>

Table 1.3-8 Standard Applied for Fugitive Waste Gas Emission

<table>
<thead>
<tr>
<th>Standard</th>
<th>Pollutant</th>
<th>Emission Standard (mg/m³)</th>
<th>Emission Rate (kg/h)</th>
<th>Control Limit for Fugitive Emissions (mg/m³)</th>
</tr>
</thead>
<tbody>
<tr>
<td>GB16297-1996</td>
<td>Particulates</td>
<td>/</td>
<td>/</td>
<td>1.0</td>
</tr>
</tbody>
</table>

(3) Noise

(a) Construction period: Standards for Ambient Noise Emission at Construction Site Boundary (GB12523-2011) is applied (see Table 1.3-9 for specific limits).

Table 1.3-9 Emission Limits for Ambient Noise at Construction Site Boundary

<table>
<thead>
<tr>
<th>Daytime</th>
<th>Nighttime</th>
<th>Source of Standard</th>
</tr>
</thead>
<tbody>
<tr>
<td>70</td>
<td>55</td>
<td>GB12523-2011</td>
</tr>
</tbody>
</table>

(b) Operation period: **Category II Zone Standard limits in Emission Standards for Industrial Enterprises Noise at Boundary** (GB12348-2008) is applied for noise at boundary (see Table 1.3-10 for specific limits).

Table 1.3-10 Category II Zone Standard Limits in Emission Standards for Industrial Enterprises Noise at Boundary

<table>
<thead>
<tr>
<th>Category</th>
<th>Daytime</th>
<th>Nighttime</th>
</tr>
</thead>
<tbody>
<tr>
<td>II</td>
<td>60</td>
<td>50</td>
</tr>
</tbody>
</table>

(4) Solid waste control standards

Control Standards for Pollution at Storage and Disposal Sites of General Industrial Solid Wastes (GB18599-2001) is applied for emission of general solid wastes.
1.4 Environmental Impact Identification and Assessment Factor Screening

1.4.1 Identification of Environmental Impact Factors

Environmental media affected by the subproject are identified according to the engineering features of the subproject and polluting sources and impact sources during subproject implementation and operation, taking into consideration status quo environment in the subproject areas, through producing a table on identifying the level of subproject impacts on environmental media. Detailed results are provided in Table 1.4-1.
<table>
<thead>
<tr>
<th>Engineering Factor</th>
<th>Construction Period</th>
<th>Operation Period</th>
<th>Importance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Topography</td>
<td>-2 -2 -2 -3</td>
<td></td>
<td>III</td>
</tr>
<tr>
<td>Soil Environment</td>
<td></td>
<td>+2</td>
<td>III</td>
</tr>
<tr>
<td>Hydrological Regime</td>
<td></td>
<td></td>
<td>III</td>
</tr>
<tr>
<td>Surface Water Environment</td>
<td>-3</td>
<td>+3 +3 +3 +3</td>
<td>I</td>
</tr>
<tr>
<td>Atmospheric Environment</td>
<td>-3</td>
<td>+3</td>
<td>+2</td>
</tr>
<tr>
<td>Acoustic Environment</td>
<td>-3 -3</td>
<td></td>
<td>II</td>
</tr>
<tr>
<td>Solid Waste</td>
<td>-2 -2 -2 -2</td>
<td>+3</td>
<td>II</td>
</tr>
<tr>
<td>Terrestrial Ecology Environment</td>
<td>-2 -2 -2 -2</td>
<td>-2 -2 -3 +3</td>
<td>+3</td>
</tr>
<tr>
<td>Aquatic Ecology Environment</td>
<td></td>
<td>+3</td>
<td>I</td>
</tr>
<tr>
<td>Invasion of Foreign Species</td>
<td></td>
<td></td>
<td>III</td>
</tr>
<tr>
<td>Water-induced Soil Erosion</td>
<td>-1 -1 -1 -1</td>
<td>+3</td>
<td>+3</td>
</tr>
<tr>
<td>Society and Economy</td>
<td>+1 -2</td>
<td>+1</td>
<td>II</td>
</tr>
<tr>
<td>Land Acquisition Impact</td>
<td>-1</td>
<td></td>
<td>II</td>
</tr>
<tr>
<td>Human Health</td>
<td></td>
<td></td>
<td>III</td>
</tr>
<tr>
<td>Residential Environment</td>
<td>+3 +2 +3 +3</td>
<td>+3</td>
<td>I</td>
</tr>
<tr>
<td>Transport</td>
<td>-3</td>
<td></td>
<td>III</td>
</tr>
</tbody>
</table>

Note: (1) “+” and “-” represent positive or adverse impacts; (2) 1, 2 and 3 represent the level of impacts, i.e. significant, medium and minor impacts; (3) I, II and III represent the status of the factor: i.e. important, more important or relatively less important.
1.4.2 EIA Factor Screening

Assessment factors for each of the environmental media are selected based on identified environmental media affected by the subproject, taking into consideration local status quo environment and engineering features of the subproject. Selected EIA factors are given in Table 1.4-2.

<table>
<thead>
<tr>
<th>Environmental Medium</th>
<th>Status Quo Assessment Factor</th>
<th>Impact Prediction and Assessment Factor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ecological Environment</td>
<td>Water-induced soil erosion, terrestrial flora, aquatic life</td>
<td>Water-induced soil erosion, terrestrial flora, aquatic life</td>
</tr>
<tr>
<td>Social Environment</td>
<td>Population, industrial and agricultural development, land use</td>
<td>Industrial and agricultural, relocation and resettlement, development, land use</td>
</tr>
<tr>
<td>Surface Water Quality</td>
<td>COD, BOD, SS, NH₃-N, petroleum</td>
<td>COD, NH₃-N</td>
</tr>
<tr>
<td>Acoustic Environment</td>
<td>LAeq</td>
<td>LAeq</td>
</tr>
<tr>
<td>Ambient Air</td>
<td>SO₂, NO₂, TSP</td>
<td>TSP</td>
</tr>
</tbody>
</table>

1.5 EIA Rating, Scope and Time Period

1.5.1 EIA Rating

Pursuant to requirements in the World Bank’s Safeguard Policy on Environmental Assessment (OP4.01) for environmental screening and categorization and building on analysis of the subproject’s type, location, sensitivity and scale as well as the features and size of the subproject’s potential environmental impacts, the subproject has been defined as a Category B project.

1.5.2 EIA Scope

EIA scope of the subproject is defined according to the EIA rating and relevant technical specifications for environmental impact assessment while taking account of the subproject’s realities (see Table 1.5-1 for details).
Table 1.5-1 EIA Scope

<table>
<thead>
<tr>
<th>No.</th>
<th>Item</th>
<th>EIA Scope</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Ecological Environment</td>
<td>The subproject’s permanent land occupation areas and areas of temporary land occupation for construction, construction road areas; Main River section in Ruijin City, Lucao Lake as well as wetland and mudflats.</td>
</tr>
<tr>
<td>2</td>
<td>Surface Water Environment</td>
<td>Main River section in Ruijin City.</td>
</tr>
<tr>
<td>3</td>
<td>Social Environment</td>
<td>Areas of land acquisition and occupation for subproject implementation.</td>
</tr>
<tr>
<td>4</td>
<td>Atmospheric Environment</td>
<td>Areas within 200m in radius around the subproject areas as the center.</td>
</tr>
<tr>
<td>5</td>
<td>Acoustic Environment</td>
<td>Areas within 200m in radius around the subproject areas as the center.</td>
</tr>
</tbody>
</table>

1.5.3 Time Period of EIA

Based on analysis of the subproject, the time periods of EIA comprise construction period and operation period.

1.6 Environmental Protection Targets

Pursuant to analysis of the subproject and survey of status quo environment, key environmental protection targets of the subproject are listed in Table 1.6-1.

1.7 EIA Preparation, Ideas and Methods

1.7.1 EIA Preparation

Based on site surveys and investigations by World Bank environmental specialists, the Provincial PMO (PPMO) and the Project EIA Team, JPESTP has no environmentally sensitive areas, such as ecologically sensitive and fragile areas, areas needing special protection and socially concerned areas. The size of pollution generated by polluting sources and their scope of impact are not large while stringent measures would be taken throughout the subproject cycle to avoid, prevent and mitigate the subproject’s potential pollution impacts. Meanwhile, further treatment can build on relevant wastewater treatment facilities and solid waste disposal facilities of the subproject. Therefore, potential adverse impacts of JPESTP are within the controllable range. Environmental specialists/consultants of PPMO and the World Bank safeguard identification mission recommended that environmental screening of the subproject be categorized under Category B and this category has been confirmed by the World Bank.
### Table 1.6-1 Targets of Environmental Protection

<table>
<thead>
<tr>
<th>No.</th>
<th>Environmental Medium</th>
<th>Targets for Protection</th>
<th>Direction</th>
<th>Distance (km)</th>
<th>Size</th>
<th>Standards for Protection</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Ecological Environment</td>
<td>Terrestrial life, aquatic life and soil and water conservation in areas of land acquisition and occupation for the project.</td>
<td>/</td>
<td>/</td>
<td>/</td>
<td>/</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Cinnamomum camphora</td>
<td>E</td>
<td>20m</td>
<td>About 100 trees (wild)</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Surface Water</td>
<td>Mian River</td>
<td>/</td>
<td>Within scope of the subproject</td>
<td>Annual average flow of 43.43m³/s</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Social Environment</td>
<td>People affected by land acquisition</td>
<td>Gaoxuan Village</td>
<td>26 households, 95 people</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Xinyuan Village</td>
<td>32 households, 120 people</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Ruilu Village</td>
<td>24 households, 87 people</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Ambient Air</td>
<td>Zhugang Village</td>
<td>E</td>
<td>0.15</td>
<td>7 households, 25 people</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Ruilu Village</td>
<td>W</td>
<td>0.1</td>
<td>10 households, 34 people</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Acoustic Environment</td>
<td>Xiajie Village</td>
<td>W</td>
<td>0.2</td>
<td>6 households, 21 people</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Xinyuan Village</td>
<td>E</td>
<td>0.2</td>
<td>8 households, 31 people</td>
<td></td>
</tr>
</tbody>
</table>

JPESTP includes a total of 22 components. Given the features of Ruijin City Mianjiang River (Lucao Lake) Wetland Protection and Utilization Subproject, preparation of a stand-alone EIA is required for the subproject. This report is the EIA for Ruijin City Mianjiang River (Lucao Lake) Wetland Protection and Utilization Subproject, which comprises EMP and Environmental Codes of Practice (ECOP). Indentification of specific environmental management tools is discussed in Section 3.3.

#### 1.7.2 Ideas and Methods for Environmental Impact Assessment

1. Environmental impacts of the proposed subproject would be analyzed building on preliminary survey of status quo environment in the subproject areas and analysis of engineering features of the subproject;
(2) The Bank’s safeguard policies triggered by Ruijin City Mianjiang River (Lucao Lake) Wetland Protection and Utilization Subproject would be carefully screened and assessed and corresponding prevention and mitigation countermeasures proposed;

(3) Relevant baseline data would be collected and analyzed and survey and assessment of status quo environment in the subproject areas conducted in an objective and scientific manner;

(4) Important and general environmental issues would be screened and identified according to subproject and environmental features, focusing on analysis of important environmental issues and sensitive protection targets;

(5) Analogy analysis, typical engineering analysis and other methods would be adopted to assess in an objective manner the subproject’s positive and negative and direct and indirect environmental impacts. Feasible and targeted mitigation measures would be proposed to address the subproject’s negative environmental impacts with special attention paid to the operability of EMP;

(6) Alternatives would be analyzed based on two scenarios: zero alternative analysis and comparison of different technical schemes. With coordination by the subproject owner and through communication between the EIA institutes and the design institute, positive environmental impacts of the subproject would have been reflected and negative impacts prevented to the greatest possible extent during the subproject’s design stage;

(7) Public consultation and information disclosure would be carried out twice. The first public consultation would be carried out after environmental issues are screened and before the terms of reference for EIA is finalized and the second one carried out at the time when the preliminary draft of the EIA is prepared;

(8) From the perspective of environmental protection, conclusions would be drawn on the feasibility of subproject implementation to provide scientific evidence for subproject design and environmental protection and management;

(9) Adequate considerations would be given in the EIA to the comments and recommendations of the World Bank on environmental assessment. Questions and recommendations of Bank specialists would be analyzed and responded in the EIA report.

1.8 EIA Procedures

Environment assessment of the subproject is divided into three stages: preparation, survey and monitoring and report preparation.

Main tasks of the first stage - preparation include familiarizing with relevant documentation, carrying out preliminary subproject analysis and status quo environmental survey, screening EIA identification and assessment factors, determining EIA TOR, proposing EIA methods, developing EIA plan and arrangements, and preparing EIA TOR;

The second stage of survey and monitoring is formal stage for suvey and monitoring, whose main tasks are further carrying out further subproject analysis and status quo environment survey, conducting environmental impact prediction and assessment, formulating countermeasures for mitigating adverse impacts and environmental monitoring and management plans, conducting environmental cost and benefit analysis, and carrying out public consultation.
Main tasks of the third stage - EIA preparation include consolidating various outputs, analysis all information and data obtained from the second stage, and completing preparation and translation of Chinese version EIA.

EIA procedures are detailed in Figure 1.8-1.
Figure 1.8-1  EIA Procedures

Accept Task

Policy Study

Environmental Survey

Project planning, design and other documentation

Project Analysis

Confirm Environmental Functions

Determine EIA Rating

Determine Env. Protection Targets

Determine Technical Requirements

Develop Work Plan

Determine Key Points of EIA

Prepare EIA TOR

First Round of Public Consultation

Status Quo Environment Survey and Monitoring

Survey of Status Quo Ecological Env. Factors

Survey of Status Quo Social Env. Factors

Monitoring of Status Quo Water, Atmospheric and Acoustic Environment

Survey of Polluting Sources and Sensitive Spots

Status Quo Environment Assessment

Public Consultation

Environmental Impact Prediction and Assessment

Environmental Protection Countermeasures

Environmental Monitoring Plan

Environmental Management and Supervision

Environmental Cost and Benefit Analysis

Consolidated Assessment

Prepare EIA

Second Round of Public Consultation

Summarize
2 Policies, Framework of Laws and Regulations and Basis for EIA Preparation

2.1 Laws and Regulations

1) Environmental Protection Law of the People’s Republic of China (December 26, 1989);
2) Environmental Impact Assessment Law of the People’s Republic of China (September 1, 2003);
3) Law of the People’s Republic of China on Prevention and Control of Ambient Noise Pollution (March 1, 1997);
4) Law of the People’s Republic of China on Atmospheric Pollution Prevention and Control (September 1, 2000);
5) Law of the People’s Republic of China on Prevention and Control of Environmental Pollution Caused by Solid Waste (April 1, 2005);
6) Law of the People’s Republic of China on Water Pollution Prevention and Control (Revised on February 28, 2008 by Standing Committee of 10th National People’s Congress);
7) Regulations on Prevention, Control and Management of Pollution in Drinking Water Source Protection Areas (July 10, 1989);
8) Regulations of the People’s Republic of China on River Course Administration (June 10, 1988);
9) Regulations on Administration of Environmental Protection in Construction Projects (Adopted on November 18, 1998 by the 10th Standing Meeting of the State Council and in effect on November 29, 1998 via State Council Decree No. 253);
10) Administration of Environmental Impact Assessment of Construction Projects by Means of Classification Catalogue (Ministry of Environmental Protection Decree No. 2, October 1, 2008);
11) Law of the People’s Republic of China on Soil and Water Conservation (March 1, 2011);
12) Law of the People’s Republic of China on Protection of Wildlife (August 28, 2004);
13) Decision of the State Council on Various Issues Concerning Environmental Protection [Guo Fa (96) No. 31, August 3, 1996];
14) Circular of the State Council on Distributing National Ecological Environment Development Plan (2010);
15) Regulations on Control and Management of Pollution in Drinking Water Source Areas (jointly issued by State Environmental Protection Administration, Ministry of Health, Ministry of Construction, Ministry of Water Resources and Ministry of Geology and Mineral Resources);
16) Circular on Enhancing Wetland Ecology Protection (State Environmental Protection Administration, Huan Ran [1994] No. 184, March 1997);
17) Guiding Catalogue for Industrial Restructuring (2011 version) (in effect on June 1, 2011)
via Decree No. 9 of NDRC).

2.2 Relevant Local Regulations

1) Regulations of Jiangxi Province on Environmental Protection in Development Projects (July 1, 2001);
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 (August 2006);
4) Methods of Jiangxi Province for Implementing Land Administration Law of the People’s Republic of China (November 22, 2001);
5) Methods of Jiangxi Province for Implementing Soil and Water Conservation Law of the People’s Republic of China (October 17, 1997);
6) Methods of Jiangxi Province for Land Acquisition Administration (December 22, 2001);
7) Regulations of Jiangxi Province on River Course Administration (Revised on December 22, 2001);
8) Poyang Lake Eco-economic Zone Development Plan (February 5, 2001).

2.3 Technical Guidelines and Specifications

1) Technical Guidelines on EIA: General Principles (HJ/T 2.1-2011);
2) Technical Guidelines on EIA: Surface Water Environment (HJ/T 2.3-1993);
3) Technical Guidelines on EIA: Atmospheric Environment (HJ2.2-2008);
4) Technical Guidelines on EIA: Acoustic Environment (HJ 2.4-2009);
5) Technical Guidelines on EIA: Ecological Impacts (HJ 19-2011);

2.4 Relevant Standards Adopted

1) Surface Water Environment Quality Standards (GB3838-2002);
2) Ambient Air Quality Standards (GB3095-1996);
3) Acoustic Environment Quality Standards (GB3096-2008);
4) Farmland Irrigation Water Quality Standards (GB5084-2005);
5) Comprehensive Wastewater Discharge Standards (GB8978-1996);
6) Odorous Pollutant Emission Standards (GB14554-93);
7) Comprehensive Atmospheric Pollutant Emission Standards (GB16297-1996);
8) Standards for Ambient Noise Emission at Construction Site Boundary (GB12523-2011);
9) Emission Standards for Industrial Enterprises Noise at Boundary (GB12348-2008);
10) Control Standards for Pollution at Storage and Disposal Sites of General Industrial Solid
Wastes (GB18599-2001).

2.5 Other Relevant Basis


2.6 World Bank Safeguard Policies

1) World Bank Operational Policy and Procedures: Environmental Assessment (OP/BP4.01);
2) World Bank Operational Policy and Procedures: Involuntary Resettlement (OP/BP4.12);
3) World Bank Operational Policy and Procedures: Natural Habitats (OP/BP4.04);
4) World Bank Operational Policy and Procedures: Physical Cultural Resources (OP4.11);
5) World Bank Procedures: Information Disclosure (BP 7.15);
6) IFC Environmental, Health and Safety General Guidelines;
7) IFC Environmental, Health and Safety Guidelines for Water and Sanitation;
8) IFC Environmental, Health and Safety Guidelines for Waste Management Facilities.

2.7 Analysis of Compliance of Proposed Subproject with Relevant Regional Policies and Plans

1) The subproject complies with national industrial policy

This subproject is an ecological demonstration and water source site protection project and falls under encouraged projects in the Guiding Catalogue for Industrial Restructuring (2011). Subproject implementation would contribute to national economic development and have an important role in protecting water environment quality in the Gan River Basin and ecological environment in the Poyang Lake Basin.

2) Implementation of the subproject is the need of ecological environment protection

Wetlands are dubbed “the kidney of the Earth”, which gather enormous wild flora and fauna resources, provide breeding and migratory environment for many rare water birds and are the “heaven of birds”. Wetland also play a critical role in maintaining ecological balance, preserving biodiversity and rare species resources, conserving water resources, storing floodwater and preventing drought, degrading pollution, regulating climate, replenishing groundwater, and controlling soil erosion, among others. However, in recent years, under the dual pressure from population explosion and economic development, wetland species are severely damaged. In Jiangxi
Province, unauthorized occupation and destruction of wetland take place from time to time. Therefore, implementation of the subproject would have great significance to protecting and rehabilitating ecological environment of wetland in Jiangxi Province, ensuring different sections of the Mianjiang River to meet requirements for corresponding water environment functional zone, and contributing to protecting ecological environment in the Gan River Basin and advancing development of Poyang Lake Eco-economic Zone.

3) Implementation of the subproject is an important component of Ruijin City Ecological Development Program

Ruijin Municipal Ecological Protection Plan and Ruijin 12th Five Year Plan for Watershed Water Pollution Control include a series of engineering measures for pollution control, which aim to control water pollution by reducing and cutting off polluting sources at their respective origin and during the process of pollutant conveyance. For the purpose of the subproject, a few important polluting points along the Mianjiang River would be selected for ecological rehabilitation through effectively integrating pollution prevention and pollution control. Construction of ecological works and pollution interception and treatment structures along the Mianjiang River would form an integrated pollution control system, which would provide an important support to pollution control undertaking in the Mianjiang River watershed.

4) Implementation of the subproject is the need of coordinated environmental and economic development

Implementation of the subproject would highlight environmental benefits of Mianjiang River watershed and maximize the role of both constructed and natural wetland in reducing and purifying pollutants. After completion of the subproject, Mianyang River watershed would become the last barrier for blocking the entry of surface water pollutant into the river, intercept pollutants to the largest possible extent, create an ecological system which has the resilience to natural and human disturbances and has self-maintenance and self-regulation functions, and achieve harmonization with surrounding systems and landscape. Mudflats and wetland along the Mianjiang River watershed are rarely seen in China today, which maintain a rather complete urban freshwater wetland ecological system. With ample varieties, such as mudflat wetland, seasonal water-accumulating wetland including reed marshland, forest marshland, wet meadows and paddy fields, wetland along the Mianjiang River watershed are unique in southern China. Implementation of the subproject would have a positive role in and significant implications for guaranteeing water quality of water source sites at the origin and protecting freshwater wetland ecological system.

Implementation of the subproject would not only create an ecological label for the city of Ruijin and protect drinking water sources in neighboring towns and townships, but also provide excellent recreational places for the city’s residents. Hence, the subproject would have significant ecological, cultural and economic values.
Therefore, implementation of the subproject is extremely necessary, is an important measure for achieving double wins in regional socioeconomic development and environmental protection, and would have a demonstration role for implementation of other projects in the upstream of Poyang Lake Basin Eco-economic Zone.
3 Subproject Description

3.1 Subproject Overview

(1) Name: World Bank-financed Jiangxi Poyang Lake Basin and Ecological Economic Zone Small Town Development Demonstration Project - Ruijin City Mianjiang River (Lucao Lake) Wetland Protection and Utilization Subproject;
(2) Construction type: new construction;
(3) Location: The upper, middle and lower reaches of Miaojiang River in Ruijin, Jiangxi Province and the northern suburb of the central city of Ruijin. See Attached Map 1 for the detailed location.
(4) Objectives
Building on natural resources and landscape resources in and around the Mianjiang River Wetland, the wetland is intended to develop into:

① A ideal place for the existence and inhabitation of animals and plants with well protected wetland ecological environment and natural conditions;
② A demonstration project of the upper reaches of Poyang Lake Ecological Economic Zone
③ A place where water quality of the water source area is protected and improved;
④ A place where social harmony is promoted, immediate and long-term interests as well as local and overall interests are well addressed, and the relations between wetland and social public, the relations between wetland and local economic construction and the relations between mass production and life are properly handled;
⑤ A place where wetland resources are monitored and assessed, wetland management is provided with scientific guidance and the sustainable development of wetland resources are secured;
⑥ A wetland ecological education base in Ruijin;
⑦ A demonstration base for wetland culture publicity and exhibition in Jiangxi Province.

(5) Investment
The subproject involves a total investment of RMB143.80 million, including RMB71.90 million of World Bank loan (50%) and RMB71.90 million of counterpart funding (50%).

3.2 Subproject Construction Scope

Ruijin City Mianjiang River (Lucao Lake) Wetland Protection and Utilization Subproject includes three major components: Wetland Protection and Purification in the Upper Reaches of Mianjiang
River, Wetland Ecological Restoration and Utilization in the Middle and Lower Reaches of Mianjiang River and Ecological Environment Protection in Lucao Lake Wetland. See Table 3.2-1 for detailed construction contents.

<table>
<thead>
<tr>
<th>No.</th>
<th>Component</th>
<th>Zone</th>
<th>Contents of Construction</th>
<th>Component Scale and Location</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Wetland Protection and Purification in the Upper Reaches of Mianjiang River</td>
<td>(1) Ridong Reservoir Wetland Protection and Conservation Zone</td>
<td>① Isolation and protection works</td>
<td>1,900m</td>
<td>1-5m outside the land territory border of Class-1 water source protection area</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>② Trash bin</td>
<td>1,086</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>⑤ Garbage collection station</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>④ Septic tank</td>
<td>543</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>⑥ Non-engineering measures</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>(2) Rentian Wetland Purification, Protection and Utilization Area</td>
<td></td>
<td>① Septic tank</td>
<td>1,900</td>
<td>Gaoxuan Village, Zhongtan Village, Xixin Village, Xiajie Village, etc.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>② Wastewater pipeline network</td>
<td>4km</td>
<td>Xiajie Village</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>⑤ Manhole</td>
<td>200</td>
<td>100kg/collection site</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>④ Garbage collection spot</td>
<td>300</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>⑥ Garbage collection station</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>⑦ Integrated A²/O equipment</td>
<td>1 set</td>
<td>Xiajie Village</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>⑦ Ecological wetland</td>
<td>9.5ha</td>
<td>Gaoxuan Village</td>
</tr>
</tbody>
</table>

Table 3.2-1 Construction Cotents
<table>
<thead>
<tr>
<th>No.</th>
<th>Project Description</th>
<th>Location</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>①</td>
<td>Septic tank</td>
<td>Shanqi Village, Songping Village, Yunji Village and Xinyuan Village, etc.</td>
<td>2,100 units, with the type being Z1-2SFQ.</td>
</tr>
<tr>
<td>②</td>
<td>Wastewater pipeline network</td>
<td>Xinyuan Village, Julin Village, Gangbei Village</td>
<td>DN300 and DN400 respectively have a length of 3km, with the materials respectively being PVC-U, HDPE</td>
</tr>
<tr>
<td>③</td>
<td>Manhole</td>
<td>Gangbei Village</td>
<td>Brickwork, Φ1000mm</td>
</tr>
<tr>
<td>④</td>
<td>Garbage collection spot</td>
<td>Yeping Township</td>
<td>470 units, with the type being Z1-2SFQ.</td>
</tr>
<tr>
<td>⑤</td>
<td>Garbage collection spot</td>
<td>Julin Village, Gangbei Village</td>
<td>Julin Village 6t/d, Gangbei Village 4t/d</td>
</tr>
<tr>
<td>⑥</td>
<td>Constructed wetland treatment station</td>
<td>Xinyuan Village</td>
<td>1 bar screen tank (built with reinforced bar and concrete, 2.6m×1.8m×2.1m), 1 grit chamber (built with reinforced bar and concrete, 5.1m×2.8m×3.8m), 1 pump well (built with reinforced bar and concrete, 2.6m×1.8m×2.1m), 6 high-load biological filtering tanks (built with reinforced bar and concrete, 4.0m×4.0m×3.8m), multi-level constructed wetland system (5m×15m×3.8m×3, 4m×15m×1.5m×3, built with bricks and total area is 6200m²)</td>
</tr>
<tr>
<td>⑦</td>
<td>Ecological wetland</td>
<td>Xinyuan Village</td>
<td>Designed influent load q = 0.1m³/(m²·d); Make the vegetation cover of ecological intertidal zone restoration works not lower than 70% through arrangement of floating plants, floating-leaved plants, submerged plants and emerged aquatic plants.</td>
</tr>
<tr>
<td>⑧</td>
<td>Publicity and education sites</td>
<td>Xinyuan Village</td>
<td>Regularly organize trainings</td>
</tr>
</tbody>
</table>

### Xianghu Yaoqianba Wetland Rehabilitation, Protection and Utilization Area

- **Wetland Ecological Restoration and Utilization in the Middle and Lower Reaches of Mianjiang River**
<table>
<thead>
<tr>
<th>Forest Marshland Wetland Protection and Utilization Area</th>
<th>Utilization Area</th>
<th>wastewater interception amount being 7,000t/d.</th>
</tr>
</thead>
<tbody>
<tr>
<td>② Manholes</td>
<td>78</td>
<td>Φ1000mm brickwork, Φ1200mm concrete, Φ1400mm concrete</td>
</tr>
<tr>
<td>③ Nan Lake Natural ecological wetland</td>
<td>20ha</td>
<td>Arrange sediment section, deep water section, aquatic plant belt and shallow water section in the wetland. Develop circular water flows in the wetland and arrange gallet flow diversion systems and plant islands.</td>
</tr>
<tr>
<td>⑤ Floodplain plant buffer zone</td>
<td>3.5ha</td>
<td>The buffer zone starts from Ruijin Bridge, and extends southwestward to Xianghu Park, with a full length of 3.5km. The average restoration width is 7-10m and the restoration area is about 35,000 m².</td>
</tr>
<tr>
<td>⑥ River corridor wetland</td>
<td>2ha</td>
<td>Arrangements on both banks have a full length of 2km. The average restoration width is about 10m and the river corridor wetland restoration area is about 20,000 m². Local species such as reed, Iris and cattail can be selected.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Ecological Environment Protection in Lucao Lake Wetland</th>
<th>Lucao Lake Wetland Environment Education Base</th>
<th>Lucao Lake</th>
</tr>
</thead>
<tbody>
<tr>
<td>① Ecological wetland treatment area</td>
<td>11.5ha</td>
<td>Make ascendens mucronatums, weeping willows, reeds and calami the plant communities of the whole wetland, and make the natural wetland structure in the lakeside dominate restoration of the plant species layout.</td>
</tr>
<tr>
<td>② Central lake area</td>
<td>29.6ha</td>
<td>Arrange some leisure facilities such as lookout pavilions, dikes, plank roads, floating bridges and stone banks</td>
</tr>
<tr>
<td>③ Activity area at entrance</td>
<td>2.8ha</td>
<td>Build a base management center, a square and public toilets, etc.</td>
</tr>
</tbody>
</table>

Local species such as reed, Iris and cattail can be selected.
### Non-engineering measures for Ridong Reservoir Wetland Protection and Conservation Area and Forest Marshland Wetland Protection and Utilization Area

<table>
<thead>
<tr>
<th>Area</th>
<th>Area Size</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>④ Wetland scientific popularization area</td>
<td>10.1ha</td>
<td>Arrange a thatch pavilion and numerous publicity plates</td>
</tr>
<tr>
<td>⑤ Greenland leisure area</td>
<td>8ha</td>
<td>Design different ecological and landscape plant communities dominated by grass and supplemented by swamps and bamboo forest</td>
</tr>
<tr>
<td>⑥ Auxiliary works</td>
<td></td>
<td>Scenic roads with a length respectively being 200m, 2,200m, 260m and 1,820m and a width respectively being 1.5m, 2m, 2.5m and 3.0m will be built, and a 5,200m fire fighting passageway with a width of 6.0m will be built.</td>
</tr>
</tbody>
</table>

Non-engineering measures for Ridong Reservoir Wetland Protection and Conservation Area and Forest Marshland Wetland Protection and Utilization Area, and construction of the wastewater interception works and garbage collection stations in Xianghu Yaoqianba Wetland Rehabilitation, Protection and Utilization Area in Table 3.2-1 are illustrated as follows:

### 3.2.2.1 Non-engineering Measures for Ridong Reservoir Wetland Protection and Conservation Area

1. **Compulsory regulations on protection of water sources**

Waters within 300m of water intake under the long-term plan in Ridong Reservoir and land areas within 200m of the normal water level beside the water intake are defined as Level 1 water source protection areas; Other waters in the areas are defined as Level 2 water source protection areas, and land areas are those within the ridge line of the upstream face adjacent to the waters. Signs and publicity slogans for permanent protection of the drinking water source areas shall be arranged, and the activities that may pollute waters shall be prohibited in the water source protection areas.

2. **Publicity and education project**

Publicity and sign plates with prompt, explanation or restriction words will be arranged according to state regulations, so as to play a role in publicity, education or prewarning. The signs shall be striking. Swimming and other activities that may pollute drinking water bodies shall be prohibited in Level 1 water source areas. Publicity plates for waste classification shall be erected inside villages, and manuals used to publicize waste classification shall be given out as well.

3. **Environmental emergency preparedness capacity building in water source areas**

The purpose is to strengthen environmental accident risk prevention capabilities, avoid or prevent drinking water source pollution and ensure water safety for residential use.

Main contents: Build emergency systems to ensure effective system operation; Improve water environment protection and emergency capacity and formulate emergency plans.
Engineering measures: Engineering measures are implemented to secure water supply under emergent conditions, including the launch of emergency water source works, water transportation tools and water storage facilities as well as pollution treatment and restoration works.

Non-engineering measures: The emergency organization agencies, pollution information release system, decision-making department, inter-departmental negotiation system, emergency water use management system, emergency aid techniques and staff, publicity and awarding measures, etc.

(4) Prewarning and monitoring system construction in water source areas

The purpose is to ensure the management agency to monitor and control water source quality and water quantity safety, and to improve the prewarning capability so as to meet the needs for managing drinking water sources protection areas in reservoirs. According to relevant state regulations, water quality in Chenshi Reservoir Drinking Water Source Protection Area shall be monitored through monthly sampling, and monitoring over possible polluting sources shall be strengthened.

(5) Concentrated treatment of waste

Waste in reservoirs, rivercourses and their neighboring areas will be treated in an integrated and concentrated manner to eliminate residual solid waste.

2. Non-engineering Measures in Forest Marshland Wetland Protection and Utilization Area

The wetland with forests and swamps shall be well protected under the uniform deployment of Ruijin Forestry Bureau. Hill closure shall be adopted to preserve the camphor trees, which shall be neither cut nor burnt, and human activities shall be reduced as much as possible. Some tree species such as Chinese ashes, camphor trees, native plants and bushes that adapt to local conditions and are free from diseases and pests can be planted in the vacant space of the forests to promote plant community succession, improve forest coverage and restore biological species as soon as possible. The protection areas and staff at inspection stations shall play a role in protection and management by reasonably deploying patrol lines and intensifying daily patrol. Efforts shall be made to crack down on illegal behaviors that destroy ecological and natural environment as well as casual felling and hunting.

3. Wastewater Interception in Xianghu Yaoqianba Wetland Rehabilitation, Protection and Utilization Area

DN600-DN1000 wastewater interception pipes are to be built on the southeastern bank of Mianjiang River in Xianghu Town to collect the wastewater from the southeastern part of Ruijin City; Elevating pump room DN1000 wastewater interception pipes are connected in the lower reaches, and wastewater is finally discharged into Ruijin Wastewater Treatment Plant in the
lower reaches. The pipe is about 2.8 km long with a wastewater storage quantity of 7,000 m$^3$/d.

Ruijin Wastewater Treatment Plant is to be located in Jinxing Village, Xianghu Town, Ruijin, with a design capacity of 20,000 m$^3$/d, and the current wastewater treatment quantity is about 19,000 m$^3$/d. In the wastewater treatment plant, the oxidation ditch treatment technique is adopted, and the wastewater after treated meets Level 1 B standards specified in the Discharge standard of pollutants for municipal wastewater treatment plant (GB18918-2002) and thus can be discharged into Mianjiang River. The treatment technical process is shown in Figure 3.2-1.

According to the results of regular monitoring conducted by Ruijin Environmental Monitoring Station over Ruijin Wastewater Treatment Plant, the effluent of Ruijin Wastewater Treatment Plant can be discharged as it meets relevant standards.

According to the 12th Five-year Plan of Ruijin City for Environmental Protection, Ruijin Wastewater Treatment Plant will complete Phase II construction during the 12th Five-year Plan period and have a design treatment capacity of 40,000 m$^3$/d of wastewater in 2015. The capacity of wastewater interception works in Xianghu Yaoqianba Wetland Rehabilitation, Protection and Utilization Area is 7,000 m$^3$/d, and all the wastewater treated will be domestic wastewater. The wastewater interception works is expected to be put into operation in 2016, so intercepted wastewater can be treated by Ruijin Wastewater Treatment Plant and further discharged after meeting relevant standards.

![Figure 3.2-1 Technical Process of Wastewater Treatment](image)

**Figure 3.2-1 Technical Process of Wastewater Treatment**

4. Garbage collection stations

The subproject involves construction of six garbage collection stations, which will be respectively built in Hupo Village, Lukeng Village, Xiajie Village, Gaoxuan Village, Julin Village and Gangbei Village and along the village roads. Waste generated shall be cleaned each day; The basic operation method, i.e. garbage is “concentrated by households, collected by villages, transported by townships (villages) and treated by cities (townships) at designated sites”, shall be adopted. Concretely speaking, cleaners first transport the waste at garbage collection spots to garbage
collection stations, which is then loaded in closed trucks by waste loading workers, directly transported to nearby waste transfer stations and finally to Niulanwo Landfill for treatment.

In the towns and townships where the garbage collection stations are located, cleaners, one driver and two waste loading workers need to be hired. The wages for the workers will be supported by the municipal government according to the measure of replacing subsidies with awards, and the wage standards are RMB200/month for cleaners and RMB800/month for drivers and waste loading workers. The wage gap shall be jointly filled by townships, villages and rural households: Villages can raise part of the money from the collective revenue of villages and groups, and residential committees can charge RMB1-3 of cleaning fees from rural households.

Niulanwo Landfill is located at Niulanwo, Qingshui Village, Ruijin (beside National Highway 206), which has the daily disposal capacity of 200 tons and the actual daily disposal volume of 125 tons. Civil works for the landfill was completed in January 2011, construction of garbage leachate treatment facilities commenced in July 2010 and equipment has been installed and commissioned. The sanitary landfill process is applied for domestic waste treatment and the process of pretreatment+MBR+NF+RO is adopted for leachate treatment, where the effluent meets Category A Standard in Pollutant Discharge Standards for Urban Wastewater Treatment Plants. HDPE anti-seepage geomembrane is used for the landfill and leachate is collected via blind ditch and pipes to the regulation tank and discharged after being treated by leachate treatment facilities. Garbage collection stations under the subproject collect 21.5 tons of garbage per day and it is feasible to transport the garbage to Niulanwo Landfill in Qingshui Village, Ruijin. See Table 3.2-2 for garbage collection and transportation at various garbage collection stations.

<table>
<thead>
<tr>
<th>No.</th>
<th>Villages where garbage collection stations are located</th>
<th>Garbage Transfer Station</th>
<th>Landfill</th>
<th>Transportation Route</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Hupo Village</td>
<td>Yangmeikeng Waste Transfer Station</td>
<td>Niulanwo Landfill in Qingshui Village, Ruijin</td>
<td>Waste→village roads→National highway 206→transfer station（about 2 km）→National highway 206→landfill（about 30 km）</td>
</tr>
<tr>
<td>2</td>
<td>Lukeng Village</td>
<td>Yangmeikeng Waste Transfer Station</td>
<td>Waste→village roads→National Highway 206→transfer station（about 7 km）→National Highway 206→landfill（about 30 km）</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Xiajie Village</td>
<td>Xiajie Village Waste Transfer Station</td>
<td>Waste→village roads→National Highway 206→transfer station（about 1 km）→National Highway 206→landfill（about 22 km）</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Gaoxuan Village</td>
<td>Xiajie Village Waste Transfer Station</td>
<td>Waste→village roads→National Highway 206→transfer station（about 3 km）→National Highway 206→landfill（about 22 km）</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Julin Village</td>
<td>Julin Village</td>
<td>Waste→village roads→National Highway 319→transfer</td>
<td></td>
</tr>
</tbody>
</table>
5. Integrated A²/O Equipment

(1) See Figure 3.2-2 for wastewater treatment technical process of integrated A²/O equipment.

(2) See Table 3.2-3 for design inlet and effluent quality in integrated A²/O equipment

(3) Routine management of integrated A²/O equipment

See Annex 2 for the rules for routine management of integrated A²/O equipment.
Table 3.2-3 Designed Inlet and Effluent Quality (Unit: mg/L)

<table>
<thead>
<tr>
<th>Items</th>
<th>COD$_{cr}$</th>
<th>BOD$_5$</th>
<th>SS</th>
<th>NH$_3$-N</th>
<th>TP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Raw water quality</td>
<td>200</td>
<td>100</td>
<td>100</td>
<td>25</td>
<td>2.5</td>
</tr>
<tr>
<td>Anaerobic tank outlet</td>
<td>160</td>
<td>70</td>
<td>60</td>
<td>20</td>
<td>2.15</td>
</tr>
<tr>
<td>Removal rate (%)</td>
<td>20</td>
<td>30</td>
<td>40</td>
<td>20</td>
<td>14</td>
</tr>
<tr>
<td>Effluent</td>
<td>56</td>
<td>17.5</td>
<td>18</td>
<td>7</td>
<td>0.45</td>
</tr>
<tr>
<td>Removal rate (%)</td>
<td>60</td>
<td>82.5</td>
<td>70</td>
<td>65</td>
<td>82</td>
</tr>
<tr>
<td>Discharge standards</td>
<td>≤100</td>
<td>≤20</td>
<td>≤70</td>
<td>≤15</td>
<td>≤0.5</td>
</tr>
</tbody>
</table>

3.3 Identification of Environmental Tools

This report classifies the subproject contents based on respective features and adopts corresponding environmental management tools according to engineering types. See Table 3.3-1 for detailed classification.

Table 3.3-1 Classification of Environmental Tools Adopted in Various Components of Ruijin Wetland Subproject

<table>
<thead>
<tr>
<th>Subproject</th>
<th>Subproject Component</th>
<th>EMP Type</th>
<th>ECOP types</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Wetland Protection and Purification in the</td>
<td>Ridong Reservoir Wetland Protection and Conservation Area</td>
<td>EMP Type</td>
<td>ECOP ECOP ECOP</td>
</tr>
<tr>
<td>Upper Reaches of Mianjiang River</td>
<td>Rentian Wetland Purification, Protection and Utilization Area</td>
<td>ECOP</td>
<td>ECOP ECOP ECOP ECOP ECOP</td>
</tr>
<tr>
<td>2. Wetland Ecological Restoration and Utilization in the</td>
<td>Yeping Wetland Purification, Protection and Utilization Area</td>
<td>EMP</td>
<td>ECOP ECOP ECOP ECOP ECOP</td>
</tr>
<tr>
<td>Middle and Lower Reaches of Mianjiang River</td>
<td>Xianghu Yaoqianba Wetland Rehabilitation, Protection and Utilization Area</td>
<td>EMP</td>
<td>ECOP</td>
</tr>
<tr>
<td></td>
<td>Forest Marshland Wetland Protection and Utilization Area</td>
<td>EMP</td>
<td>ECOP</td>
</tr>
</tbody>
</table>
As shown in the table above, this report includes an environmental management plan (EMP) and the following seven types of ECOP for the Xianghu Yaoqianba Wetland Rehabilitation, Protection and Utilization Area, Forest Marshland Wetland Protection and Utilization Area and Lucao Lake Wetland Ecological Environment Protection Area:

<table>
<thead>
<tr>
<th>3. Ecological Environment Protection in Lucao Lake Wetland</th>
<th>Lucao Lake Wetland Environment Educational Base</th>
<th>EMP</th>
</tr>
</thead>
</table>

(1) ECOP for small civil works: Small and medium-sized civil works under the subproject.
(2) ECOP for afforestation: Including the isolation and protection engineering in Ridong Reservoir Wetland Protection and Conservation Area.
(3) ECOP for garbage collection station construction: including the garbage collection station construction in Ridong Reservoir Wetland Protection and Conservation Area, Rentian Wetland Purification, Protection and Utilization Area and Yeping Wetland Purification, Protection and Utilization Area.
(4) ECOP for septic tank construction: including the septic tank construction in Ridong Reservoir Wetland Protection and Conservation Area, Rentian Wetland Purification, Protection and Utilization Area and Yeping Wetland Purification, Protection and Utilization Area.
(5) ECOP for rural domestic wastewater treatment: including the treatment of rural domestic wastewater in the integrated A²/O equipment in Rentian Wetland Purification, Protection and Utilization Area and Yeping Wetland Purification, Protection and Utilization Area.
(6) ECOP for wetland protection and restoration: including the micro landform restructuring and wetland environment restoration in Rentian Wetland Purification, Protection and Utilization Area and Yeping Wetland Purification, Protection and Utilization Area.
(7) ECOP for wastewater interception pipeline: including wastewater interception pipeline works in Xianghu Yaoqianba Wetland Rehabilitation, Protection and Utilization Area.

See annexes for the said seven ECOPs.
4 Baseline Environmental Situation

4.1 Overview of Natural Environment

4.1.1 Geographical Location

Situated in the south of Jiangxi Province, in the east of Ganzhou Region and on the western side of Wuyi Mountains, Ruijin is located at 25°30’-26°20’ N and 115°42’-116°22’ E. It is where Jiangxi, Fujian and Guangdong Provinces meet each other, as it borders Changting County of Fujian Province in the east (47 km), Huichang in the south (48 km), Yudu in the west (85 km), Ningdu (85 km) and Shicheng (76 km) in the north. Ruijin has a total area of 2,448 km², with the length from south to north being 85 km and the width from east to west being 64 km.

4.1.2 Landforms

Ruijin is surrounded by high mountains in the east, west and north, with the topography lowering gradually in the center and the southwestern part. Ten basins with different sizes, centering on Xianghu Town, make up a narrow and long basin belt along the banks of Mianjiang River. Low hills are mostly seen in the area, with the elevation generally being 400-800 m (Huanghai elevation system). By features, the landforms include erosional low hill landform, erosional structure landform, valley erosional and depositional landform and erosional landform. In particular, hills take the dominant position, covering an area of 1,967.85 km² that comprises 80.35% of the total land area; Mountains represent 9.96% with an area of 243.89 km²; Downland makes up 9.69% with an area of 237.26 km². The downland plain is the area where the villages and towns of Ruijin are concentrated. Located at the converging point of the Mianjiang River and Gucheng River, the urban area belongs to the valley erosional and depositional landform and is a basin surrounded by mountains on three sides (with the northeastern part opened).

The urban area is the biggest of the ten basins within Ruijin, with the S-shaped Mianjiang River running from northeast to southwest and connected with Gucheng River, Luoxi River and Qibao River. The topography is high in the northeastern part and low in the southwestern part, with the elevation between 206.4 m and 191.2 m; Elingnao located on the south side of Gucheng River is part of the downland, with the elevation between 206.4 m and 215.2 m and the relative elevation difference with the areas on the north side of Gucheng River being 15-18 m; The hilly areas in the south have an elevation of 337-442 m (Xinchating and neighboring areas); The western part consists of hills, with the elevation being 400-473.3 m; Hilly land is also seen in the northeastern part of the city, with the elevation on the northern side of the Mianjiang River (areas near Yangxi Village) being 237.4-197.5m.

The landform on both banks of Mianjiang River in Ruijin is dominated by hills and vally basins.
The topography is gentle, with the altitude being 180-250 m and 180-190 m in the center of the basin. In the basin of Mianjiang River, there are metamorphic sandstone and quartz sandstone as well as low Wuyi Mountains filled with phyllite. The altitude is about 200-280 m; The forests are dense and the landscape is beautiful.

Level I terrace is the depositional terrace: Red soil terrace consists of table land and downland covered by the Quaternary red clay soil, with the front edge steep and mostly washed by rivers. The river banks are easily collapsed.

Level II terrace is the depositional terrace: Steamed bread-shaped hills consist of exposed purple shales, purple glutenites, red sandstone and purple soil developed from the above. They are distributed in a scattered and uncontinuous manner, with the terrace surface elevation being 140-150 m and the width being 30-100 m (generally 5-10 m higher than the river surface).

### 4.1.3 Hydrogeological Conditions

Ruijin is dominated by low hills, with the exposed strata including metamorphic rocks, clastic rocks, granites, carbonate rocks and Quaternary rocks. There is plenty of Groundwater, with the daily yield reaching 447,200 m³ and the annual yield reaching 163.24 million m³, as shown in the survey results released by Jiangxi Hydrogeological Team. There are four areas, including the Quaternary Loose Rock Pore Area, Red Bed Confined Water Area, Carbonate Rock Solute Water Area and Bedrock Crack Water Area, and seven sub-areas.

#### Table 4.1-1 Distribution of Groundwater in Ruijin City

<table>
<thead>
<tr>
<th>Names of zones</th>
<th>Code</th>
<th>Areas of distribution</th>
<th>Area (km²)</th>
<th>Daily Water Use (ton/day)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quaternary Loose Rock Pore Area</td>
<td>I</td>
<td>Xiefang, Wuyang, Shishuiwei, Hexi, Liren, Jiubao, Xianghu Town, Huangzhitang, Xiewu, Baofang, Mashan, Qipu, Yunshishan, Huang’an</td>
<td>208.5</td>
<td>20852.91</td>
</tr>
<tr>
<td>Red Bed Confined Water Area</td>
<td>II</td>
<td>Xifang, Helongwei, Jiubao</td>
<td>451.0</td>
<td>993.57</td>
</tr>
<tr>
<td>Carbonate Rock Solute Water Area</td>
<td>III</td>
<td>Yunshishan, Shazhouba, Yeli</td>
<td>73.0</td>
<td>9939.96</td>
</tr>
<tr>
<td>Bedrock Crack Water Area</td>
<td>Tectonic Crack Water Area</td>
<td>Chuandiwo, Laowujia, Gaowu, Xianghu Town, Youliaobei, Mashansi, Dutou, Dabaidi, Longjing, Taozhu, Ruobie, Shijing, Wantian</td>
<td>1367.0</td>
<td>264503.92</td>
</tr>
</tbody>
</table>
The hydrogeological conditions in the assessed areas are simple, mainly being pore phreatic water and bedrock crack phreatic water.

Crack phreatic water exists in the Cretaceous red beds, which features weak water permeability and a small quantity of water. Water is supplemented by precipitation and phreatic water in the upper pores and discharged into rivers.

Pore phreatic water exists in the Quaternary loose strata, and the main permeable layer is the conglomerate strata with a thickness of 2-3 m. Water is supplemented by rivers during precipitation in flood seasons and discharged into rivers. The Groundwater level is 3-5 m deep, with relative abundant water quantity. As there is a clay soil layer with relatively good water isolating properties in the upper part, the Groundwater shows features of confined water when the water level is high in flood seasons. The surface water and Groundwater both have good quality in the assessed area, which is not erosive to concrete as shown by relevant water quality materials.

4.1.4 Weather and Climate Conditions

Located in the subtropical monsoon climate zone, Ruijin features moderate climate, sufficient sunshine and rainfall, distinctive seasons and a long frost-free period. The average temperature for years is 18.9°C, and the annual accumulated positive temperature is about 7000°C. The average temperature in July, the hottest month, is 28°C, and the average temperature in January, the coldest month, is 7.5°C. The extremely high temperature for years is 38.4°C, and the extremely low temperature is -5.8°C.

Rainfall and evaporation: The average rainfall is 1,710 mm for years, and the average rainfall duration is 163.7 days. Most of the rainfall is in April-June, which accounts for about 60% of the rainfall of a full year. Ruijin sees much torrential rain, with the biggest daily rainfall reaching 216.2 mm. The average evaporation quantity for years is about 1,400 mm, and the relative humidity is 79%.

Sunshine: The average sunshine duration for years is 1,900 hours and the rate of sunshine is 43%. The total sunshine radiation quantity is 111.87 kilocalories/ cm²; The rate of solar energy utilization is 2%; The average frost-free period is 269 days.

Wind direction: Northeasterly and northerly winds dominate the urban areas for most of the year, and southwesterly and southerly winds are more frequent in summer days. As the urban areas belong to the closed basin landform, the wind speed is low and calm winds are frequent, with the
atmosphere relatively stable. Days around winter are most likely to see temperature inversion, in which gas pollutants in the atmosphere are not easily diffused and diluted.

4.1.5 Water System of the Basin

Ruijin boasts plenty of surface water resources, development of which is difficult however as the rivers are in mountains and the annual runoff vary greatly. Trunk rivers within Ruijin include Mianjiang River, Jiubao River, Wantian River, Meijiang River and Gucheng River, with the basin area covering 2,449 km² and 36 branches. There are 17 reservoirs in Ruijin, with the water storage quantity being 198 million m³. The average runoff of surface water for years totals 2.12 billion m³, and the water yield per km² is 863,900 m³. The maximum annual runoff is 3.75 billion m³, and the minimum annual runoff is 9.52 m³.

The water system under the research scope are the basin of Mianjiang River, a branch of Gongjiang River, which is part of the Ganjiang River System. Mianjiang River runs from north and east to west and south, through Ridong, Rentian, Helong, Yeping, Xianghu, Zetan, Wuyang and Xiefang to the county area of Huichang, where it converges with Xiangshui River into Gongjiang River. It has a full length of 130 km, including 119 km in Ruijin, and a width of 30-160 m, with the basin area covering 159,960hm². The Mianjiang River that passes through the urban areas of Ruijin has an annual flow of 43.43 m³/s on average, the minimum flow of 0.317m³/s and the maximum flow of 2300m³/s. The normal water level is 188.07 m, and the highest water level after Liberation is 193.37 m (the flood in 1962). The flood frequency is once every 50 years. Water system in the subproject areas is shown in Figure 4.1-1.
4.1.6 Soil

Affected by natural conditions and human activities, Ruijin has diverse soil types, with the zonal soil being red soil and yellow soil. Concrete soil types include red soil, red-yellow soil, yellow soil, purple soil, limestone soil and paddy soil.

4.2 Current Ambient Quality in the Subproject Areas

All data are regular monitoring data about surface water and air from the Report on
Environmental Impacts of Lucao Lake Wetland Park in Ruijin and those of Ruijin in 2011, with the exception of data about acoustic environment quality obtained from field monitoring.

**4.2.1 Ambient Air**

1. **Monitoring Sites**

Based on assessment grades, local weather features, landform conditions and peripheral sensitive sites, the report includes four ambient air monitoring sites, the locations and functions of which are seen in Table 4.2-1.

<table>
<thead>
<tr>
<th>No. of monitoring sites</th>
<th>Names of monitoring sites</th>
<th>Locations of monitoring sites</th>
<th>Functions of monitoring sites</th>
</tr>
</thead>
<tbody>
<tr>
<td>A_1</td>
<td>Hulingxia Village</td>
<td>0.5 km north of Lucao Lake Educational Base</td>
<td>Comparison site</td>
</tr>
<tr>
<td>A_2</td>
<td>Guanyinqian Village</td>
<td>0.2 km south of Lucao Lake Educational Base</td>
<td>Caring site</td>
</tr>
<tr>
<td>A_3</td>
<td>The home of Xiaolan, a worker with Ruijin</td>
<td>2.3 km northeast of Xianghu Yaoqianba Wetland</td>
<td>Caring site</td>
</tr>
<tr>
<td></td>
<td>Environmental Protection Bureau</td>
<td>Rehabilitation, Protection and Utilization Area</td>
<td></td>
</tr>
<tr>
<td>A_4</td>
<td>Yeping</td>
<td>2.0km away from Yeping Wetland Purification, Protection and Utilization Area</td>
<td>Caring site</td>
</tr>
</tbody>
</table>

2. **Monitored Items:** $\text{SO}_2$, $\text{NO}_2$, TSP.

3. **Monitoring Cycle and Frequency:** The ambient air monitoring will last seven days from September 19 to 25, 2011, with the monitoring hours being 8:00, 14:00, 20:00 and 2:00. The monitoring and analysis will be executed in accordance with Technical Specifications for Automated Monitoring of Ambient Air Quality (HJ/T193-2005) and Technical Specifications for Manual Monitoring of Ambient Air Quality (HJ/T194-2005) to obtain hourly concentration and average daily concentration. In particular, two of the sampling sites, i.e. the house of Xiaolan, a worker with Ruijin Environmental Protection Bureau and Yeping, are regular monitoring sampling sites in Ruijin, with the sampling period lasting from December 12 to 16, 2012.

4. **Assessment Methods**

The single factor index method is adopted for the assessment, with the expression being:

$$P_i = \frac{C_i}{C_{oi}}$$

In which: $P_i$ —— The single factor index for Type i pollutant;

$C_i$ —— Actually measured concentration of Type i pollutants;
5. Standard Applied

Category II Standard in Ambient Air Quality Standards (GB3095-1996) is applied for SO₂, NO₂ and TSP.

6. Monitoring Statistics and Assessment Results

See Table 4.2-2 for the results of ambient environment quality monitoring and assessment.

### Table 4.2-2 Monitoring and Assessment Results about Ambient Quality

(Unit: mg/m³)

<table>
<thead>
<tr>
<th>Monitoring sites</th>
<th>Monitored items</th>
<th>Sampling date Frequency</th>
<th>July 19-25</th>
<th>Single factor index</th>
</tr>
</thead>
<tbody>
<tr>
<td>☑️ A1 Hulingxia Village</td>
<td>SO₂</td>
<td>Scope of hourly value</td>
<td>0.016-0.084</td>
<td>0.032-0.168</td>
</tr>
<tr>
<td></td>
<td>Daily average value</td>
<td>0.02325-0.056</td>
<td>0.155-0.373</td>
<td></td>
</tr>
<tr>
<td></td>
<td>NO₂</td>
<td>Scope of hourly value</td>
<td>0.009-0.019</td>
<td>0.0375-0.0792</td>
</tr>
<tr>
<td></td>
<td>Daily average value</td>
<td>0.01-0.016</td>
<td>0.0417-0.133</td>
<td></td>
</tr>
<tr>
<td></td>
<td>TSP</td>
<td>Daily average value</td>
<td>0.077-0.101</td>
<td>0.257-0.337</td>
</tr>
<tr>
<td>☑️ A2 Guanyinqian</td>
<td>SO₂</td>
<td>Scope of hourly value</td>
<td>0.02-0.052</td>
<td>0.04-0.104</td>
</tr>
<tr>
<td></td>
<td>Daily average value</td>
<td>0.02925-0.03725</td>
<td>0.195-0.248</td>
<td></td>
</tr>
<tr>
<td></td>
<td>NO₂</td>
<td>Scope of hourly value</td>
<td>0.012-0.024</td>
<td>0.05-0.1</td>
</tr>
<tr>
<td></td>
<td>Daily average value</td>
<td>0.01525-0.02175</td>
<td>0.127-0.181</td>
<td></td>
</tr>
<tr>
<td></td>
<td>TSP</td>
<td>Daily average value</td>
<td>0.079-0.094</td>
<td>0.263-0.313</td>
</tr>
<tr>
<td>☑️ A3 The house of Xiaolan, a worker with Ruijin</td>
<td>SO₂</td>
<td>Scope of hourly value</td>
<td>0.021-0.037</td>
<td>0.042-0.074</td>
</tr>
<tr>
<td></td>
<td>NO₂</td>
<td>Scope of hourly value</td>
<td>0.014-0.039</td>
<td>0.058-0.163</td>
</tr>
</tbody>
</table>
According to Table 4.2-2, the single factor indexes of various current condition factors at the four monitoring sites are less than 1, indicating that the current ambient air quality is good as it meets Category II standards in Ambient Air Quality Standards (GB3095-1996).

## 4.2.2 Surface Water Environment

### 1. Monitoring Sites

To describe the water quality of the pollutant-containing water bodies involved in the subproject, the report uses the monitoring results about water quality of Mianjiang River released by Ruijin Environmental Protection Bureau, which arranges three regular monitoring sections on the Mianjiang River. See Table 4.2-3 for the locations of various monitoring sections.

<table>
<thead>
<tr>
<th>Section No.</th>
<th>Section Location</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>SW₁</td>
<td>Ruijin Airport Section</td>
<td>Located in Yeping Town under the subproject (upstream section)</td>
</tr>
<tr>
<td>SW₂</td>
<td>Taxiasi Section</td>
<td>Located in Xianghu Town under the subproject (midstream section)</td>
</tr>
<tr>
<td>SW₃</td>
<td>Qingshi Section</td>
<td>Located in Shazhouba forest wetland under the subproject (downstream section)</td>
</tr>
</tbody>
</table>


3. Monitoring Cycle and Frequency: the monitoring was conducted in 2011 and monitoring data is the average value in 2011. The analysis is conducted in accordance with the methods specified in Technical Specifications for Surface Water and Wastewater Monitoring (HJ/T91-2002) and Table 4 of Environmental Quality Standards for Surface Water (GB3838-2002).

### 4. Assessment Methods

The single factor index method is adopted for the assessment, with the expression being:

In which, the standard index of pH is:
In which: \( pH_{sd} \)——The lower limit of the pH value specified in the standards for surface water quality;

\( pH_{su} \)——The upper limit of the pH value specified in the standards for surface water quality;

Other expressions:

\[
P_i = \frac{C_i}{C_{oi}}
\]

In which: \( P_i \)——The single factor index for Type i pollutant;

\( C_i \)——Acturally measured concentration of Type i pollutants, mg/L;

\( C_{oi} \)——Standard assessment value of Type i pollutants, mg/L.

Current surface water environment quality is analyzed based on the calculation results of the single factor index of pollutants, so as to verify whether it meets requirements in functional planning and thus pave the way for water environment impact prediction after the subproject implementation.

5. Assessment Standards


6. Monitoring Statistics and Assessment Results

See 4.2-4 for results of surface water quality monitoring and assessment.

**Table 4.2-4 Monitoring Results of Surface Water Quality**

(Unit: mg/L, pH is dimensionless)

<table>
<thead>
<tr>
<th>Item</th>
<th>SW1</th>
<th>SW2</th>
<th>SW3</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Annual Average</td>
<td>Single Factor Index</td>
<td>Annual Average</td>
</tr>
<tr>
<td>pH</td>
<td>6.95</td>
<td>0.1</td>
<td>6.97</td>
</tr>
<tr>
<td>( \text{COD}_{\text{mn}} )</td>
<td>2.31</td>
<td>0.3</td>
<td>2.36</td>
</tr>
<tr>
<td>NH\text{\textsubscript{3}}-N</td>
<td>0.181</td>
<td>0.056</td>
<td>0.163</td>
</tr>
</tbody>
</table>
According to Table 4.2-4, values of all pollutant indicators at monitoring sections within the assessment scope meet applicable standards, and no single factor values exceed standards, indicating that the current water quality in the assessment area is generally good and meets requirements for Class III water specified in Environmental Quality Standards for Surface Water (GB3838-2002).

4.2.3 Acoustic Environment

1. Monitoring Sites

Xinjian County Environment Monitoring Station conducted acoustic environment monitoring on June 18, 2012 by arranging six monitoring sites in the subproject areas. See Attached Drawing 2 for the monitoring sites, and Annex III for the monitoring reports. The noise monitoring factor is equivalent continuous noise level A, and the monitoring is conducted in accordance with Technical Specifications for Environment Monitoring.

2. Assessment Standards and Methods

See Category II standard specified in Acoustic Environment Quality Standards (GB3096-2008) for noise assessment standards. The assessment is based on the comparison between the equivalent continuous noise level A and the applicable environment standards.

3. Monitoring Results and Assessment

See Table 4.2-5 for monitoring results.

<table>
<thead>
<tr>
<th>Monitoring hours</th>
<th>Monitoring sites</th>
<th>June 18</th>
<th>Standard values for execution</th>
<th>Exceed standards or not</th>
</tr>
</thead>
<tbody>
<tr>
<td>Daytime</td>
<td>N₁ Hupo Village</td>
<td>48.6</td>
<td>60</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td>N₂ Lukeng Village</td>
<td>49.2</td>
<td>60</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td>N₃ Xiajie Village</td>
<td>48.1</td>
<td>60</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td>N₄ Xinyuan Village</td>
<td>49.7</td>
<td>60</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td>N₅ Zhugang Village</td>
<td>47.3</td>
<td>60</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td>N₆ Xingcun</td>
<td>47.9</td>
<td>60</td>
<td>No</td>
</tr>
<tr>
<td>Night</td>
<td>N₁ Hupo Village</td>
<td>32.5</td>
<td>50</td>
<td>No</td>
</tr>
<tr>
<td>Site</td>
<td>Latitude</td>
<td>Longitude</td>
<td>Emission</td>
<td></td>
</tr>
<tr>
<td>-----------------</td>
<td>----------</td>
<td>-----------</td>
<td>----------</td>
<td></td>
</tr>
<tr>
<td>N2 Lukeng Village</td>
<td>32.9</td>
<td>50</td>
<td>No</td>
<td></td>
</tr>
<tr>
<td>N3 Xiajie Village</td>
<td>32.1</td>
<td>50</td>
<td>No</td>
<td></td>
</tr>
<tr>
<td>N4 Xinyuan Village</td>
<td>33.2</td>
<td>50</td>
<td>No</td>
<td></td>
</tr>
<tr>
<td>N5 Zhugang Village</td>
<td>31.4</td>
<td>50</td>
<td>No</td>
<td></td>
</tr>
<tr>
<td>N6 Xingcun</td>
<td>31.6</td>
<td>50</td>
<td>No</td>
<td></td>
</tr>
</tbody>
</table>

According to Table 4.2-5, the values at six monitoring sites in the subproject areas are all lower than the applicable environment standards, indicating the acoustic environment is generally good as Category II standards specified in GB12348-2008 are all met.

### 4.3 Profile of Ecological Environment

#### 4.3.1 Terrestrial Ecology

##### 4.3.1.1 Terrestrial Plants

1. Terrestrial Plant Resources

The assessed area is located in the mid-subtropical humid monsoon climate zone, with the vegetation originally dominated by mid-subtropical evergreen broad-leaved forests. But long periods of human activities have changed the vegetation evolution and resulted in widespread secondary vegetation and man-made vegetation. The vegetation is presently dominated by Chinese red pines, man-made wetland pines and bushes.

There are 57 species of seed plants under 32 genuses of 20 families, respectively accounting for 1.3%, 2.5% and 9.2% of the total species, families and genuses in Jiangxi Province. By the number of species contained, the dominant families of the 20 families of seed plants are gramineae (nine species, including the bamboo family), rosaceae (seven species), compositae (six species), fabaceae (four species) and polygonaceae (four species). The seed plant species in the assessed area only represent 1.3% of the total in Jiangxi Province, mostly being bushes or herbaceous cosmopolitan species. There are no natural evergreen broad-leaved forests in the area, but there are cinnamomum camphoras and their young trees. The current vegetation conditions show that natural vegetation has been seriously destroyed and is right at a stage of restoration.

Features of the forest vegetation in the assessed area: Located in the South plant zone, the seed plants are mostly tropic species; Mountain vegetation is dominated by man-made cunngihamia Inceolata forest, natural Chinese red pine forest, man-made wetland pine forest and bushes; Agricultural vegetation is dominated by paddy rice. Plant species are dominated by plants and crops commonly seen in the hilly downland of the areas south of the Yangtze River. There are no wild plants, ancient or famous trees under state or provincial protection within the assessed scope.
2. Vegetation

According to the classification for natural vegetation as specified in the Vegetation of China, the forest vegetation in the assessed area includes seven communities under three vegetation types. There is no original vegetation in the assessed area. The naturally regenerated Chinese red pines and secondary bushes are the natural secondary forests with rich diversity in the assessed area.

Chinese red pine forests are among the main forest vegetation types in the assessed area. Most of them naturally grow up from seeds flying into soils and are young trees. Arbor trees are dominated by Chinese red pines, accompanied by small quantities of young schima superba, liquidambar formosana, castanopsis sclerophylla and camphor trees. The crown density is mostly between 0.35 and 0.65. Soil erosion is not serious as there are dense bushes under the forests.

Main species of bushes under trees include loropetalum chinensis, gardenia jasminoides, syzygium buxifolium, vaccinium bracteatum, rhododendron simsii, adinandra millettii, dicranopteris dichotomai and miscanthus floridulus. The coverage of bushes or shrub-grasses is between 25% and 60%. There were a few interlayer plants, which mainly include rosa laevigata.

Form. Liquidambar formosana / schima superba: Due to man-made interference, bushes generally have a height of 1.5-2m, dominated by liquidambar formosana and schima superba and supplemented by castanopsis sclerophylla, loropetalum chinensis, cape jasmine, gurgeon stopper, vaccinium bracteatum, symlocos sumuntia, adinandra millettii and phyllostachys heteroclada, etc. Ground cover is dominated by dicranopteris dichotomai. The total vegetation cover is 45%-85%. The falling leaves and ground coverage greatly reduce Soil erosion.

Form. Phyllostachys heteroclada: Phyllostachys heteroclada is 1-1.8 m tall, with a diameter of 5-15 mm. Small branches usually grow separately, with 3-5 leaves. There are often tiny hairs on the upper part of the leaf sheaths, and on either side of the sheath mouth is a tiny auricle. The leaf is oblong and needle shaped, with a width of 8-16 mm. Pliable and tough, phyllostachys heteroclada is a suitable material for ware weaving. Shoots emerge in April-May and are edible.

Phyllostachys heteroclada bushes are commonly seen at mountain foots, on barren hills, near ditches or in fields.

There are mainly cunninghamia lnceolata forest, wetland pine forest and other man-made forests in the assessed scope.

Form. Cunninghamia Lnceolata: It is a shallow-rooted tree species with the principal root developed. Featuring fertilizer tropism, it is seen in subtropical hillland and a traditional commercial tree species in the area. Mainly distributed in red earth hills developed from soil parent materials like...
sandstones, cunnighamia lanceolata forests in the assessed area are man-made and supplemented by Chinese red pinese, liquidambar formosana, scnima superba and paulownia kawakamii.

The shade densities of middle-aged forests are mostly 0.45-0.75, and the coverage of bush grass under trees is about 15%-55%. Bushes are dominated by loropetalum chinensis, itea oblonga, vaccinium bracteatum and rubus corchorifolius; Vines include rosa laevigata and smilax glabra, etc; The herb layer mainly consists of dcranopteris dichotomai and miscanthus floridulus.

Young cunnighamia lanceolata forests generally have a shade density of 0.25-0.45. Various bushes in the forests outnumber middle-aged cunnighamia lanceolata trees and mainly include litsea cubeba, hardleaf oatchestnut, white oak, vaccinium bracteatum and loropetalum chinensis. Herb plants are dominated by latiusculum, dcranopteris dichotomai and miscanthus floridulus.

Form. Pinus elliottii: Young pinus elliottii forests take the dominant position. There are small quantities of young schima superba, liquidambar formosana and camphora. The shade density is mostly beteen 0.2 and 0.6. The forest appearance is tidy but Soil erosion is serious.

Main species of the bushes under the trees include loropetalum chinensis, azalea, gurgeon stopper, vaccinium bracteatum, smilax china and rosa laevigata; Herb plants are mainly dcranopteris dichotomai. The bush grass coverage is 30%-65%.

Agricultural vegetation: Agricultural vegetation accounts for a certain proportion in the assessed scope. The valleys in hill downland and banks of rivers are mostly paddy fields or dry land. Crops are dominated by paddy rice. Rapes are commonly seen in winter and spring. Peanuts, lotuses, sweet potatoes and vegetables are planted in dry land.

3. Comprehensive Comments on the Vegetation in the Assessed Area

Based on the contents above, the vegetation in the assessed area has the following features:

1) Current vegetation in the assessed scope is dominated by cunnighamia lanceolata forest, Chinese red pinese forest, man-made wetland pine forest, bushes and agricultural dry land. Forest vegetation is divided into three levels, three vegetation types and seven communities.
2) Due to dense villages, convenient traffic as well as historical and human factors, forest vegetation in the assessed area is dominated by cunnighamia lanceolata forest, Chinese red pinese forest, man-made wetland pine forest and bushes. The natural Chinese red pinese forest in the assessed area is right at a preliminary stage of natural vegetation ecological restoration.
3) Farmland is mainly for paddy rice planting, with rapes as a rotation crop. Dry land is mostly for vegetables, peanuts, soy beans and sweet potatoes. There are no agricultural vegetation with special ecology or economic values in the assessed area.
4.3.1.2 Terrestrial Animals

1. Composition of Animals

There are dense population in the villages and towns in the assessed area. Vegetation mainly consists of agricultural vegetation, cunnighamia lanceolata forest, Chinese red pine forest, wetland pine forest and bushes. Animal specicies are those commonly seen in Jiangxi Province.

(1) Beasts
Beasts in the assessed area mainly include rhizomys sinensis, sewer rat, rattus flavipectus, north niviventer and lepus sinensis. In particular, lepus sinensis and murine are common. With the most species and the biggest number in the assessed area, rodents are village companion animals, with some species making both homes and wild their habitats. For example, sewer rats will go indoors from outdoors when there is food shortage in the wild in winter days, and go outdoors again when spring comes and food is increasingly more outside. Some species do harm to local crops such as paddy rice, peanuts and sweet potatoes as well as forests. Others species are carriers of certain diseases.

(2) Birds
Among the commonly-seen birds in the assessed area, resident birds include tree sparrows, turdus merula, pied wagtail, pycnonotus sinensis, lanius schach and lonchura striata; Summer birds include hirundo daurica, barn swallow, egret, Chinese pond-heron and nyctilcorax nycticorax. Winter birds include phoenicurus auroreus, turdus naumanni, Brambling and emberiza spondocephala. In particular, egret and Chinese pond-heron are among the key wild animals under provincial protection, and there are no fixed habitats and areas of concentrated distribution for birds.

(3) Amphibians

Commonly seen species in the assessed area include bufo gargarizan, rana nigromaculata, rana limnocharis and rana guentheri. In particular, the rana nigromaculata is a key wild animal species under provincial protection.

The ecological habits and distribution of the main species:

Bufo gargarizan, commonly known as the “toad”, lived in the bushes that are close to waters or moist, river valleys or areas around village houses. Toads are widely distributed in the assessed area and are the species with the biggest community.

Rana nigromaculata, also called the “frog”, often rest in paddy fields, river ditches or grass close to
waters. Frogs are extensively distributed in Jiangxi Province.

Rana limnocharis and microhyla ornate often rest in farmland or nearly fields, which are commonly seen in the assessed area.

(4) Reptiles

Reptiles in the assessed area are dominated by cosmopolitan species like eumeces chinensis and takydromus septentrionalis. They also include ptyas korros, ptyas mucosus, pphiui and enhydris chinensis. As the subproject is located in the suburban areas, no wild animals under priority protection have been found in the assessed area.

4.3.2 Aquatic Ecosystem

4.3.2.1 Aquatic Plants

There are ten species of phytoplankton in the assessed area, which are respectively under four phyla. Five of the species belong to chlorophyta; Three belong to bacillariophyta; One belongs to cyanophyta and one belongs to euglenophyta.

As for the composition of the phytoplankton in the assessed area, chlorophyta takes the dominant position and is followed by bacillariophyta; Dominant species include treubaria bern and ankistrodesmus under chlorophyta and navicula under bacillariophyta.

4.3.2.2 Aquatic Animals

1. Animal Plankton

There are 13 species of animal plankton in the assessed area, including five species of protozoa, three species of wheel animalcules, three species of copepods and two species of cladoceras. The quantities of animal plankton vary with seasons: Spring sees the biggest quantities and is followed by winter; Autumn sees the smallest quantities. Besides, the quantities of animal plankton are related to water temperatures and the pH values of water bodies. Commonly seen protozoa include difflugia, arcella and tintinnididae; Commonly seen wheel animalcules include asplanchna and polyarthra vulgaris; Commonly seen copepods include chydorus and bosmina; Cladoceras mainly include diaptomidae.

2. Benthic Invertebrates

There are nine species of benthic invertebrates. Commonly-seen ones include cipangopaludina chinensis, limnoperna lacustris, hyriopsis cumingii, unio douglasiae, chironomid larvae and water earthworm, which are mainly distributed in rivercourses, paddy fields and ponds with many
organic matters.

3. Fishes

The wetland ecological environment in the assessed area shows no special features. Fishes in the rivercourses are commonly seen species, including carps, crucian carps, grass carps, opsarichthys bidens, abbottina rivularis, rhodeus sinensis, finless eel, mud fish and yellow catfish. There are no fish spawning grounds, feeding grounds or wintering grounds in the rivercourses involved.

4.4 Social and Economic Overview

4.4.1 Administrative Division and Population

Ruijin has jurisdiction over Xianghu Town, Rentian Town, Xiefang Town, Ruilin Town, Shazhouba Town, Jiubao Town, Wuyang Town, Yeping Township, Zetan Township, Huangbo Township, Dabodi Township, Dingbei Township, Yunshishan Township, Gangmian Township, Wantian Township, Baying Township and Ridong Township. With 13 residential committees and 231 villager committees, Ruijin has a population of 663,000, which mainly consists of the Han people. The population density is 130 persons per sq km.

4.4.2 Overview of Regional Economy

In 2010, Ruijin focused on the construction of “one center” and the strategic goal of “four buildings”, and earnestly implemented the three-year plan of Ganzhou Municipality on building a well-off society in an all-round way to accelerate its economic growth. As a result, the municipal economy generally showed a good momentum of growth, with major economic indicators taken to a new stage. In 2010, the regional GDP reached RMB6.5 billion, an annual growth of 15.4% on average; The fiscal revenue totaled RMB580 million, an annual growth of 23.5% on average; Social retail sales of consumer goods amounted to RMB2.17 billion, an annual growth of 16.3% on average. Seven indicators including regional GDP were redoubled in five years; Five indicators, including the added values of industrial enterprises above the statistical threshold, investment in fixed assets and deposits at financial institutions, were redoubled in three years. In 2010, it took the first place among the counties and cities of Ganzhou Municipality in the growths of fiscal revenue and investment in fixed assets. In particular, the primary industry generated RMB1.04 billion of added value, up 6.4%; The secondary industry registered RMB2.24 billion of added value, up 16.8%, and the tertiary industry realized RMB3.22 billion of added value, up 14.3%. The structure of the three industries was 16:34.5:49.5.

4.4.3 Physical Cultural Resources

There are numerous cultural relics within the administrative scope of Ruijin, with the historical and
cultural sites including ancient tombs from the Han Dynasty, ancient kilns and ancient buildings from the Ming and Qing Dynasties. During the Soviet Area period, a number of old revolutionary residencies were left in Ruijin, including five heritage sites under State protection such as the Red Well, the First Soviet Auditorium, the Second Soviet Auditorium and Red Mint, and four heritage sites under provincial protection.

According to the heritage distribution and field investigations in Ruijin, key cultural heritage sites are away from the subproject site. There are no heritage sites under protection of various levels found within the scope of land required.

4.4.4 Municipal Facilities

1. Roads

National Highways 319, 323 and 206 meet in the city area. Xiamen-Chengdu Expressway (G76) in Jiangxi and Fujian Provinces have been completed; Two entrances/exits (West Ruijin and East Ruijin) are arranged within Ruijin and directly lead to Ganzhou and Xiamen. Jinan-Guangzhou Expressway (G35) in Jiangxi Province has been completed and open to traffic; Two entrances/exits (North Ruijin and South Ruijin) are arranged within Ruijin and directly lead to Yingtan and Xunwu. The two State-level expressways integrate Ruijin into China’s expressway networks. Crossing expressways have four entrances/exits in the suburb of Ruijin, a high-profile design that is hard to realize in ordinary prefectural cities.

2. Railways

Ganzhou-Ruijin-Longyan Railway that has been open to traffic will connect to Yingtan-Xiamen Railway, Beijing-Kowloon Railway and Beijing-Guangzhou Railway. In particular, the Ruijin Station is a major prefecture-level station along Ganzhou-Ruijin-Longyan Railway. The capacity expansion project of Ganzhou-Ruijin-Longyan Railway has been commenced and is expected to be completed in September 2013. The project was designed and constructed based on a Level I dual-line electrical railway and an hourly speed of 200 km. Ruijin Railway Station will be upgraded as well.

3. Aviation

Two airports are located in Ganzhou and Liancheng, respectively. The Ganzhou Huangjin Airport provides flights to Beijing, Shenzhen, Shanghai, Nanchang, Xiamen and other cities, and the ticket offices sell joint-way air tickets to and from all parts of China and handle international air tickets as well. The Liancheng Airport is located along an expressway to be constructed and is only 90 km away from Ruijin.

Ruijin 4C Airport: According to the 12th Five-year Plan of Ruijin Municipal Government, the
current Ruijin 4C Airport will be reconstructed in the next five years, with the location suggested to be close to Tingzhou, Fujian Province and between Ruijin in the southern part of Ganzhou and Changting in the western part of Fujian. It will connect Tingzhou and Ruijin and help develop Tingzhou-Ruijin metropolis - “China’s Red Metropolis”, the urban areas of which will have population of more than 500,000.

4. Power

Ruijin is part of the Central China Grid, with two large-scale power transmission and transformation systems (110,000 KVA and 220,000 KVA). Power supply is sufficient and the quality is good. According to the 12th Five-year Plan of Ruijin Municipal Government, Huaneng Power International and Datang International will build a thermal power plant and a nuclear power plant (about 500,000 KVA).

5. Water Supply

Ruijin has first-class running water quality, with a water supply quantity of 50,000 tons per day. This can fully satisfy the needs of both the people and enterprises.

6. Communications

Telephones are all program-controlled; Long-distance transmission is digitalized, and mobile communications has been opened. March 2001 saw initiation of broadband Internet.

4.4.5 Current Use of Land Resources

Ruijin has a land area of 2,448 km², including 356,900 mu of farmland and 2,800,000 mu of mountain area and accounting for 9.7% of the whole municipality. The per capita farmland is 0.6 mu. Forests cover 1,283,300 mu, with the coverage being 34.9%.

4.4.6 Mineral Resources

According to preliminary test, there are 26 kinds of mineral reserves under 13 categories in Ruijin, which mainly include dolomite, limestone, cann, gold, tantalum niobium, rare earth, tungsten, silver, iron, manganese, clay, anthracite coal, phosphorus and aranium. In particular, excellent limestone reserves total more than 900 million tons, with the content of calcium oxide exceeding 60%, and most of them are exposed and easily exploited. Dolomite reserves reach over 100 million tons, with C+D grades totaling 19 million tons and the content of magnesium being 20.9%; Cann reserves amount to 1.34 million tons, with the grade being 65% and above. Mineral reserves are distributed in the area including Shazhouba, Yunshishan, Jiubao and Huangbo and the area including Xiefang and Baying.
4.4.7 Tourism Resources

As the former the Red Capital of China and the cradle of the republic, Ruijin boasts abundant red tourism resources, with 15 heritage sites under State protection and traditional revolutionary education bases set up by the Central Committee of the CPC and 22 State ministries and commissions. Ruijin boasts beautiful natural landscape, with a provincial-level scenic spot named Luohanyan. Ruijin is also home to Hakka people, with the culture, customs, buildings and food showing distinctive Hakka features. In Ruijin, the landform is complicated, and there are plenty of cultural relics both on and under the ground, with those left from the revolutionary base area of the Central Committee of the CPC during the Second Civil War drawing particular attention. Relying on the ancient relics and the natural landscape, “Eight Attractions along the Mianjiang River”, Shuangshiyian, Luohanyan and some other places of interests have been developed. There are 16 heritage sites under State protection, one under provincial protection and 163 under county protection within Ruijin.

4.5 Polluting Sources Control in the Region

4.5.1 Garbage Collection and Treatment

Local residents have poor awareness of waste sorting and collection. Various waste packing materials, agricultural films and kitchen waste are seen everywhere, not only seriously affecting the living environment but also entering rivercourses with rainwater runoff. Arbitrarily piled waste may generate waste leachate. This greatly affects the water quality in the Mianyang River basin.

4.5.2 Wastewater Discharge and Treatment

The Mianjiang River basin involves 11 towns and townships, where domestic wastewater is discharged before treated and pollutes the water quality of Mianjiang River. In the assessed areas, wastewater collection systems in all towns and townships are backward, except that Xianghu Town has a wastewater treatment plant with the capacity of 20,000 tons per day and corresponding wastewater collection pipes. There are no domestic wastewater treatment facilities in rural areas. As a result, untreated domestic wastewater is discharged into surface water bodies. Meanwhile, agricultural return water along the river is also discharged directly into the river. The two factors have adversely affected ecological and environmental sustainability of Mianjiang River basin.

4.5.3 Relevant Environmental Management and Ecological Protection Plans of the Government

(1) The ecological construction plan of Ruijin city

According to the Ecological Construction Plan of Ruijin City (2010-2015), Ruijin will introduce a number of environmental protection and ecological construction projects. Specifically,
environmental protection projects include drinking water safety projects in villages and towns, Phase II of wastewater treatment plant, demonstration projects of wastewater treatment in villages and towns, demonstration projects of harmless treatment of waste in villages and towns, rural methane projects, mine environment improvement, environment safety forecast and prewarning and forecast system construction. Ecological construction projects include public-good forest protection project, the State-level soil and water conservation project and the project of comprehensive ecological environment improvement in the Mianjiang River basin. Such projects are of positive significance to securing water quality of water source areas and protecting ecological system in the Mianjiang River basin.
5 Environmental Impact Prediction and Assessment and Environmental Protection Measures

5.1 Ecological Environment Impact Assessment and Protection Measures

5.1.1 Ecological Impacts during Construction

5.1.1.1 Impacts on Terrestrial Ecology

1) Impacts on terrestrial plant resources

During subproject construction, land consolidation, land occupation for construction, road construction and other activities would completely destroy individual plants and vegetation and such destruction is devastating and unrestorable. Vegetation in the subproject areas mainly includes bushes and grass and plantation residue. Destruction to vegetation in the subproject areas due to construction would slightly reduce the area and population of such vegetation, but impacts on the existence and reproduction of plant population and on changes of vegetation landscape would be minimal. Spoil and debris from construction would be mainly used for land leveling and would not produce impacts on plants and vegetation resources in the assessed areas.

2) Impacts on terrestrial animal resources

(1) 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, noise of construction workers and construction machinery and illumination at night in the construction area impel the animals to migrate, reduce the varieties and amount of animals and change the animal distribution within the subproject scope. In addition, the construction has certain effect on activities of amphibians and reptiles. Scared by the construction noise, some varieties of beasts are forced to leave their original habitat. However, as there is not single animal under protection and habitat within the assessment area, there are diversified food sources, and animals have migration abilities, subproject construction would not endanger the existence of animal population.

(2) Impacts on 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) Lightning 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 are 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.

The above impacts could force birds to migrate to other places far from the construction areas; the population of some birds could decrease due to reduced habitats. However, after subproject completion, habitats would be reconstructed and bird species and population would gradually increase to the normal levels.

5.1.1.2 Impacts on Aquatic Ecology

1) Impacts on aquatic plants

Survey shows there are mainly naproxen species of algae in waters of the assessment area and there are no algae plants with remarkable economic significance or under special state protection. During subproject construction, excavation and other activities would have some impacts on algae plants in the affected waters, especially on epiphytic algae plants. However, due to large quantity, wide distribution and fast breeding of algae plants, the algae community would quickly restore after subproject completion. Therefore, subproject implementation would not have significant impacts on aquatic plants.

2) Impacts on aquatic animals

During subproject construction, excavation and filling in the affected waters could lead to water pollution and have some impacts on aquatic animals. After construction completion, species and population of aquatic animals in the affected waters would gradually restored to the original levels. Therefore, subproject implementation would not have significant impacts on aquatic animals.

5.1.1.3 Impacts on key provincially protected animals

Key wild animals under Jiangxi provincial protection within the assessment area include *Egretta garzetta*, *Ardeola bacchus* and *Rana nigromaculata*. This section focuses on analyzing subproject impacts on these animals.

1) Impacts on Egretta garzetta and Ardeola bacchus
Egretta garzetta belongs to Egretta garzetta genus of Ardeidae family, which mainly eats fish, crustaceans and insects; Ardeola bacchus belongs to Ardeola bacchus genus of Ardeidae family, which mainly eats dragonflies, caterpillar, stink bugs and leech as well as small fish, shrimps and crabs. In spring, the two birds normally migrate to breeding spots in the north between early April and mid April and in autumn, they start to migrate to the south between end September and early October. When migrating, they would fly in dispersed small groups or in individual families. Construction areas of the subproject are located at suburban areas, where there are no habitats for Egretta garzetta and Ardeola bacchus and where the two birds only occasionally stop over for a short while. Therefore, subproject implementation would only have minor impacts on them.

2) Impacts on Rana nigromaculata

Rana nigromaculata belongs to Ranidae, Anura of Amphibia and is a wild animal under special protection by Jiangxi Province. Rana nigromaculata generally inhabit in paddy fields, ponds and nearby grass clusters. They act and forage at night, being experts in eliminating pests, thus being of significance to protecting paddy fields from pest attacks. Impacts of construction on Rana nigromaculata is primarily noise generated by construction machinery and transportation vehicles, which would narrow the habitat scope of Rana nigromaculata; in addition, as Rana nigromaculata are large in size and taste good, some construction workers may catch and kill them.

5.1.2 Ecological Impacts during Operation

5.1.2.1 Impacts on Terrestrial Animals

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. Due to partial destructions to the original habitats and increased human impact factors in the areas of the subproject after its completion, such as domestic waste and noise, there would be some but minor impacts on these animals.

2) Impacts on birds

After subproject completion, vegetation in the subproject areas would be restored to gradually restore habitat environment for birds. Meanwhile, sufficient water and ample food in wetland and less human disturbance would provide unique and favorable environment for the migration of birds. It is predicted that birds population would increase over time after completion of the subproject.

5.1.2.2 Impacts on Aquatic Organisms

1) Impacts on aquatic plants
Increased water area in some water bodies after operation of the subproject would expand the existence area of aquatic plants and thus provide a favorable living environment for them.

2) Impacts on aquatic animals

There would be no additional structures in Mianjiang River channel and water area in some sections would increase after operation of the subproject, thereby providing 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. Under the Component of Xianghu Yaoqianba Wetland Rehabilitation, Protection and Utilization, the original pumps would be used to divert some river water (maximum diversion is 20,000 tons/day) to Nanhu Ecological Wetland for purification and treatment and treated water would be released to the original river channel. During operation, water would be pumped at the maximum designed capacity of 20,000 tons/day during wet seasons and pumping would be reduced or ceased during dry seasons to ensure aquatic animals in the river channel are not affected (see attached Map 3 for the plan of Nanhu Ecological Wetland Treatment Process). Therefore, implementation of the subproject would not adversely affect fish migration passageway and hydrological regimes in the Mianjiang River.

3) Impacts on landscape

Implementation of the subproject would significantly improve environment in surrounding areas. Scenic quality after implementation of the subproject is rated using scenic quality evaluation methods in the Visual Resources Management (VRM) system of US Bureau of Land Management and the scores at provided in Table 5.1-1.

<table>
<thead>
<tr>
<th>Landscape Medium</th>
<th>Scoring Criterion</th>
<th>Score</th>
<th>Before Implementation</th>
<th>After Implementation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Landform</td>
<td>High vertical relief as expressed in prominent cliffs, spires, or massive rock outcrops; or detail features dominant and exceptionally striking and intriguing, such as glaciers.</td>
<td>5</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Steep canyons, mesas, buttes, cinder cones, and drumlins; or interesting erosional patterns or variety in size and shape of landforms; or detail features which are interesting though not dominant or exceptional.</td>
<td>3</td>
<td>12</td>
<td>12</td>
</tr>
<tr>
<td></td>
<td>Low rolling hills, foothills, or flat valley bottoms; or few or no interesting landscape features.</td>
<td>1</td>
<td>12</td>
<td>12</td>
</tr>
<tr>
<td>Vegetation</td>
<td>A variety of vegetative types as expressed in interesting forms, textures, and patterns.</td>
<td>5</td>
<td>3</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>Some variety of vegetation, but only one or two major types.</td>
<td>3</td>
<td>3</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>Little or no variety or contrast in vegetation.</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Water</td>
<td>Clear and clean appearing, still, or cascading white water.</td>
<td>5</td>
<td>3</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>Description</td>
<td>Score</td>
<td>Total Score</td>
<td>Class</td>
</tr>
<tr>
<td>----------------------</td>
<td>------------------------------------------------------------------------------</td>
<td>-------</td>
<td>-------------</td>
<td>-------</td>
</tr>
<tr>
<td>any of which are a</td>
<td>dominant factor in the landscape.</td>
<td>3</td>
<td>15</td>
<td>A2</td>
</tr>
<tr>
<td>Flowing, or still,</td>
<td>but not dominant in the landscape.</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Absent, or present,</td>
<td>but not noticeable.</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Rich color combinations, variety or vivid color; or pleasing contrasts in</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>the soil, rock, vegetation or water fields.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Some intensity or variety in colors and contrast, but not a dominant</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>scenic element.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Subtle color variations, contrast, or interest; generally mute tones.</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Adjacent scenery</td>
<td>greatly enhances visual quality.</td>
<td>5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Adjacent scenery</td>
<td>moderately enhances overall visual quality.</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>has little or no influence on overall visual quality.</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>One of a kind;</td>
<td>or unusually memorable, or very rare within region.</td>
<td>6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Distinctive, though</td>
<td>somewhat similar to others within the region.</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Interesting within its setting, but fairly common within the region.</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Modifications add</td>
<td>favorably to visual variety while promoting visual harmony.</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Modifications add</td>
<td>little or no visual variety to the area, and introduce no discordant</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Modifications add</td>
<td>variety, but are very discordant and promote strong disharmony.</td>
<td>-4</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Total Score</td>
<td>15</td>
<td>25</td>
<td></td>
</tr>
</tbody>
</table>

Based on the above table, the total score after the subproject implementation is 25, which indicates Class A2 scenic quality. The total score after implementation is 10 points higher than before implementation and the scenic quality is elevated from Class B to Class A2, suggesting that implementation of the subproject contributes to scenic quality improvement.

### 5.1.3 Ecological Environment Protection Measures

Implementation of the subproject would inevitably have some impacts on ecological environment. For potential ecological problems, effective measures shall be taken to avoid, mitigate or offset such problems. The order of “avodance-mitigation-offset” shall be followed to minimize potential adverse ecological impacts.

To protect local ecological environment and mitigate adverse ecological impacts, the following measures have been developed:

#### 5.1.3.1 Terrestrial Ecology Protection Measures

1) Design stage
Tree species would be carefully selected when designing afforestation models to protect the safety of local tree species and avoid disturbances of foreign tree species. When selecting land for afforestation, existing forest with canopy density greater than 0.2 cannot be selected to avoid and bushes and thinly stocked secondary forest land shall be selected as much as possible as they can provide habitats and shelters to local wildlife.

2) Construction period

Main protection measures to be taken during subproject construction include:

(1) Construction workers shall be arranged to live, as much as possible, in houses of residents nearby construction areas to reduce building of construction camps. When building of construction camps is needed, their management shall be strengthened by building administration and living facilities in the designated locations to minimize land and vegetation occupation, damages to natural vegetation and losses of natural productivity;
(2) During construction, protection measures shall be taken to address surface disturbances due to construction activities. For exposed slopeland, engineering measures shall be adopted to reduce soil erosion while land reafforestation shall be conducted in a timely manner in combination with landscaping and garden greening;
(3) Warning signs will be put up in construction sites to indicate construction areas. Construction activities will be confined in the pre-designated areas. Construction workers are not allowed to enter non-construction areas to avoid damages to vegetation outside construction areas;
(4) Construction management shall be strengthened and low-noise equipment shall be selected as much as possible to minimize impacts on terrestrial animals and plants;
(5) Ecological protection dissemination and education will be provided for construction workers and residents nearby construction areas during construction in the forms of public notice and brochure. Capture of frogs, snakes, birds and beasts shall be prohibited to reduce impacts of construction activities on local terrestrial animals and effective measures shall be taken to control harms from mice;
(6) Measures shall be taken during afforestation to prevent introduction of invasive organisms.

3) Operation period

(1) After completion of construction activities, construction sites will be revegetated and reclaimed to provide a stable habitat for terrestrial animals;
(2) Local tree and grass species shall be selected for revegetation of construction sites and selection of original species forming the original natural vegetation would be the best. In particular, manual planting of seedlings can be adopted following the principles of mixed tree and grass planting with appropriate density;
(3) For Cinnamomum camphora – an ancient and rare tree, protection measures shall be taken locally, including putting up protection sign board in a prominent location, which also provides
description of the tree; routine management of Cinnamomum camphora trees shall be strengthened with vegetation planted around the trees and protection of land from being exposed; between end of autumn and early winter, dry and dead branches shall be cleared to reduce incidence of pests and diseases; firewood, rice straw and other materials piled up around the trees shall be removed to reduce fire risks. For a weakening tree, support shall be provided and mending shall be conducted. For a tree whose trunk is unstable or tilting, reinforcing measures shall be taken and support be provided;

(4) Dissemination of knowledge about *Egretta alba*, *Ardeola bacchus* and other migratory birds shall be enhanced so that people in the subproject areas are aware of the habitat environment and ecological habits of various migratory birds; protection measures shall be developed, various national laws and decrees on migratory birds protection be strictly enforced, and unauthorized catching and shooting of migratory birds be strictly banned, especially during summer, destroying bird nests and getting bird eggs are not allowed. It is everyone’s responsibility to care for and protect migratory birds. Water pollution shall be reduced, destroying forest for reclamation be strictly prohibited and more trees be planted to create favorable living environment for migratory birds.

(5) Publicity campaigns about *Rana nigromaculata* protection shall be upgraded and catching of tadpoles and killing of *Rana nigromaculata* shall be strictly banned.

5.1.3.2 Aquatic Ecology Protection Measures

1) Construction period

1) Environmental protection awareness shall be improved. Environmental and resource protection shall be fully considered during construction. The principle of “Three Synchronous Actions” for project construction and resource protection shall be adhered to;
2) Activities including sand and gravel acquisition from the river course, dumping of construction debris to river, change of river route and increase of sediment charge shall be prohibited during construction, as these activities would have significant direct impacts on fish growth and reproduction as well as fish habitat;
3) Destroyed vegetation shall be recovered as soon as possible to prevent soil and water loss, avoid and reduce silt and hazardous substances into rivers and consequent adverse impacts on water environment and fishery;
4) Construction of rural wastewater treatment facilities shall be accelerated and management and supervision shall be strengthened to ensure environmental requirements are strictly enforced for construction. Domestic sewage and industrial wastewater are prohibited to be discharged into drinking water source protection areas and other sensitive water bodies. For water bodies where discharge is allowed, discharge standards shall be strictly enforced to prevent pollution to aquatic environment.

2) Operation period
Environmental protection awareness shall be improved. Environmental and resource protection shall be fully considered during construction. The principle of “Three Synchronous Actions” for project construction and resource protection shall be adhered to.

5.2 Water Environment Impact Prediction and Assessment and Protection Measures

5.2.1 Impacts during Construction and Protection Measures

Wastewater/Sewage generated during construction of the subproject mainly includes wastewater from construction production and domestic sewage from construction camps. Wastewater from construction production is mainly from concrete mixing system and vehicle and ground flushing; domestic sewage is mainly generated by construction workers during their daily life.

1) Wastewater from concrete mixing system

The subproject would have a number of construction spots and structures to be built would dispersed. No concrete would be used under the Forest Marshland Wetland Protection and Utilization Component. In addition, with the exception of Lucao Lake Environmental Education Base Component for which concrete would be outsourced, the other components would use dispersed concrete mixing systems. The subproject would have a total of 12 concrete mixing systems and mixers of 0.8m$^3$ would be installed close to buildings which need a large amount of concrete.

Wastewater is generated when flushing the rotary drum and feed bucket of the concrete mixer. One set of 0.8m$^3$ mixer generates about 1.0 m$^3$ flushing wastewater per shift. The content of flushing wastewater from concrete mixer is simple. Most are SS with about 5,500mg/L. pH is around 12. Wastewater is characterized by high SS content, small amount, and intermittent centralized discharge in batch. If flushing wastewater from concrete mixing system is discharged directly without proper sedimentation treatment, the water environment around the discharge points will be polluted.

Given the features of flushing wastewater from concrete mixing system, process of flocculation sedimentation in an intermittent manner will be adopted to treat the wastewater. Two containers with volume more than 1m$^3$ for each would be provided for each mixer and used alternately. Attention shall be paid to cleaning the containers on a regular basis. Supernatant will be pumped back for flushing concrete mixing system.

2) Wastewater from vehicle and ground flushing

Under the subproject, only Lucao Lake Environmental Education Base Component would have concentrated construction sites with frequent movement of vehicles. Construction sites of the other components are dispersed. Therefore, a settling pond with the capacity over 3 m$^3$ would be
provided at the vehicle flushing spot of each construction site under Lucao Lake Environmental Education Base Component. Effluent of settling ponds would be reused for watering construction access roads and these ponds would be cleaned on a regular basis.

3) Domestic sewage during construction

Domestic sewage during construction is mainly originated from domestic sewage discharged by construction management staff and construction workers, wastewater from cooking, human waste and wastewater from showering, among others. Compared with data of similar projects, water consumption for workers during construction is about 0.15 m$^3$ per capita per day with discharge coefficient of 0.8. The major pollutants of domestic sewage are COD$\text{cr}$, BOD$_5$, SS, NH$_3$-N and TP with concentrations of 250mg/L, 100mg/L, 150mg/L, 25mg/L and 4mg/L, respectively.

During construction, most construction workers would rent houses of villagers along the construction sites and only some would live in a few construction camps at Lucao Lake Wetland Environmental Education Base. Oil trapping tank and septic tank would be used for treatment of domestic sewage at these camps and effluent would be used for farmland irrigation after meeting the Dry Farming Standard in Farmland Irrigation Water Quality Standards (GB5084-2005). Impacts of treated domestic sewage on the environment would be minor. For construction workers who renting villagers’ houses, their domestic sewage would be collected and treated at local villages and would only have minimal impacts on surface water environment.

5.2 Impacts during Operation

5.2.2 Polluting Source Analysis

Wastewater/Sewage during operation of the subproject mainly includes sewage in septic tanks, wastewater from garbage collection stations (spots), wastewater from integrated A$^2$/O equipment and sewage from Lucao Lake Wetland Environmental Education Base.

1) Sewage in septic tanks

Such sewage is mainly domestic sewage of villagers, including those from Hupo and Lukang Villages at Ridong Reservoir Wetland Protection and Conservation Area, Gaoxuan, Zhongtan, Xixin and Xiajie Villages at Rentian Wetland Purification, Protection and Utilization Area, and Shanqi, Songping, Yunji and Xinyuan Villages at Yeping Wetland Purification, Protection and Utilization Area.

There are total 2,511 people from 543 households at Hupo and Lukang Villages. Calculated based on 60L/person/day) of water use for rural residents, domestic water use is 150.7m$^3$/day or 54,990.9m$^3$/annum. Calculated based on 80% of water use, generation of domestic sewage is 120.5m$^3$/day/person or 43,992.7m$^3$/annum. Main pollutants in domestic sewage are COD$\text{cr}$, BOD$_5$,
SS, NH$_3$-N and TP with the concentration of 250mg/L, 100mg/L, 150mg/L, 25mg/L and 4mg/L, respectively, and their generation is 11.00t/a, 4.40t/a, 6.60t/a, 1.10t/a and 0.18t/a, respectively.

There are total 8,232 people from 1,900 households at Gaoxuan, Zhongtan, Xixin and Xiajie Villages. Based on calculation, domestic water use is 493.9m$^3$/day or 180,280.8m$^3$/a and domestic sewage generation is 395.1m$^3$/d or 144,224.6m$^3$/a. Main pollutants include COD$_{cr}$, BOD$_5$, SS, NH$_3$-N and TP and their generation is 36.06t/a, 14.42t/a, 6.63t/a, 3.61t/a and 0.58t/a, respectively.

There are total 10,700 people from 2,100 households at Shanqi, Songping, Yunji and Xinyuan Villages. Based on calculation, domestic water use is 642m$^3$/d or 234,330m$^3$/a and domestic sewage generation is 513.6m$^3$/d or 187,464m$^3$/a. Main pollutants are COD$_{cr}$, BOD$_5$, SS, NH$_3$-N and TP and their generation is 46.87t/a, 18.75t/a, 28.12t/a, 4.69t/a and 0.75t/a, respectively.

2) Wastewater from garbage collection spots

Such wastewater is mainly from flushing garbage bins and contains COD$_{cr}$, BOD$_5$, SS and other pollutants. Making reference to data of similar projects, the concentration of pollutants is COD$_{cr}$ 300mg/L, BOD$_5$ 150mg/L and SS 300mg/L. Calculated based on water use of 10L/bin for flushing, water use at 770 garbage collection spots to be constructed is 7.7m$^3$/day. Calculated based on 90% of water use, wastewater generation is 6.9m$^3$/day or 2529.5m$^3$/annum and COD$_{cr}$, BOD$_5$ and SS generation is 0.76t/a, 0.38t/a and 0.76t/a, respectively.

3) Wastewater from garbage collection stations

Such wastewater is mainly wastewater from ground and vehicle flushing. Calculated based on water use of 0.5m$^3$/day for ground flushing, water use by each garbage collection station is 182.5m$^3$/a. Calculated based on 80% of water use, wastewater generation from ground flushing is 146m$^3$/a or 876m$^3$/a. Calculated based on water use of 400L/vehicle and on flushing once every week, water use by each station for vehicle flushing is 0.4m$^3$/week or 20.8m$^3$/a and wastewater generation is 16.6m$^3$/a or 99.8m$^3$/a for all stations. Total wastewater generation for all stations is 975.8m$^3$/a.

Pollutant concentration of wastewater from ground and vehicle flushing is similar to that of domestic sewage. Main pollutants are COD$_{cr}$, BOD$_5$, SS, NH$_3$-N and TP, their concentration is 250mg/L, 100mg/L, 150mg/L, 25mg/L and 4mg/L, respectively, and their generation is 0.244 t/a, 0.098t/a, 0.146t/a, 0.024t/a and 0.004t/a, respectively.

4) Wastewater from integrated A$^2$/O equipment

Such wastewater is mainly tail water of sewage intercepted by septic tanks at Xiajie, Xinyuan and Julin Villages. Tail water treatment volume of Xiajie Village is 500m$^3$/day and that of Xinyuan and Julin Villages is 1,200m$^3$/day combined.
5) Wastewater from Lucao Lake Wetland Environmental Education Base

Such wastewater is mainly generated by staff of and visitors to the base. There are 6 regular at the base and calculated based on daily water use of 50L and wastewater generation accounting for 80% of water use, their wastewater generation is 0.24m$^3$/day or 72m$^3$/a. The number of visitors to be based is about 300 persons/day and calculated based on daily water use of 20L/person/day and wastewater generation accounting for 80% of water use, wastewater generation by visitors is 4.8m$^3$/day or 1440m$^3$/a.

Total wastewater generation at the base is 1,512m$^3$/a. Main pollutants in wastewater include COD$_{cr}$, BOD$_5$, SS, NH$_3$-N and TP, their concentration is 250mg/L, 100mg/L, 150mg/L, 25mg/L and 4mg/L, respectively, and their generation is 0.38t/a, 0.15t/a, 0.23t/a, 0.038t/a and 0.006t/a, respectively.

5.2.2.2 Environmental Impact Analysis and Environmental Protection Measures

5.2.2.2.1 Sewage from Septic Tanks

After being treated at septic tanks, intercepted domestic sewage from Xiajie, Xinyuan and Julin Villages would be treated further by integrated A$^2$/O equipment. Domestic sewage from other villages is treated at septic tanks and would be used for farmland irrigation after meeting the Dry Farming Standard in Farmland Irrigation Water Quality Standards (GB5084-2005). Therefore, impacts of treated sewage on surrounding water environment would be minor.

5.2.2.2.2 Wastewater from Garbage Collection Spots

All garbage collection spots are located along both sides of village roads and are close to inspection wells of interception sewer pipeline. Wastewater at these spots is collected and poured into inspection wells by sanitation workers, which would be treated, together with septic tank tail water, by integrated A$^2$/O equipment. Therefore, impacts of treated wastewater on surrounding water environment would minor.

5.2.2.2.3 Wastewater from Garbage Collection Stations

Garbage collection stations at Xiajie, Gaoxuan and Julin Villages are located nearby interception sewer pipeline, which feeds wastewater into integrated A$^2$/O equipment for treatment; each of garbage collection stations at Hupo, Lukang and Gangbei Villages would be provided with one wastewater collection tank with the capacity of 5m$^3$ and wastewater would be transported by fecal sucking trucks to nearby integrated A$^2$/O equipment for treatment. Therefore, treatment garbage collection station wastewater would only have minor impacts on surrounding water environment.
5.2.2.2.4 Rural Domestic Sewage

Rural domestic sewage is mainly tail water of sewage intercepted by septic tanks and wastewater from garbage collection stations (spots) at Xiajie, Xinyuan and Julin Villages. Tail water and wastewater treatment volume of Xiajie Village is 500m$^3$/day and that of Xinyuan and Julin Villages is 1,200m$^3$/day combined. After meeting Category I Standard in Comprehensive Wastewater Discharge Standards (GB8978-1996), septic tank tail water treated by rural domestic sewage treatment facilities would be discharged into the Mianjiang River.

Pollutant discharge of the subproject is indicated in Table 5.2-1.

<table>
<thead>
<tr>
<th>No.</th>
<th>Polluting source</th>
<th>Pollutant</th>
<th>Generation</th>
<th>Management Measures</th>
<th>Discharge</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Concentration (mg/L)</td>
<td>Amount (t/a)</td>
<td>Concentration (mg/L)</td>
</tr>
<tr>
<td>1</td>
<td>Hupo Village and others</td>
<td>COD$_{cr}$</td>
<td>250</td>
<td>11.00</td>
<td>195</td>
</tr>
<tr>
<td></td>
<td></td>
<td>BOD$_5$</td>
<td>100</td>
<td>4.40</td>
<td>90</td>
</tr>
<tr>
<td></td>
<td></td>
<td>SS</td>
<td>150</td>
<td>6.60</td>
<td>90</td>
</tr>
<tr>
<td></td>
<td></td>
<td>NH$_3$-N</td>
<td>25</td>
<td>1.10</td>
<td>24</td>
</tr>
<tr>
<td></td>
<td></td>
<td>TP</td>
<td>4</td>
<td>0.18</td>
<td>3.8</td>
</tr>
<tr>
<td>2</td>
<td>Gaoxuan Village and others</td>
<td>COD$_{cr}$</td>
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<td>36.06</td>
<td>80</td>
</tr>
<tr>
<td></td>
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<tr>
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<td>21.63</td>
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<td>NH$_3$-N</td>
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</tr>
<tr>
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</tr>
<tr>
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<td>Shanqi Village and others</td>
<td>COD$_{cr}$</td>
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<td>80</td>
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<td>28.12</td>
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<td>NH$_3$-N</td>
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<td>TP</td>
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<td>Garbage collection sites</td>
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<td>0.38</td>
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<td></td>
<td>SS</td>
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<td>0.76</td>
<td>40</td>
</tr>
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<td>5</td>
<td>Garbage collection stations</td>
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<td></td>
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<td>0.146</td>
<td>40</td>
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<td></td>
<td></td>
<td>NH$_3$-N</td>
<td>25</td>
<td>0.024</td>
<td>12</td>
</tr>
</tbody>
</table>
No. | Polluting source | Pollutant | Generation | Management Measures | Discharge |
--- | --- | --- | --- | --- | --- |
 |  |  |  | Concentration (mg/L) | Amount (t/a) | Concentration (mg/L) | Amount (t/a) |
 | 6 | Wastewater from Lucao Lake Wetland Environmental Education Base | TP | 4 | 0.004 | 0.4 | 0.0004 |
 |  |  | COD<sub>cr</sub> | 250 | 0.38 | 50 | 0.08 |
 |  |  | BOD<sub>5</sub> | 100 | 0.15 | 18 | 0.03 |
 |  |  | SS | 150 | 0.23 | 18 | 0.03 |
 |  |  | NH<sub>3</sub>-N | 25 | 0.038 | 7 | 0.011 |
 |  |  | TP | 4 | 0.006 | 0.8 | 0.001 |

1) Environmental Impact Prediction of Rural Domestic Sewage

Under normal circumstances, tail water from septic tanks is discharged into Mianjiang River after being treated by rural domestic sewage treatment facilities and meeting Category I Standard in Comprehensive Wastewater Discharge Standards (GB8978-1996). In case of any problem in sewage treatment equipment, the accidental effluent will be discharged directly into the Mianjiang River.

According to hydrological elements of main pollutant-carrying water bodies, the addition value of contribution values of COD<sub>cr</sub> and ammonia nitrogen to the concentration of surface water environment and their background values is predicted for normal and abnormal circumstances upon completion of the subproject. According to the predicted result, the assessment and analysis is made on the degree of impact of wastewater discharge on water quality after the subproject completion.

(1) Prediction Factors
According to the characteristics of wastewater discharge of the subproject, COD<sub>cr</sub> and ammonia nitrogen are selected as the main pollution factors in the prediction and assessment on surface water environment.

(2) Prediction Period
The prediction period is the dry season.

(3) Hydrological Conditions
Flow Q=5.78m³/s. The river is 50m wide and 1m deep on average, with the average flow being 0.21 m/s, and the average sloping being 2.13%.

(4) Assessment Mode
①Prediction Mode:
According to the provision of the Technical Guidelines For Environmental Impact Assessment, the two-dimensional steady-state mixing attenuation mode for straight river mixing process section is adopted for the mixing process section in the assessment, while the S-P mode is adopted for the fully mixing section, in order to predicted net added values of concentrations of COD and ammonia nitrogen.

The two-dimensional steady-state mixing attenuation mode is as follows:

\[
C(x, y) = \exp\left(-K_1 \frac{x}{86400u}\right) \left\{ \frac{C_p Q_p}{H \sqrt{\pi M_y x u}} \left[\exp\left(-\frac{u y^2}{4 M_y x}\right) + \exp\left(-\frac{u (2B - y)^2}{4 M_y x}\right)\right]\right\}
\]

In which, \(C(x,y)\)——net added value of pollutant concentrations of predicted points, mg/L; \(x,y\)——coordinate position of predicted points, m; \(C_p\)——pollutant discharge concentration value, mg/L; \(C_h\)——status quo value of pollutant water area, mg/L; \(Q_p\)——sewage discharge, m\(^3\)/s; \(u\)——river flow velocity, m/s; \(H\)——depth of river water, m; \(B\)——width of river, m; \(M_y\)——transverse mixing coefficient, calculated with Taylor method recommended in the Guidelines; \(K_1\)——oxygen consuming coefficient of river; \(g\)——acceleration due to gravity, m/s\(^2\); \(I\)——sloping at river bottom;

S-P mode:

\[
c = c_0 \exp\left(-K_1 \frac{x}{86400u}\right)
\]

Length of the mixing process section:

\[
L = \frac{(0.4B - 0.6a)Bu}{(0.058H + 0.0065B)\sqrt{gHI}}
\]

(2) Determination of Other Parameters

The research group of the Study on Countermeasures for Environmental Pollution of Chinese Township And Village Enterprises made a regression analysis on data of rivers in China to get the formula for calculating the natural degradation rate of organic pollutants, namely \(K_1 = 0.5586Q^{-0.15}\), in which \(Q\) stands for the flow of river (m\(^3\)/s). With the relative coefficient \(r = 0.78\), the formula is applicable for the flow range between 114–1200m\(^3\)/s. The average flow in the dry season is predicted to be 5.78m\(^3\)/s, which is applicable for this formula. Therefore, it is calculated that \(K_1 = 0.43/d\).

The transverse diffusion coefficient \(M_y\) is determined by Taylor method in accordance with the
Technical Guidelines For Environmental Impact Assessment (HJ/T2.3-93).

\[ My = (0.058H + 0.0065B)(gH)^{1/2} \]

In which, 
- \( g \)—— acceleration due to gravity, m/s\(^2\);
- \( I \)—— hydraulic sloping, 0.0213m/m.

My is calculated to be 0.175m\(^2\)/s;

Parameters of pollution source emission

See Table 5.2-2 for pollutant emission of wastewater from integrated A\(^2\)/O equipment after the subproject operation

Table 5.2-2 Discharge of Pollutants in Wastewater from Rural Domestic Sewage Treatment Facilities

<table>
<thead>
<tr>
<th>Wastewater Flow</th>
<th>Item</th>
<th>Normal Discharge Concentration (mg/L)</th>
<th>Accidental Discharge Concentration (mg/L)</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.0058m(^3)/s</td>
<td>COD(_{cr})</td>
<td>80</td>
<td>195</td>
<td></td>
</tr>
<tr>
<td></td>
<td>NH(_3)-N</td>
<td>12</td>
<td>24</td>
<td></td>
</tr>
<tr>
<td>0.0139 m(^3)/s</td>
<td>COD(_{cr})</td>
<td>80</td>
<td>195</td>
<td></td>
</tr>
<tr>
<td></td>
<td>NH(_3)-N</td>
<td>12</td>
<td>24</td>
<td></td>
</tr>
</tbody>
</table>

(5) Prediction Results

1. Pollution Impact Prediction for Wastewater Discharge in Line with the standards

The mixing process section is calculated to be 1,200m. Within the prediction scope, the first section of 1,200m is the mixing process section, while the second part of 1,800m is the fully mixing section. Therefore, pollutant prediction value of the mixing process section in the downstream of the discharge outlet is calculated with two-dimensional steady-state mixing attenuation mode, while the fully mixing section is calculated with the S-P mode. See Table 5.2-3-Table 5.2-6 for prediction results of net added values of concentrations of COD\(_{cr}\) and ammonia nitrogen.

Table 5.2-3 Predicted Impacts of Net Incremental COD\(_{cr}\) on Water Quality under Normal Discharge of Wastewater from Integrated A\(^2\)/O Equipment at Xiajie Village

<table>
<thead>
<tr>
<th>(Unit: mg/L)</th>
</tr>
</thead>
<tbody>
<tr>
<td>X(m)</td>
</tr>
<tr>
<td>--------------</td>
</tr>
<tr>
<td>10</td>
</tr>
<tr>
<td>50</td>
</tr>
<tr>
<td>Y(m) (m)</td>
</tr>
<tr>
<td>---------</td>
</tr>
<tr>
<td>10</td>
</tr>
<tr>
<td>50</td>
</tr>
<tr>
<td>110</td>
</tr>
<tr>
<td>210</td>
</tr>
<tr>
<td>310</td>
</tr>
<tr>
<td>410</td>
</tr>
<tr>
<td>510</td>
</tr>
<tr>
<td>1010</td>
</tr>
<tr>
<td>1510</td>
</tr>
<tr>
<td>2010</td>
</tr>
<tr>
<td>2510</td>
</tr>
<tr>
<td>2910</td>
</tr>
</tbody>
</table>

Table 5.2-4 Predicted Impacts of Net Incremental COD\textsubscript{cr} on Water Quality under Normal Discharge of Wastewater from Constructed Wetland Treatment Facilities at Xinyuan and Julin Villages
(Unit: mg/L)

<table>
<thead>
<tr>
<th>Y(m) (m)</th>
<th>X(m)</th>
<th>10</th>
<th>20</th>
<th>30</th>
<th>40</th>
<th>50</th>
</tr>
</thead>
<tbody>
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</tr>
<tr>
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<td>0.0036</td>
<td>0.0012</td>
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Table 5.2-5 Predicted Impacts of Net Incremental NH\textsubscript{3}-N on Water Quality under Normal Discharge of Wastewater from Integrated A\textsuperscript{2}/O Equipment at Xiajie Village
(Unit: mg/L)
<table>
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<th>40</th>
<th>50</th>
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<td>0.0045</td>
<td>0.0024</td>
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<tr>
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<td>0.007</td>
<td>0.0049</td>
<td>0.0033</td>
<td>0.0027</td>
</tr>
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<td>0.0066</td>
<td>0.0051</td>
<td>0.0039</td>
<td>0.0034</td>
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<tr>
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<td>0.0042</td>
<td>0.0042</td>
<td>0.0042</td>
<td>0.0042</td>
</tr>
<tr>
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<td>0.0015</td>
<td>0.0016</td>
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Table 5.2-6 Predicted Impacts of Net Incremental NH₃-N on Water Quality under Normal Discharge of Wastewater from Constructed Wetland Treatment Facilities at Xinyuan and Julin Villages

(Units: mg/L)

②Pollution Impact Prediction in case of accidental wastewater discharge (namely direct discharge) in case of accidental wastewater discharge, the pollutant prediction value of the mixing process section in the downstream of the discharge outlet is calculated with the two-dimensional steady-state mixing attenuation mode, while the fully mixing section is calculated with the S-P mode. See Table 5.2-7-Table 5.2-8 for prediction results of net added values of concentrations of CODₜ and ammonia nitrogen.

Table 5.2-7 Predicted Impacts of Net Incremental CODₜ on Water Quality under Accidental Discharge of Wastewater from Integrated A²/O Equipment at Xiajie Village

(Units: mg/L)
### Table 5.2-8 Predicted Impacts of Net Incremental COD\(_{\text{er}}\) on Water Quality under Accidental Discharge of Wastewater from Constructed Wetland Treatment Facilities at Xinyuan and Julin Villages

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<tr>
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### Table 5.2-9 Predicted Impacts of Net Incremental NH\(_3\)-N on Water Quality under Accidental Discharge of Wastewater from Integrated A\(^2\)/O Equipment at Xiajie Village

<table>
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<th>50</th>
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<td>0.0000</td>
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<tr>
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<td>0.0000</td>
<td>0.0000</td>
</tr>
<tr>
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<tr>
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</table>
Table 5.2-10 Predicted Impacts of Net Incremental NH₃-N on Water Quality under Accidental Discharge of Wastewater from Constructed Wetland Treatment Facilities at Xinyuan and Julin Villages

(Unit: mg/L)

<table>
<thead>
<tr>
<th>Y(m)</th>
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</tr>
</tbody>
</table>

2) Assessment of predicted results and emergency measures for accidental discharge

(1) Assessment of predicted results

According to the prediction by reference to Table 5.2-3-Table 5.2-10, sewage discharge of the subproject is smaller than the flow of Mianjing River. As the normal discharge of sewage has a small impact on the pollutant carrying water area of Mianjing River, COD_{cr} and ammonia nitrogen are calculated to be less than 20mg/L and 1.0mg/L by adding the prediction values and the
background values of the assessment, which meet the requirements of grade III of the Environmental Quality Standard for Surface Water (GB3838-2002). In case of accidental discharge of wastewater, the addition of concentrations of COD\textsubscript{cr} and ammonia nitrogen and the background values also meet the requirements of grade III of the Environmental Quality Standard for Surface Water (GB3838-2002).

To protect surface water environment of Mianjiang River and avoid pollution of local water environment, we shall thoroughly implement national requirements, ensure normal and stable operation of sewage treatment facilities of the proposed subproject, and strictly prohibit discharge of untreated wastewater or wastewater exceeding the standards.

(2) Emergency measures for accidental discharge

(1) Types of accidental discharge

Emergencies: The quality problem or improper maintenance of sewage treatment equipment and facilities will cause failure in equipment and facilities, reduction in sewage treatment efficiency and even direct discharge of untreated wastewater; breakdown of sewage treatment facilities and direct discharge of large amounts of untreated sewage caused by such irresistible external causes as power outage and sudden natural disasters are the limiting case of abnormal discharge of wastewater treatment stations. In case of abnormal operation of sewage treatment facilities caused by power failure, sewage could only be directly discharged into surface water, which will cause severe pollution to Mianjiang River.

Equipment failure: Failure in equipment of sewage or sludge treatment system could cause reduction in sewage treatment capacity, inconformity of water quality indicators with the design requirements, or delay in sludge concentration and dehydration, which results in sludge fermentation and full storage and odor emission of sludge pool.

(2) Mitigation measures for accidents

i) Equipment safety measures

Failure of such equipment as pumps, valves, electrical appliances and instruments used in the treatment facility system during operation will cause reduction in sewage treatment capacity or even breakdown of wastewater treatment stations, which may take place more frequently. The emergency measures for these accidents are as follows:

- In terms of technical design, certain backflow treatment and buffer capacity and facilities (such as addition of corresponding accident handling buffer pool) shall be preserved in the treatment system, and fitted with appropriate treatment equipment (such as backflow pumps, backflow pipelines, valves and instruments). In case of equipment failure during the operation of the
treatment system, buffer and backflow equipment of the system shall work to retreat ineligible discharged water in line with the discharge standards.

- Multiple sets of standbys shall be adopted for vulnerable equipment, with enough spare parts for repair and replacement. One electromechanical equipment for use and another for standby shall be adopted for the treatment system at minimum.
- Good quality equipment shall be selected. Such equipment as machines, electrical appliances and instruments that feature good quality and low failure rate, meet the design requirements and are applicable for long-term operation and easy for repair and maintenance shall be selected for treatment facilities.
- During the operation, operators on duty shall strictly observe the rules and regulations for treatment facilities, conduct frequent patrol inspections for equipment and timely repair and maintenance, in order to reduce the failure rate of equipment.
- Electrical equipment shall company with the requirements of the grounding protection specifications and installed with automatic tripping circuits; main equipment shall be installed with accident warning devices for timely warning and rush repair. The installation and protection of all electrical equipment shall comply with relevant safety regulations for electrical equipment.
- Two-circuit power supply is adopted to ensure normal operation of power supply facilities and circuits.

ii) Protection from abnormal discharge

The design shall give full consideration to emergency measures for unstable water volume caused by various factors, in order to relieve the adverse state.

- Establish the operation management and operation responsibility system for wastewater treatment stations;
- Hold trainings for management and operation personnel and establish technical examination archives, unqualified persons shall not start work;
- Engage experienced professional technicians in charge of technical management of wastewater treatment stations;
- Increase the frequency for patrol inspections for water transport pipelines to timely discover and solve problems;
- Strengthen maintenance and management of equipment and facilities, standbys shall be adopted for key equipment to ensure two-way power supply;
- To reduce odor emission from sewage stations, water collection wells shall be sealed, and sewage shall be timely pumped into integrated equipment for treatment; screenings and sludge shall be timely cleaned away after dehydration;
- Afforestation around the wastewater treatment station with plants featuring high efficiency in smelly substance purification (such as Canna).

iii) Emergency measures for sudden discharge accidents
In case of sudden sewage discharge accidents at the wastewater treatment station, the following measures shall be adopted:

- Efforts shall be made to ensure the normal operation of screens and grit chambers and thus certain reduction of SS and COD in the water;
- Accident emergency pools shall be established, with the size totaling 48-hour design sewage treatment amount. In case of irresistible external factors such as double circuit power failure and sudden natural disasters that will lead to discharge of untreated sewage, sewage shall be discharged to the accident emergency pools to ensure functional safety of water bodies;
- When an accident occurs or is handled, warning signs shall be suspended in the water areas near the discharge outlet to remind all the sides concerned to take precautions.

iv) Mitigation measures for impacts of sludge discharge

After dehydrated at the wastewater treatment station, sludge (with the moisture content of 80%) in the total annual amount of 25 tons would be transported to Niulanwo Landfill in a timely manner using special-purpose closed vehicles to avoid the spread of odor or drop of sludge polluting environment. Detailed treatment measures are shown in Section 5.4.2. In addition, once there are any accidents of abnormal discharge of sludge at the wastewater treatment station, equipment shall be maintained in a timely manner and fixed as much as possible within the time during which sludge is stored in the sludge pool; Meanwhile, lime and other medicaments need to be input to prevent sludge fermentation and smelly gas emission.

5.3 Soil Erosion Impact Assessment and Soil and Water Conservation Measures

According to Report on Soil and Water Conservation Plan for Ruijin City Mianjiang River (Lucao Lake) Wetland Protection and Utilization Subproject (Ganzhou Xinglu Soil and Water Conservation Technical Services Center, July 2012), impacts of incremental soil erosion are outlined below.

5.3.1 Prediction on Impacts of Incremental Soil Erosion

5.3.1.1 Scope and Period of Prediction

1) Prediction scope

The scope covers construction area, construction access road area and temporary earth storage site area with soil erosion area totaling 199.35hm². Of which, Ridong Reservoir Wetland Protection and Conservation Scheme is 44.7hm²; Rentian Wetland Purification, Protection and Utilization Scheme, 11.0hm²; Yeping Wetland Purification, Protection and Utilization Scheme, 19hm²; Xianghu Yaoqianba Wetland Rehabilitation, Protection and Utilization Scheme; 20.32hm²; Forest Marshland Protection and Utilization Scheme, 18.0hm²; and Lucao Lake Wetland Ecological Environment
Protection and Management Scheme, 86.33hm².

2) Prediction period

Soil erosion prediction covers construction preparation period, construction period and natural restoration period.

(1) Construction preparation period: The prediction period will last three months from October 2012 to January 2013. Contents of predication include surface earth stripping, construction ground leveling, temporary engineering construction, access road construction as well as the potential soil erosion from construction activities including the construction of the water and power supply systems for the Lucao Lake wetland environmental education base.

(2) Construction period: As Ruijin is located in the southern part of Jiangxi Province with the rainy season between April and September, the subproject construction will involve four rainy seasons from January 2013 to October 2016, and the prediction periods will thus last four years. Contents of predication will include earthwork excavation, backfill, earthwork transportation, sand and stone transportation and stacking, construction waste discarding as well as potential soil erosion from production and construction activities including the construction of the Lucao Lake wetland environmental education base.

(3) Natural restoration period: Soil erosion during the vegetation restoration in various prevention and treatment areas will be predicted. As for sewage interception works, natural ecological wetland schemes, floodplain restoration schemes and Lucao Lake wetland environmental education base construction, the natural restoration period is predicted as one year after the subproject completion; The prediction periods for soil erosion in various areas will be arranged in accordance with project construction progress and in combination with the seasons of soil erosion. The construction period will be the full year if they are longer than the rainy season and be calculated based on the proportion if they are shorter than the rainy season. See Table 5.3-1 for detailed periods for prediction of soil erosion in various areas under the project.

<table>
<thead>
<tr>
<th>No.</th>
<th>Zone</th>
<th>Period of Prediction (year)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Construction Preparation</td>
<td>Capital Construction</td>
</tr>
<tr>
<td>1</td>
<td>Ridong Reservoir Wetland Protection and Conservation</td>
<td>0.25</td>
<td>4</td>
</tr>
<tr>
<td>2</td>
<td>Rentian Wetland Purification, Protection and Utilization</td>
<td>0.25</td>
<td>4</td>
</tr>
<tr>
<td>3</td>
<td>Yeping Wetland Purification, Protection and Utilization</td>
<td>0.25</td>
<td>4</td>
</tr>
<tr>
<td>4</td>
<td>Xianghu Yaoqianba Wetland</td>
<td>0.25</td>
<td>4</td>
</tr>
</tbody>
</table>
5.3.1.2 Contents and Methods of Prediction

See Table 5.3-2 for contents and methods of prediction.

<table>
<thead>
<tr>
<th>No.</th>
<th>Contents</th>
<th>Methods</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Disturbed original landforms, damaged land and vegetation</td>
<td>Field surveys and reconnaissance and prediction based on the technical materials and design drawings for project construction as well as the red line for land acquisition</td>
</tr>
<tr>
<td>2</td>
<td>Areas of damaged soil conservation facilities</td>
<td>Field reconnaissance and prediction based on the technical materials regarding project construction and in collaboration with the design agencies.</td>
</tr>
<tr>
<td>3</td>
<td>Discarded earth, discarded stones and amount of discarded earth</td>
<td>Prediction for various sections based on similar projects, test results and conditions in various periods</td>
</tr>
<tr>
<td>4</td>
<td>Potential soil erosion area and amount</td>
<td>Prediction based on the wetland protection and utilization project layout, construction features and potential soil erosion dangers, etc.</td>
</tr>
<tr>
<td>5</td>
<td>Potential soil erosion dangers</td>
<td>Prediction based on the wetland protection and utilization project layout, construction features and potential soil erosion dangers, etc.</td>
</tr>
</tbody>
</table>

5.3.1.3 Results of Soil Erosion Prediction and Analysis

The newly-increased soil erosion in the project comes from the construction period. Statistics show that the predicted period will see 143,830 tons of predicted amount of soil erosion, including 9,022 tons of original surface soil erosion and 134,808 tons of newly-increased soil erosion. Among the newly-increased amount of soil erosion, that in the construction preparation period totals 8,458 tons (6.27%), the basic construction period 124,298 tons (92.20%), and natural restoration period 2,053 tons (1.52%). See Table 5.3-3 for predicted soil erosion.

As the project involves a wide disturbance and destruction scope and a large amount of earthworks, the soil erosion in the project area may significantly increase, with extreme intensity and severe erosion that damage the original surface vegetation and affect the ecological environment in the project area to some extent.
Table 5.3-3 Outcomes of Soil Erosion Prediction

<table>
<thead>
<tr>
<th>Zone</th>
<th>Period</th>
<th>Predicted Erosion Area (hm$^2$)</th>
<th>Time Period (Year)</th>
<th>Background Erosion Value (t/km$^2$·a)</th>
<th>Predicted Erosion Value (t/km$^2$·a)</th>
<th>Total Erosion (t)</th>
<th>New Erosion (t)</th>
</tr>
</thead>
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<tr>
<td><strong>Ridong Reservoir Wetland</strong> Protection and Conservation</td>
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<td>1393</td>
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<td>700</td>
<td>9000</td>
<td>9469</td>
<td>17955</td>
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<td>865</td>
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<td>20212</td>
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<td>13000</td>
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<td>440</td>
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<td>5892</td>
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<td>6331</td>
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<td>Construction Preparation</td>
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<td>13000</td>
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<td>760</td>
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<td>700</td>
<td>11000</td>
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<td>10176</td>
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<td></td>
<td></td>
<td>11671</td>
<td>10936</td>
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<tr>
<td><strong>Xianghu Yaoqianba Wetland Rehabilitation, Protection and Utilization</strong></td>
<td>Construction Preparation</td>
<td>26.42</td>
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<td>1189</td>
<td>1136</td>
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<td>Construction</td>
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<td>16000</td>
<td>16909</td>
<td>16063</td>
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<td>Natural Restoration</td>
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<td>17296</td>
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<td><strong>Forest Marshland Protection and Utilization</strong></td>
<td>Construction Preparation</td>
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<td>11000</td>
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<td>Construction</td>
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<tr>
<td>Natural Restoration</td>
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<td>1</td>
<td>700</td>
<td>2300</td>
<td>138</td>
<td>96</td>
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<tr>
<td>Subtotal</td>
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<td></td>
<td></td>
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<td>6536</td>
</tr>
<tr>
<td><strong>Lucao Lake Wetland Ecological Environment Protection and Management</strong></td>
<td>Construction Preparation</td>
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<tr>
<td>Subtotal</td>
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<td></td>
<td></td>
<td>77844</td>
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</tr>
<tr>
<td><strong>Grand Total</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>143830</td>
<td>134808</td>
</tr>
</tbody>
</table>

5.3.2 Prediction of Spoil, Waste Stone and Spoil Quantity
Earth and rock by foundation excavation in project construction area is allocated and utilized between far distance and near distance, with inadequate earth and rock being transported from access road. Total excavated volume of earth and rock in this project is 1,390,000m$^3$, backfill volume is 749,000m$^3$, the volume of surface soil returned to plant vegetation is 296,000m$^3$. The project area does not set waste slag yard, some places like Huyao Qianba Wetland Restoration and Protection Area which is too close to the downtown area, the earth and rock there are transported to nearby construction site for municipal engineering construction. See Table 5.3-4 below for specific earth-rock balance conditions for details.

<table>
<thead>
<tr>
<th>Component</th>
<th>Excavation (m$^3$)</th>
<th>Filling (m$^3$)</th>
<th>Surface Soil Utilization (m$^3$)</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ridong Reservoir Wetland Protection and Conservation</td>
<td>0.15</td>
<td>0.15</td>
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<tr>
<td>Rentian Wetland Purification, Protection and Utilization</td>
<td>0.76</td>
<td>0.76</td>
<td>-</td>
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</tr>
<tr>
<td>Yeping Wetland Purification, Protection and Utilization</td>
<td>1.16</td>
<td>1.16</td>
<td>-</td>
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<tr>
<td>Xianghu Yaoqianbu Wetland Rehabilitation, Protection and Utilization</td>
<td>64.83</td>
<td>0.73</td>
<td>-</td>
<td>641,000m$^3$ transported to and use by other areas</td>
</tr>
<tr>
<td>Forest Marshland Protection and Utilization</td>
<td>0.64</td>
<td>0.64</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>Lucao Lake Wetland Ecological Environment Protection and Management</td>
<td>71.46</td>
<td>71.46</td>
<td>29.6</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>139</td>
<td>74.9</td>
<td>29.6</td>
<td></td>
</tr>
</tbody>
</table>

5.3.3 Soil and Water Conservation Measures

5.3.3.1 Objectives and Targets of Control and Prevention

Overall objectives of soil and water conservation scheme of the project are: original soil and water loss within the scope of prevention and control is basically managed, newly increased soil and water loss is effectively controlled, the volume of soil and water loss is significantly reduced, and ecological environment is obviously improved. The specific targets include:

① New soil erosion and water loss that may be caused in the course of project construction is comprehensively controlled, the harnessing percentage of soil erosion and water loss caused is up to 90%.
② Waste soil (rock) produced in the course of engineering construction is effectively blocked, the slag blocking rate is up to 95%.
③ Land disturbed by engineering construction gets comprehensive improvement, land productivity is effectively recovered and reconstructed, and harnessing percentage of land disturbed is up to
The vegetation cover in project area is effectively recovered and reconstructed, with vegetation recovery coefficient reaching above 95% and grass coverage rate reaching above 25%.

Water loss and soil erosion modulus control target in project area is 600t/km²·a, soil erosion control ratio after engineering operation is 1.4.

Soil and water conservation and control target for the regions is shown in Table 5.3-5

<table>
<thead>
<tr>
<th>Zone</th>
<th>Management Rate of Disurbed Land (%)</th>
<th>Percentage of Erosion Control Areas (%)</th>
<th>Control Ratio of Soil Erosion</th>
<th>Dregs Blocking Rate (%)</th>
<th>Vegetation Recovery Rate (%)</th>
<th>Forestry and Grass Coverage (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ridong Reservoir Wetland Protection and Conservation</td>
<td>95</td>
<td>90</td>
<td>1.2</td>
<td>95</td>
<td>95</td>
<td>40</td>
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<tr>
<td>Rentian Wetland Purification, Protection and Utilization</td>
<td>95</td>
<td>90</td>
<td>1.2</td>
<td>95</td>
<td>95</td>
<td>80</td>
</tr>
<tr>
<td>Yeping Wetland Purification, Protection and Utilization</td>
<td>95</td>
<td>90</td>
<td>1.2</td>
<td>95</td>
<td>95</td>
<td>85</td>
</tr>
<tr>
<td>Xianghu Yaoqianba Wetland Rehabilitation, Protection and Utilization</td>
<td>95</td>
<td>90</td>
<td>1.2</td>
<td>95</td>
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<td>90</td>
<td>1.2</td>
<td>95</td>
<td>95</td>
<td>80</td>
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<td>Lucao Lake Wetland Ecological Environment Protection and Management</td>
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<td>90</td>
<td>1.2</td>
<td>95</td>
<td>95</td>
<td>30</td>
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<tr>
<td>Overall Target</td>
<td>95</td>
<td>90</td>
<td>1.2</td>
<td>95</td>
<td>95</td>
<td>25</td>
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</tbody>
</table>

5.3.3.2 Overall Arrangement of Soil Erosion Prevention and Control Measures

Overall arrangement of various soil erosion prevention and control measures is developed pursuant to soil erosion features in the targeted control areas and design requirements for construction projects while following the principle of “focusing on prevention, integrating prevention with control, combing phytotmeasures with engineering measures, and synergizing soil and water conservation measures with the overall project”. Overall arrangement of soil erosion prevention and control measures is shown in Figure 5.3-1.
Figure 5.3-1 Overall Arrangement of Soil Erosion Prevention and Control Measures
5.3.3.3 Design

5.3.3.3.1 Ridong Reservoir Wetland Protection and Conservation Zone

1. Engineering Measure Layout

Intercepting/drainage ditch: in the course of garbage collection station, the intercepting ditch made of mortar laid stone excavates original side slope within 5m, to block the flowing of the rainwater fallen from original slope into the site, the total length of intercepting/drainage ditch is 120m in north. Both are built by mortar laid stone.

2. Measures for Soil and Water Conservation

Temporary drainage ditch and temporary settling pit: during the stage of sewage interception engineering construction, the surrounding area of engineering construction lays drainage ditch to drain the rainwater within the site and to protect the construction area from being eroded by rainwater and thus resulting in water loss and soil erosion. The total length of temporary drainage ditch laid is 220m, with one temporary Settling Pond being set for every 100m along temporary drainage ditch to subside temporary drainage ditch runoff sediment, the excavated earth of intercepting ditch is piled up at the downside of the slope, with water blocking weir being constructed using rammed method.

5.3.3.3.2 Rentian Wetland Purification and Protection Area

1. Engineering Measure Layout

①Intercepting Ditch
The intercepting ditch is laid round integrated A²/O equipment to prevent surface runoff carrying sediment outside the site from entering integrated A²/O equipment, the total length of the layout is 448m, the intercepting ditch is built with mortar laid stone.

②Settling Pond
Settling pits are arranged at the exit on both sides of the intercepting ditch, after surface runoff intercepted by the intercepting ditch enters Settling Pond for desilting, the clean water is drained into Mianjiang River, two settling pits are laid and built using red brick masonry.

2. Vegetation Measures

Sewage intercepting pipeline and sewage inspection wells would be built for Rentian Wetland Purification and Protection Area, where 5,000m pipe trench would be excavated. After the pipes are laid, the earth is backfilled and the site is leveled with 1.0hm² of hybrid grass seeds being planted.
3. Temporary Soil and Water Conservation Measures

Temporary soil and water conservation measures for Rentian Wetland Purification and Protection Area include: first, temporary intercepting ditches are excavated at both sides of the pipe trench prior to the laying of the pipe in the course of pipe trench excavation, to prevent the flowing of slope runoff occurred due to rainfall in the course of pipe trench excavation into the pipe trench to cause man-made water loss and soil erosion, the total length of temporary intercepting ditch is 10,000m. Second, one temporary Settling Pond is laid for every 100m to match with temporary drainage ditch, a total of 100 settling pits are set. Third, the excavated earth of intercepting ditch is piled up at the downside of the slope, with water blocking weir being constructed using rammed method.

5.3.3.3.3 Yeping Wetland Purification and Protection Area

1. Engineering Measures

① Intercepting Ditch
The intercepting ditch is arranged around constructed wetland treatment facilities to prevent surface runoff carrying sediment outside the side from entering the constructed wetland treatment facilities, the total length of the layout is 448m, the intercepting ditch is built using mortar laid stone.

② Settling Pond
The settling pits are set at the exit on both sides of the intercepting ditch, after surface runoff intercepted by the intercepting ditch enters settling pit, the clean water is drained into Mianjiang River, two settling pits are constructed using red brick masonry.

(2) Vegetation Measures

Yeping Wetland Purification and Protection Area arranges sewage interception pipeline and sewage inspection wells would be built for Yeping Wetland Purification and Protection Area, where 8,000m pipe trench would be excavated. After pipes are laid, the earth is backfilled and the site is leveled, with 1.6hm² of hybrid grass seeds being planted.

(3) Temporary Soil and Water Conservation Measures

Temporary water conservation measures of Yeping Wetland Purification and Protection Area include: first, temporary intercepting ditch is excavated at both sides of the pipe trench prior to the laying of the pipeline in the course of pipe trench excavation to prevent the flowing of slope runoff occurred due to rainfall in the course of pipe trench excavation into the pipe trench to cause man-made water loss and soil erosion, the total length of temporary intercepting ditch is 16,000m. Second, one temporary Settling Pond is set for every 100m to match with temporary intercepting
ditch, a total of 160 settling pits are set. Third, the excavated earth of intercepting ditch is piled up at the downside of the slope, with water incepting weir being constructed adopting rammed method.

5.3.3.3.4 Xianghu Yaoqianba Wetland Rehabilitation and Protection Area

1) Engineering Measures

① Intercepting/Drainage Ditch
The drainage ditch is arranged at the edge of flood control dam above Mianjiang River Xianghu Section Restoration Beach and natural confluence gallery, the total length of the layout is 1,932m, constructed with mortar laid stone.

2) Vegetation Measures

The mudflat part below the fending groin of Xianghu Wetland Utilization and Protection Component would be rehabilitated and planted with 5,800m$^2$ of hybrid grass seeds for water conservation.

3) Temporary Soil and water Conservation Measures

During the construction of flood control dikes in Xianghu Wetland Utilization and Protection Area, one is to lay 5,600m of temporary drainage ditch along foundation excavation section of sewage interception pipeline laying, two is to arrange one temporary Settling Pond for every 100m to match with temporary drainage ditch, a total of 56 temporary settling pits are excavated, three is to pile up the excavated earth of intercepting ditch at the downside of the slope with water blocking weir being constructed adopting rammed method.

5.3.3.3.5 Forest Marshland Wetland Protection and Utilization Area

In Forest Marshland Wetland Protection and Utilization Area, the mudflat section is restored by planting camphor trees and bamboos, in the stage of construction and soil preparation, hybrid grass seeds is sowed for water conservation.

5.3.3.3.6 Lucao Lake Wetland Ecological Environment Protection and Control Zone

1. Vegetation Measures

① Landscaping
In Lucao Lake Wetland Ecological Environment Protection and Control Area, a large volume of earth is excavated in center lake, the excavated earth is used for build-up slope in green leisure area to form leisure landscape with topographic relief. To prevent water loss and soil erosion, landscaping is adopted and grass seeds are sowed for harnessing. Thus its soil and water conservation function can be made into full play in earlier stage, while being fully utilized in landscape planting in later stage.

2. Temporary Soil and Water Conservation Measures

In Lucao Lake Wetland Ecological Environment Protection and Control Area, one is to conduct foundation excavation at the entrance activity area and laying 1,130m of temporary drainage ditch, one settling pond is set for every 100m and 960m of temporary water blocking weir is built; two is to arrange 3,260m of temporary intercepting ditch along the surrounding areas of lake center excavation area, with one temporary Settling Pond being set for every 100m; three is to lay 4,200m of temporary drainage ditch in the course of water and power supply pipe trench excavation, with one temporary Settling Pond being set for every 100m; four is to lay 9,680m of temporary drainage ditch in the course of road construction, with one temporary Settling Pond being set for every 100m.

5.3.4 Summary of Incremental BOQ for Soil and Water Conservation

According to soil and water conservation measure layout and measure design of the control regions, Bill of quantities are summarized in Table 5.3-6.

<table>
<thead>
<tr>
<th>No.</th>
<th>Component</th>
<th>Unit</th>
<th>Incremental BOQ</th>
</tr>
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<tr>
<td>1</td>
<td>Part I Engineering Measures</td>
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<td></td>
</tr>
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<td>1.1</td>
<td>Interception and drainage ditches</td>
<td></td>
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<td>1.1.1</td>
<td>Earth work for foundation excavation</td>
<td>m³</td>
<td>140.4</td>
</tr>
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<td>M7.5 rubble masonry</td>
<td>m³</td>
<td>90</td>
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<tr>
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<td>Rentian Wetland Purification, Protection and Utilization</td>
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</tr>
<tr>
<td>2.1</td>
<td>Intercepting ditch</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.1.1</td>
<td>Earth work for foundation excavation</td>
<td>m³</td>
<td>561.6</td>
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<tr>
<td>2.1.2</td>
<td>M7.5 rubble masonry</td>
<td>m³</td>
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<td>Grit chamber</td>
<td></td>
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<td>Earth work for foundation excavation</td>
<td>m³</td>
<td>12.98</td>
</tr>
<tr>
<td>2.2.2</td>
<td>Red brick masonry</td>
<td>m³</td>
<td>3.98</td>
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<td>Yeping Wetland Purification, Protection and Utilization</td>
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</tr>
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<td></td>
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<td>m³</td>
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<td>Grit chamber</td>
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<td>m³</td>
<td>12.98</td>
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<td>3.2.2</td>
<td>Red brick masonry</td>
<td>m³</td>
<td>3.98</td>
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<td>4</td>
<td>Xianghu Yaoqianba Wetland Rehabilitation, Protection and Utilization</td>
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<td></td>
</tr>
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<td>Intercepting ditch</td>
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<tr>
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<td>Earth work for foundation excavation</td>
<td>m³</td>
<td>12.98</td>
</tr>
<tr>
<td>4.2.2</td>
<td>Red brick masonry</td>
<td>m³</td>
<td>3.98</td>
</tr>
</tbody>
</table>

II Vegetation Measures

1 Rentian Wetland Purification, Protection and Utilization

1.1 Site grassing

1.1.1 Mixed grass seed

1.1.1.1 Sowing and planting | hm² | 1.0 |
1.1.1.2 Grass seed          | kg   | 45  |

2 Yeping Wetland Purification, Protection and Utilization

2.1 Site grassing

2.1.1 Mixed grass seed

2.1.1.1 Sowing and planting | hm² | 1.6 |
2.1.1.2 Grass seed          | kg   | 72  |

3 Xianghu Yaoqianba Wetland Rehabilitation, Protection and Utilization

3.1 Site grassing

3.1.1 Mixed grass seed

3.1.1.1 Sowing and planting | hm² | 0.58 |
3.1.1.2 Grass seed          | kg   | 26.1 |

4 Forest Marshland Protection and Utilization

4.1 Site grassing

4.1.1 Mixed grass seed

4.1.1.1 Sowing and planting | hm² | 4.5 |
4.1.1.2 Grass seed          | kg   | 202.5 |

5 Lucao Lake Wetland Ecological Environment Protection and Management

5.1 Afforestation/Tree-planting

5.1.1 Metasequoia | Tree | 1100 |
5.1.1.1 Land consolidation 80×80×80 | Tree | 1100 |
5.1.1.2 Planting | Tree | 1111 |
5.1.1.3 Seedling |      |     |
5.1.2 Cinnamomum camphora

5.1.2.1 Land consolidation 80×80×80 | Piece | 1100 |
5.1.2.2 Planting | Tree | 1100 |
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<thead>
<tr>
<th>No.</th>
<th>Component</th>
<th>Unit</th>
<th>Incremental BOQ</th>
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</thead>
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<td>Tree</td>
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<td>5.1.3</td>
<td>Snow pine</td>
<td></td>
<td></td>
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<tr>
<td>5.1.3.1</td>
<td>Land consolidation 80×80×80</td>
<td>Piece</td>
<td>1100</td>
</tr>
<tr>
<td>5.1.3.2</td>
<td>Planting</td>
<td>Tree</td>
<td>1100</td>
</tr>
<tr>
<td>5.1.3.3</td>
<td>Seedling</td>
<td>Tree</td>
<td>1111</td>
</tr>
<tr>
<td>5.1.4</td>
<td>Slash pine</td>
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<td></td>
</tr>
<tr>
<td>5.1.4.1</td>
<td>Land consolidation 60×60×60</td>
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<td>3300</td>
</tr>
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<td>Planting</td>
<td>Tree</td>
<td>3300</td>
</tr>
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<td>5.1.4.3</td>
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<td>Tree</td>
<td>3333</td>
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<td>5.1.5</td>
<td>dogbane oleander</td>
<td></td>
<td></td>
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<td>Land consolidation 60×60×60</td>
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<td>Planting</td>
<td>Tree</td>
<td>3500</td>
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<td>3535</td>
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<td>Privet tree</td>
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<td></td>
<td>Seedling</td>
<td>Tree</td>
<td>6767</td>
</tr>
<tr>
<td></td>
<td>Grass sowing/planting</td>
<td></td>
<td></td>
</tr>
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<td></td>
<td>Direct sowing</td>
<td>hm²</td>
<td>18.1</td>
</tr>
<tr>
<td></td>
<td>Turf</td>
<td>m²</td>
<td>90.5</td>
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</table>

### III Temporary Works

1. Ridong Reservoir Wetland Protection and Conservation
   1.1 Temporary drainage ditch
      1.1.1 Earth excavation $m^3$ 44
   1.2 Temporary water blocking weir
      1.2.1 Earth filling $m^3$ 44
   1.3 Temporary grit chamber
      1.3.1 Earth excavation $m^3$ 9

2. Rentian Wetland Purification, Protection and Utilization
   2.1 Temporary drainage ditch
      2.1.1 Earth excavation $m^3$ 2000
   2.2 Temporary water blocking weir
      2.2.1 Earth filling $m^3$ 2000
   2.3 Temporary grit chamber
      2.3.1 Earth excavation $m^3$ 450

3. Yeping Wetland Purification, Protection and Utilization
   3.1 Temporary drainage ditch
      3.1.1 Earth excavation $m^3$ 3200
   3.2 Temporary water blocking weir
      3.2.1 Earth filling $m^3$ 3200
   3.3 Temporary grit chamber
      3.3.1 Earth excavation $m^3$ 720

4. Xianghu Yaoqianba Wetland Rehabilitation, Protection and
<table>
<thead>
<tr>
<th>No.</th>
<th>Component</th>
<th>Unit</th>
<th>Incremental BOQ</th>
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<tr>
<td>4.1.1</td>
<td>Earth excavation</td>
<td>m³</td>
<td>1120</td>
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<td>4.2</td>
<td>Temporary water blocking weir</td>
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<tr>
<td>4.2.1</td>
<td>Earth filling</td>
<td>m³</td>
<td>1120</td>
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<td>4.3</td>
<td>Temporary grit chamber</td>
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<td>4.3.1</td>
<td>Earth excavation</td>
<td>m³</td>
<td>252</td>
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<td>Lucao Lake Wetland Ecological Environment Protection and Management</td>
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</tr>
<tr>
<td>5.1</td>
<td>Temporary drainage ditch</td>
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<td>5.1.1</td>
<td>Earth excavation</td>
<td>m³</td>
<td>3624</td>
</tr>
<tr>
<td>5.2</td>
<td>Temporary water blocking weir</td>
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<td></td>
</tr>
<tr>
<td>5.2.1</td>
<td>Earth filling</td>
<td>m³</td>
<td>192</td>
</tr>
<tr>
<td>5.3</td>
<td>Temporary grit chamber</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5.3.1</td>
<td>Earth excavation</td>
<td>m³</td>
<td>819</td>
</tr>
</tbody>
</table>

5.4 Solid Waste Impact Assessment and Protection Measures

5.4.1 Impacts and Protection Measures during Construction

5.4.1.1 Polluting Source Analysis

Solid wastes generated by engineering construction include construction debris and domestic solid waste. Environmental impacts of construction debris are reflected in incremental soil erosion and impacts on natural landscaping. Section 5.3 of this report discussed potential soil erosion caused by construction debris and relevant soil and water conservation measures. This section will only discuss treatment and disposal measures for domestic solid waste.

5.4.1.2 Impact Analysis and Protection Measures

Domestic solid wastes are collected by area and by category considering long construction route and scattered construction site layout. Each construction site will be equipped with garbage bins for domestic solid garbage collection and separation. Inorganic solid waste will be hauled to nearby dumping site, food leftovers and kitchen waste are given to nearby rural residents free of charge for pig feeding, and other organic solid waste is collected and transported periodically to nearby domestic garbage collection stations or garbage transfer stations. Other organic solid waste will be provided to farmers for composting.

In addition, domestic waste, discarded construction materials and solid waste with recycling value shall be recycled or sold whenever possible.
Solid garbage collection and separation of construction sites shall be under integrated management of the contractor. Pesticide shall be sprayed to the garbage bin to prevent mosquito and fly breeding. Adverse impacts of domestic solid waste on sanitation of construction sites shall be mitigated.

Therefore, after proper treatment, solid waste generated during construction would only have minor impacts on the environment.

5.4.2 Impacts and Protection Measures during Operation

Solid waste generated during subproject operation mainly comprises night soil, sludge from wastewater treatment and domestic garbage (see Table 5.4-1 for details).

<table>
<thead>
<tr>
<th>No.</th>
<th>Name</th>
<th>Amount (t/a)</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Night soil</td>
<td>557.5</td>
<td>Septic tank</td>
</tr>
<tr>
<td>2</td>
<td>Domestic waste</td>
<td>7826.7</td>
<td>Garbage collection spot</td>
</tr>
<tr>
<td>3</td>
<td>Domestic waste</td>
<td>19.8</td>
<td>Lucao Lake Wetland Environmental Education Base</td>
</tr>
<tr>
<td>4</td>
<td>Sludge</td>
<td>7.35</td>
<td>Integrated A²/O equipment</td>
</tr>
</tbody>
</table>

1) Dung Slag

Dung slag is mainly from septic tank, which is calculated according to 26kg/(person·a), the number of people covered is about 21,443, then dung slag production volume is 557.5t/a. Because the subproject is located in rural area, dung slag is used for farmland as fertilizer.

2) Sludge

Sludge is mainly from integrated A²/O equipment. Sludge production volume is calculated by removing 1kg COD to produce 0.1kg dry sludge and 80% sludge moisture content, then the production volume is 7.35t/a. the sludge is transported by Ruijin sanitation department to Niulanwo Refuse Landfill of Qingshui Village in Ruijin City for drying and backfilling. The sluge is transported by sealed tank truck once per week, the transportation route is village road → National Rd 206/319 → Niulanwo Refuse Landfill of Qingshui Village, Ruijin City.

3) Domestic garbage

Domestic garbage mainly comes from garbage collection points and Green Grass Wetland.
Environment Education Base. Of which, the domestic garbage at garbage collection points is mainly generated from daily life of the residents in the village; while most of domestic garbage at Green Grass Wetland Environment Education Base come from visitors, there is a small part coming from daily work of the workers.

The covered number of people of garbage collection points is 21,443, as calculated per 1.0kg/p/d, then domestic garbage production volume is about 7826.7t/a; the fixed number of workers for Green Grass Wetland Environment Education Base is six persons, the size of vistors visiting the base is about 300 p/d, as workers and vistors are caculated per producing 1kg/p/d and 0.2kg/p/d, then a total of solid waste produced are 0.066t/d and 19.8t/a respectively.

Domestic garbage after collected by sanitation workers is transported to Niulanwo Refuse Landfill of Qingshui Village in Ruijin City for landfill treatment.

Therefore, solid waste produced during the subproject operation period after proper treatment has little effects on surrounding environment.

5.5 Ambient Air Impact Assessment and Environmental Protection Measures

5.5.1 Design Stage

(1) When design septic tank, reasonable construction process and scientific construction method shall be designed. The location of material stock yard shall be reasonably chosen to prevent soil erosion; the location of septic tank shall be reasonably selected to be away from kitch as far as possible. Water quality requirements and maintenance requirements shall be well balanced.

(2) When designing garbage collection station, appropriate garbage collection station construction way shall be chosen in combination of current rural conditions; the economic and reasonable waste transporation route with minimum times of passing through the village shall be considered.

(3) When designing rural sewage treatment engineering, appropriate sewage treatment process shall be selected through scheme comparison; the site selected shall be located at downwind direction with maximum wind direction frequency and good engineering geological conditions, while at the same time taking into consideration the possibility for expansion and the convenience for discharge and utilization of sewage and sludge.

5.5.2 Impact Assessment and Protection Measures during Construction

5.5.2.1 Polluting Source Analysis

During engineering construction, atmospheric pollutant mainly comes from the dust produced due to concrete mixing, spoil dumping, vehicle transport and other links as well as the tail gas produced
by vehicle transport, the main pollutant in waste gas is TSP. Concrete mixing and slag dumping are considered as intermittent pollution sources, while vehicle transport and construction machinery are mobile pollution sources, they all belong to fugitive emission. Pollution discharge is mainly concentrated in construction site and the line along the construction area, the main targets affected are residential areas along the subproject construction route and construction workers.

5.5.2.2 Environmental Impact Analysis

1) Impacts of concrete mixing system

Concrete mixing facility would generate dust pollution during mixing operations and loading/unloading and would have certain impacts on ambient air quality. Through ensuring reasonable layout of concrete mixing systems and taking corresponding pollution control measures, their impacts on air quality and environmentally-sensitive targets would be controlled within an acceptable range.

2) Impacts of traffic dust

As onsite roads during construction are mostly macadam roads, vehicle transportation will cause dust suspension in dry weather. Increased vehicles during construction will result in higher particulate content along the road, which would have certain impacts on ambient air quality and affect construction workers and local residents. As long as road maintenance and watering for dust control are conducted during construction, impacts on sensitive residential areas would be acceptable.

3) Impacts of waste gas from fuel combustion

Exhaust gas from transportation vehicles and other fuel-powered machinery (vehicles) would affect ambient air quality along the construction route. Although with long construction route and dispersed exhaust gas emission easy for diffusion, necessary protection measures are still required to protect local residents.

5.5.2.3 Air Pollution Control Measures

1) Dust control and mitigation of concrete mixing system

(1) Construction techniques and equipment

Concrete mixing system with dust collection device shall be selected whenever possible. Sealed up containers shall be chosen for concrete transportation to avoid dust pollution during transportation.
(2) Dust control measures

Water spraying is needed for residents of Zhugang and Ruilu Villages living around the construction site and plants would be planted around the processing system to mitigate dust pollution.

2) Traffic dust reduction and control

(1) Permanent roads shall be hardened as early as possible. Full-time team for road maintenance and cleaning shall be established, especially for temporary roads with macadam pavement in order to prevent dust suspension and maintain normal road operation;
(2) Prohibiting overloaded vehicles and promote covered transportation to reduce dust pollution caused by construction debris and sand and soil spillover;
(3) Setting speed limit signs in construction areas and living areas to prevent dust suspension caused by overspeed which may pose health impacts;
(4) Planting trees along the road to reduce dust impacts, which is included in soil and water conservation measures.

3) Mitigation and control of waste gas from fuel combustion

Construction machinery and transportation vehicles in compliance with national health standards shall be selected by the contractor in order to reduce generation of waste gas from fuel combustion. As construction vehicles are mostly diesel-powered trucks having higher waste gas emission and pollutant content than gasoline vehicles, exhaust gas purifiers shall be installed to ensure waste gas emission is up to applicable standards.

Retirement Standard for In-use Vehicles shall be strictly followed and mandatory retirement and renewal regulations shall be implemented. Old vehicles with high fuel consumption, low efficiency and non-compliant waste gas emission shall be replaced in a timely manner. Attention shall be paid to periodical maintenance of machinery and transportation vehicles to keep them in good condition.

5.5.3 Impact Assessment and Protection Measures during Operation

5.5.3.1 Polluting Source Analysis

Waste gas generated during operation is mainly odor, whose main pollutants are H₂S and NH₃. Odor is mainly from septic tanks, garbage collection stations (spots), integrated A²/O equipment and public toilets at Lucao Lake Wetland Environmental Education Base. Waste gas emission is fugitive.

5.5.3.2 Ambient Air Impacts and Protection Measures
1) Odor from septic tanks

Environmental pollution of odor can be minimized through covering up and periodically cleaning up septic tanks and planting odor-removing plants such as canna around these tanks.

2) Odor from garbage collection spots

As garbage at garbage collection spots is mostly bagged and stored in sealed up bins, diffusion of odorous gases such as \( \text{H}_2\text{S} \) and \( \text{NH}_3 \) can be effectively prevented. Placing garbage bins inside enclosed containers can further reduce odor diffusion. When necessary, odor remover would be used at garbage collection spots to eliminate odorous smell.

3) Odor from garbage collection stations

Environmental pollution of odor can be minimized through flushing ground every day and washing garbage vehicles once every week and planting odor-removing plants such as canna around garbage collection stations.

4) Odor from integrated A\(^2\)/O equipment

Such odor is mainly from settling ponds, anaerobic tanks and constructed wetland. Environmental pollution of odor can be minimized through strengthening equipment management, planting more trees in the local area and planting odor-removing plants such as canna in surrounding areas.

5) Odor from public toilets at Lucao Lake Wetland Environmental Education Base

Odor generation would be minimized through timely flushing and cleaning toilets, spraying disinfectants and using odor remover.

In conclusion, through taking the above measures, impacts of odor on surrounding environment would be minor.

5.6 Acoustic Environment Impact Assessment and Protection Measures

5.6.1 Impact Assessment and Protection Measures during Construction

5.6.1.1 Polluting Source Analysis

During subproject implementation, noise is mainly generated by construction machinery and equipment as well as transportation vehicles. Types of noise mainly include construction equipment noise, noise from handling construction materials and noise from daily life of construction workers. Noise intensities of large construction machinery and equipment and
transportation vehicles are provided in Table 5.6-1.

**Table 5.6-1 Noise Intensities of Strong Noise Generation Equipment of JPESTP**

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<thead>
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<th>No.</th>
<th>Equipment</th>
<th>Noise Intensity [dB(A)]</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Excavator</td>
<td>79-83</td>
</tr>
<tr>
<td>2</td>
<td>Bulldozer</td>
<td>85</td>
</tr>
<tr>
<td>3</td>
<td>Loader</td>
<td>85</td>
</tr>
<tr>
<td>4</td>
<td>Heavy-duty Truck (above 10t)</td>
<td>79-83</td>
</tr>
<tr>
<td>5</td>
<td>Crane</td>
<td>76</td>
</tr>
<tr>
<td>6</td>
<td>Vibrator</td>
<td>95</td>
</tr>
<tr>
<td>7</td>
<td>Concrete Pump</td>
<td>85</td>
</tr>
</tbody>
</table>

Types of construction machinery and equipment differ in corresponding to different construction stages and types of construction activities, resulting in different noise intensities. Meanwhile, as operation of different construction equipment is intermittent, noise generated during construction is also intermittent and short-lasting.

5.6.1.2 Noise Impact Analysis

Based on analysis of polluting sources, polluting sources at construction sites are mainly strong noise generation machinery and equipment while during construction large amount of machinery and equipment would be in operation at the sites, whose single noise level is between 6dB(A)-95dB(A). Noise attenuation with distance is calculated using the following formula:

\[ L_2 = L_1 - 20 \log \frac{r_2}{r_1} \]

Where: \( L_2 \) and \( L_1 \) refer to noise levels at distances of \( r_1 \) and \( r_2 \), respectively, to noise source. \( r_1 \) and \( r_2 \) refer to distances to noise source.

During calculation, the value of \( r_1 \) is 5m.

Based on calculation, noise attenuation with distance of construction machinery and equipment is shown in Table 5.6-2.

**Table 5.6-2 Attenuation of Construction Equipment Noise at Different Distances to Noise Source**

<table>
<thead>
<tr>
<th>No.</th>
<th>Noise Source</th>
<th>Noise Intensity</th>
<th>Noise Values at Different Distances to Noise Source</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>20m</td>
</tr>
<tr>
<td>1</td>
<td>Excavator</td>
<td>83</td>
<td>71</td>
</tr>
</tbody>
</table>
During construction, noise from construction machinery would be the main noise source, whose maximum level would reach 55dB(A), which almost conforms with the daytime noise value at construction site boundary, regardless of baffling effects of houses, trees and air. If taking account of the noise reduction effects of houses, trees and air [at reduced noise level of 15 dB(A)], spots at 500m to both sides of construction site can meet the daytime noise limit at construction site boundary.

As there are environmentally sensitive spots around the subproject areas, construction noise of the subproject would have certain impacts on local residents and effective measures must be taken to reduce noise pollution.

5.6.1.3 Environmental Protection Measures

1) Designed target

Noise would concentrate in construction period. Construction noise in construction sites shall meet Standards for Noise Emission at Construction Site Boundary (GB12523-2011), which specifies noise limits of 70dB(A) and 55dB(A) for daytime and nighttime, respectively, or prohibits construction during night. The target of environmental noise control is to meet environmental functional requirements for acoustic environmental quality in sensitive areas, which stipulates noise limits of 60dB(A) and 50dB(A) for daytime and nighttime, respectively.

2) Traffic noise control measures

(1) Avoiding night construction or transportation as much as possible;
(2) Enhancing maintenance of roads and vehicles and strictly prohibiting overloaded vehicles to reduce noise sources;
(3) Construction and transportation vehicles shall comply with Noise Limits to Stationary Vehicles (GB16170-1996) and Allowable Noise Level for Motor Vehicles (GB1495-79), and low-noise vehicles shall be used whenever possible;
(4) Traffic control measures for areas with centralized construction activities shall be taken, such as signs at construction sites, speed limit, and no horn.

<table>
<thead>
<tr>
<th>No.</th>
<th>Noise Source</th>
<th>Noise Intensity</th>
<th>Noise Values at Different Distances to Noise Source</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>20m</td>
</tr>
<tr>
<td>2</td>
<td>Bulldozer</td>
<td>85</td>
<td>73</td>
</tr>
<tr>
<td>3</td>
<td>Loader</td>
<td>85</td>
<td>73</td>
</tr>
<tr>
<td>4</td>
<td>Heavy-duty Truck</td>
<td>83</td>
<td>71</td>
</tr>
<tr>
<td>5</td>
<td>Crane</td>
<td>76</td>
<td>64</td>
</tr>
<tr>
<td>6</td>
<td>Vibrator</td>
<td>95</td>
<td>83</td>
</tr>
<tr>
<td>7</td>
<td>Concrete Pump</td>
<td>85</td>
<td>73</td>
</tr>
</tbody>
</table>
3) Noise control by contractor

(1) Contractor shall choose construction machine and tools in compliance with applicable national standards and use low-noise equipment and processes as much as possible to reduce source noise intensity;
(2) Strengthening equipment maintenance and lubrication to reduce operational noise;
(3) Using damping base for strongly vibrating equipment for noise reduction.

4) Construction worker protection measures

Protection measures taken for construction workers affected by construction noise include wearing of earplug, ear muff and anti-noise helmet.

5) Protection measures for sensitive spots

Noise sensitive spots during construction are mainly distributed at Zhugang Village under Xianghu Yaoqianba Wetland Rehabilitation, Protection and Utilization Scheme and Ruilu Village under Lucao Lake Wetland Environmental Protection Scheme. Residents in these two villages are mainly dispersed. In order to maintain acoustic environment quality of the sensitive spots near construction site, color-coasted steel plate sound barriers with the maximum height of 3m will be set up at boundary of the construction site near residential areas. Low-noise equipment shall be used as much as possible. Speed of transportation vehicles shall not be greater than 40km/h when they cross villages. Truck speed lower than 40km/h can reduce noise intensity by 8 to 9dB(A). No horn is allowed for transportation vehicles. Transportation vehicle management shall be improved to avoid unloaded operation. At the same time, communication with units and individuals at the sensitive spots shall be improved by prior public notice through broadcasting or other means. In particular, public notices shall be put up in concerned residential areas and units to be affected by the subproject to seek for understanding of villagers.

Based on the above analysis, noise pollution can be minimized through taking some control measures during subproject construction.

Therefore, this EIA believes that so long as rational and effective noise control measures and effective environmental monitoring measures are taken in a timely manner, and construction plans are properly designed, noise impacts due to subproject implementation can be reduced to levels acceptable by the general public and environmental impacts of noise can be minimized.
5.6.2 Impact Assessment and Protection Measures during Operation

5.6.2.1 Polluting Source Analysis

Main polluting sources during operation include garge transportation veichiles of garbage collection stations, integrated A^2/O equipment and tourists of Lucao Lake Wetland Environmental Education Base. Noise source intensities are summarized in Table 5.6-3.

Table 5.6-3 Intensities of Main Noise Sources during Operation of the Proposed Subproject

<table>
<thead>
<tr>
<th>Noise</th>
<th>Noise Source</th>
<th>Intensity [dB(A)]</th>
<th>Quantity</th>
<th>Unit/Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Garbage transport vehicle</td>
<td>70-80</td>
<td>1</td>
<td>Garbage collection station</td>
</tr>
<tr>
<td>2</td>
<td>Pump</td>
<td>70-80</td>
<td>2</td>
<td>Integrated A^2/O equipment</td>
</tr>
<tr>
<td>3</td>
<td>Blower fan</td>
<td>80-90</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Tourist</td>
<td>60-70</td>
<td>300 persons/day</td>
<td>Lucao Lake Wetland Environmental Education Base</td>
</tr>
</tbody>
</table>

5.6.2.2.1 Prediction Model Selection

Total noise attenuation from noise sources to receivers are integrated by distance from the noise source to the receiver, sound insulation of the wall, air absorption and attenuation of building barrier. This prediction only considers attenuation of the distance and sound insulation of the building wall. The air absorption can be neglected considering the noise source is near the predicted position. The noise source is to be processed by simplifying into three point sound sources considering the distance of each noise source.

1. Prediction of sound pressure level of simple sound source

(1) The formula for contribution value of equivalent sound level \( L_{eqg} \) generated by sound source during construction at the predicted position:

\[
L_{eqg} = 10 \log \left( \frac{1}{T} \sum_{i} t_i 10^{0.1L_{Ai}} \right)
\]

Where:

\( L_{eqg} \)—The contribution value of equivalent sound level generated by sound source during at the predicted position, dB(A);

\( L_{Ai} \)—Sound level A generated by the sound source i at the predicted site, dB (A);

\( T \)—Time period calculated by the predication, s;
(2) The formula for the equivalent sound level \( L_{eq} \) predicted at the predicted position:

\[
L_{eq} = 10\log(10^{0.1L_{eqg}} + 10^{0.1L_{eqb}})
\]

Where: The contribution value of equivalent sound level generated by sound source during construction at the predicted position, dB(A);

\( L_{eqb} \)—Background value at the predicted site, dB(A)

2. Geometric divergence attenuation of point sound source

The fundamental formula for nondirectional point sound source is:

\[
L_p(r) = L_p(r_0) - 20\log(r/r_0)
\]

3. Prediction for sound pressure level of multiple sound sources

The sound pressure level at the predicted position under the multiple source sources is the decibel sum of noise level of the noise for the receiver.

Formula:

\[
L_{p_T} = 10\log\left(\sum_{i=1}^{n} 10^{0.1L_{p_i}}\right)
\]

Where: \( L_{p_T} \)—The total sound pressure level superposed at certain predicted position,dB(A);

\( L_{p_i} \)—The sound pressure level contributed by sound source i to certain predicted sites, dB (A)

5.6.2.2.2 Environmental Impact Analysis of Noise of Garbage collection Station

Waste transportation vehicle is the outdoor noise source and it enters or leaves the garbage collection station only it transports wastes. As garbage collection stations are small, waste transportation vehicles transport two times each day for garbage collection station in Julin Village, Gangbei Village and Xiajie Village, and transport one time each day for other garbage collection stations, and the number of transportation is less.

Garbage collection stations would minor impacts on surrounding acoustic environment through taking measures such as giving priority to waste transportation vehicles with low noise, low vibration and good structure, optimizing waste transportation vehicles, strengthening waste transportation management and prohibiting honking when entering or leaving villages or the garbage collection stations.

5.6.2.2.3 Environmental Impact Analysis of Noise of the Integrated A\(^2\)/O Equipment

Noise sources for integrated A2/O equipment are mainly from water pump and air blower, and
sound level for the noise source is 70-9-dB (A). As the water pump and the air blower are in the same pump house, they will be regard as one point source after executing the superimposed calculation based on the predication formula for the sound pressure level of multiple sound sources: the superimposed value from the calculation is 93.4 dB (A). The sound insulation of building wall is calculated based on 15 dB (A). Therefore, see table 5.6-5 for superimposed value of the integrated $A^2/O$ equipment of Xiajie Village, and the environment background noise.

**Table 5.6-5 Attenuation Values of Supervimpoesd Noise of Integrated $A^2/O$ Equipment at Different Distances to Noise Source**

<table>
<thead>
<tr>
<th>Place</th>
<th>Time Period</th>
<th>No.</th>
<th>Noise Source</th>
<th>Noise Intensity</th>
<th>Noise Levels at Different Distances to Noise Source</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>20m</td>
</tr>
<tr>
<td>Xiajie Village</td>
<td>Day</td>
<td>1</td>
<td>Integrated $A^2/O$ equipment</td>
<td>78.4</td>
<td>66.4</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2</td>
<td>Environmental baseline</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>3</td>
<td>Superimposed value</td>
<td>78.4</td>
<td>66.5</td>
</tr>
<tr>
<td></td>
<td>Night</td>
<td>4</td>
<td>Integrated $A^2/O$ equipment</td>
<td>78.4</td>
<td>66.4</td>
</tr>
<tr>
<td></td>
<td></td>
<td>5</td>
<td>Environmental baseline</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>6</td>
<td>Superimposed value</td>
<td>78.4</td>
<td>66.4</td>
</tr>
</tbody>
</table>

In Table 5.6-5, the superimposed value at 150m at day and night for Xiajie Village is 51.5, 49.0dB(A) and for Xinyuan Village is 52.3, 49.0dB(A), indicating the acoustic environment meeting standards of category II zone in Environmental Quality Standard for Noise (GB3096-2008).

Although there are few noise sensitive spots such as residential areas within 150m from the subproject, measures such as selecting equipment with low noise and vibration, and providing greening isolation strip around the integrated $A^2/O$ equipment, can be taken to lower the impacts of noise on them.

5.6.2.2.4 Environmental Impact Analysis of Noise of the Lucao Lake Wetland Environment Education Base

After the completion of the subproject, the number of visitors in this area would be about 300 persons each day, this would cause noise. Among them, the maximum sound level for hubbub of visitors at the square is 70dB (A). Improper management would disturb normal life of nearby residents. The impacts of noise generated by visitors on surrounding environment would be minimized through taking measures such as strengthening management of the base, greening the base and its surrounding areas and providing the greening isolation belt, among others.
5.7 Social Environment Impact Assessment and Protection Measures

5.7.1 Social Impacts during Construction

1) Socioeconomic impacts

Main construction materials for the subproject, such as cement, reinforced bar and water pipe, are procured locally. Local procurement of construction materials will help development of relevant industries. During subproject construction, repair and maintenance of construction machinery will rely on local mechanical repair and processing factories and will increase revenue of these factories. In addition, subproject construction will need labor inputs and will relieve local employment pressure by providing additional job opportunities. Further development of the subproject will promote production and sales of local food products such as meat and vegetables, promote boom and development of local tertiary industry such as services, culture and entertainment and generate employment opportunities, thereby diversifying local economy, increasing local income and improving life quality of local people.

2) Traffic impacts

Traffic impacts of the subproject during construction mainly include: (1) traffic obstruction due to pipe network construction; (2) traffic obstruction due to road excavation; and (3) increased traffic flow on roads due to increased transportation vehicles for construction. Therefore, corresponding mitigation measures shall be taken to address these adverse impacts.

3) Health and safety

As the subproject is of large size, would have many construction workers whose mobility is strong and would have simple living facilities as well as poor living, medical and sanitation conditions in construction camps, where human wastes can easily lead to air pollution and facilitate reproduction of mosquitoes and flies. These conditions would easily result in spread of communicable diseases such as hepatitis and dysentery. In addition, hidden safety risks during construction may have some adverse impacts on the health of construction workers. Therefore, corresponding measures need to be taken to protect the health and safety of construction workers.

5.7.2 Social Impacts during Operation

Ruijin Mianjiang River (Lucao Lake) Wetland Protection and Utilization Subproject is an important public-good engineering for ecological and environmental protection. Implementation of the subproject can help Ruijin city, Jiangxi province and the nation have deeper understanding of the importance of wetland environment, and deepen people’s understanding of the relationship between wetland and water, wetland and wildlife, and wetland and residents. Take this as an opportunity to reach the basic view of protecting wetland environment, namely, protecting the
survival and development space of the human, thereby improving people’s effects to consciously protect the wetland.

Implementation of the subproject would drive the Poyang Lake Basin and Ecological Economic Zone Small Town development, promote urban sewage pipe network and water treatment plant construction, closely combine road, greening, sewage discharge and drainage, etc, and greatly improve living environment of urban residents, thereby providing them with convenient life.

Implementation of the subproject would vigorously restore wetland and mudflat, and protection forest, greatly increasing urban greening area and making people live in a smart natural landscape characterizing a fine spring day.

Moreover, the subproject operation would have an important role in providing re-employment for laid-off workers, directly and indirectly providing job opportunities to local residents. Furthermore, it would also play a catalyzing role for local related industries and significantly contribute to addressing unemployment of laid-off workers and surplus rural labor and increasing rural income.

Mudflats and wetlands are the last barrier to control pollutants from entering the basin of Mianjiang River. The efficient and stable construction of wetland ecological zone would directly appertain to significant improvement of Mianjiang water environment quality and restoration of fishery resources, etc, better creating good environment conditions for economic activities in the zone. Implementation of Ruijin Mianjiang River (Lucao Lake) Wetland Protection and Utilization Subproject would create favorable environment for economic activities of the region, and it has the potential to drive regional economic development and strengthen the landscape effect inside and outside the Mianjiang River.

5.7.3 Social Environment Protection Measures
5.7.3.1 Traffic Impact Mitigation Measures

As traffic impacts of the subproject mainly concentrate in the construction period, mitigation measures are proposed only for the period.

1) During road construction, proper link roads with those outside construction areas shall be provided and traffic diversion be conducted on key affected road sections to avoid adverse impacts;
2) Establishing traffic signs; strengthening traffic management in construction areas; timely deverting traffic on congested road sections;
3) Providing traffic management staff on main road sections close to centralized populous settlements to divert vehicles during construction to ensure smooth traffic;
4) Emergency measures shall be developed in response to possible traffic congestion to ensure traffic flow and safety;
5) Temporary access roads shall be arranged prior to road construction and adequate consideration
shall be given to road access safety and convenience of nearby residents. Temporary walls/fences shall be set up to separate construction sites and outside areas while warning signs shall be put up in order to reduce safety accidents caused by construction activities.

6) Storage locations of various materials and equipment shall be consistent with the overall construction layout, and driveway and pedestrian access ways cannot be occupied without permission. Traffic signs and warning lights and lighting during night shall be provided for convenient passing through of vehicles.

7) Traffic signs shall be put up in areas with frequent vehicle flow; reasonable transportation routes shall be selected to avoid crossing residential areas. Transportation shall be well scheduled to avoid traffic congestion and reduce impacts on local residents.

8) In order to ensure construction activities will not damage nearby public facilities, a notification sign shall be put up at entrance of each construction site including information of contractor, supervisor and contact phone number of local EPB.

5.7.3.2 Public Health Protection Measures

5.7.3.2.1 Protection Measures during Construction

In order to protect the health of construction workers and local people and prevent introduction of foreign diseases and incidence of infectious diseases due to poor sanitation conditions and other factors, measures must be taken in construction areas to protect human health.

1) Sanitation activities

Environmental sanitation activities including regular elimination of mice, mosquitoes, flies and cockroaches are carried out to reduce vectors of infectious diseases. Mousetrap and poison bait are used for mouse killing and pesticide spraying is adopted for killing mosquitoes, flies and cockroaches.

2) Sanitation and food hygiene management

Management of drinking water sources, canteens, garbage bins and public toilets during construction shall be strengthened and periodic sanitation and hygiene inspection is conducted. In addition, at least twice centralized cleaning shall be done every month.

Sanitation and hygiene management of construction site canteens shall be strengthened and sanitation and hygiene inspection shall be conducted every quarter. Only persons with health certification shall be allowed to provide food services. Full-time cleaning team shall be established to be responsible for cleaning of construction sites, office areas and living camps. Garbage bins shall be equipped. Public sanitation facilities on the construction sites shall meet national health standards and requirements.
3) Health education

Health education in various forms shall be provided for construction workers and local residents to disseminate epidemic prevention and vaccination knowledge in order to improve health awareness of local residents.

5.7.3.2.2 Construction Safety Measures during Construction

1) Keep all structures at construction sites in good conditions and shape; temporary structures shall be safe and reliable, can resist shocks from local bad weather, have appropriate lighting and can block some dust and noise;
2) Construction units shall have the capacity to provide emergency rescue that meet relevant requirements and provide first-aid kits for construction sites;
3) Training on occupational health and safety shall be provided to all new construction workers, briefing them about basic operational rules, personal protection rules and steps on how to prevent injuries to other staff;
4) Right sign boards shall be erected for dangerous spots (e.g. power distribution room), devices, materials and emergency exits;
5) Construction units identify and provide construction workers with suitable personal protection devices so adequately protect workers themselves, other workers and occasional visitors. Such devices shall not cause unnecessary inconveniences to users

5.7.3.2.3 Human Health Protection Measures during Operation

1) Mitigation measures for septic tanks

(1) Septic tanks should be periodically cleaned and dregs should be removed, and also should be frequently checked and timely repaired to ensure smoothness and perfectness of muck pipelines, muck pipeline connecting well and septic tank;

(2) The septic tanks should be free from phenomena such as thick hardening or overflowing. The hardening thickness in the septic tank can’t exceed 40mm;

(3) It is not allowed to pour wastes, pollutants and sundries into the septic tank, or stacking sundries or building houses above the septic tank, and not allowed to reconstruct the sewage pipeline without permission;

(4) The cover plate of the septic tank should be covered tightly in normal times to avoid accident;
(5) Hot work beside the septic tank is prohibited.

(6) Septic tank cleaning:

- Before cleaning the septic tank, it is required to set the warning sign, remove barriers at the surface of the septic tank and ensure the traffic smoothness; before opening the septic tank
cover, it is required to evacuate operators;
- Steel bar and anvil, etc can’t be used for prying the septic tank cover to avoid spark, thereby causing burning or explosion;
- When motor is used for pumping or draining sewage, leakage of motor, power source, line and switch, etc should be checked to avoid shock accident;
- Before the worker enters the septic tank for desilting, carbonic oxide, carbon dioxide, hydrogen sulfide, methane and harmful gases should be removed through natural ventilation; moreover, the instrument should be used for detection and the worker can’t enter the tank for working unless innocuousness and safety are determined; The operating personnel who enters the septic tank should wear the anti-static clothes. It is not allowed to enter the septic tank with keys and hard metals;
- The operating personnel above the septic tank should hold the safety belts with hands and can keep the contact with the operating personnel who enters the septic tank;
- After completing the cleaning, timely repair after recovering the septic tank cover and the trench cover. The warning sign or the protective fence should be provided if works can’t be completed in the same day.

Liquid and dreg from septic tank cleaning must be transported to a professional treatment plant designated by the municipal sanitation competent department for treatment. The quality of water discharged after being treated should meet specified discharge standards. Stacking of dregs must be managed by the designated person and records should be well made to avoid the cross contamination.

2) Mitigation measures for garbage collection stations

(1) Carrying out disinfection on a regular basis;
(2) Providing sanitation workers with and requiring them to use appropriate personal protection clothing, such as shoes, gloves and gauze masks;
(3) Providing water for washing and dressing area;
(4) Providing sanitation workers with immunization services and health monitoring.
6 Alternatives Analysis

6.1 Zero Alternative Analysis

Ruijin Mianjiang River (Lucao Lake) Wetland Protection and Utilization Subproject is an environmental protection and public-good engineering and its objectives are to protect the ecological environment of Mianjiang River basin and ensure different sections of the river to meet requirements for corresponding water environment functional area, thereby serving the protection of ecological environment in the Gan River basin and promoting the construction of Poyang Lake Basin and Ecological Economic Zone.

This subproject is to establish an ecological wetland system with the functions of irrigation and flood control, which combines water source site protection, water quality improvement, wetland conservation, science popularization and education, research and monitoring, ecological restoration and ecological balance.

Implementation of the subproject will bring tremendous environmental, ecological and social benefits to the subproject areas and nearby water areas and will also push the undertakings of management and conservation of Mianjiang River basin to a new height.

However, implementation of the subproject would also have some adverse impacts, such as impacts of wastewater and waste gas discharge and solid waste generation during construction and operation, land occupation, spoil and debris stacking and resettlement, and environmental impacts each individual works during construction. Table 6.1-1 provides a comparison of the implementation alternative and the zero alternative.

Table 6.1-1 Comparison and Selection of Subproject Alternative and Zero Alternative

<table>
<thead>
<tr>
<th>Item</th>
<th>Subproject Implementation Alternative</th>
<th>Zero Alternative</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1. The subproject implementation meets Ruijin City Master Plan and Ruijin 12th Five-year Plan for Environmental Protection; 2. Facilitates protection of wetland ecological environment and rare or endangered animals and plants, maintaining the natural status of wetland and providing ideal places and habitats for rear animals and plants; 3. Protects water sources from being polluted and ensure drinking water safety for nearby rural residents; 4. Promotes coordinated social development, correctly address the relationship between the present and the future interests and between the local interests and overall interests, and properly address the relationship between wetland and the general public and that between wetland and local economic development and the production and livelihoods of local people.</td>
<td>1. Maintains existing environment conditions and will not generate environmental impacts resulted from subproject implementation; 2. Will not change land utilization value (will not occupy land); 3. Will not lead to resettlement issues/problems; 4. Maintains existing environment conditions in the river basin</td>
</tr>
<tr>
<td>Item</td>
<td>Subproject Implementation Alternative</td>
<td>Zero Alternative</td>
</tr>
<tr>
<td>------</td>
<td>--------------------------------------</td>
<td>-----------------</td>
</tr>
<tr>
<td></td>
<td>5. Provides scientific guidance for management of wetland and ensure sustainable development of wetland resources;</td>
<td>1. Sewage collection and treatment rate is low, is way behind national environmental protection requirements and the trends of deterioration may exacerbate;</td>
</tr>
<tr>
<td></td>
<td>6. Improves living environment of residents in the river basin and promote the city’s economic development and social progress;</td>
<td>2. Integrity of river basin ecological system is damaged, and living environment of surrounding residents and regional ecological environment may deteriorate;</td>
</tr>
<tr>
<td></td>
<td>7. Facilitates improving environmental protection awareness of the public and promoting harmonious coexistence of human and nature;</td>
<td>3. Disorderly stacking of waste in villages Affects the environment, damages the landscape and harms human health.</td>
</tr>
<tr>
<td></td>
<td>8. Provides replicable demonstration for ecological environment protection and economic development in areas upstream of Poyang Lake Basin and Ecological Economic Zone.</td>
<td></td>
</tr>
</tbody>
</table>

### Disadvantages

<table>
<thead>
<tr>
<th></th>
<th>Subproject Implementation Alternative</th>
<th>Zero Alternative</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1. Occupies land resources and cause some soil erosion;</td>
<td>1.</td>
</tr>
<tr>
<td></td>
<td>2. Damages vegetation and generates dust during construction;</td>
<td>2.</td>
</tr>
<tr>
<td></td>
<td>3. Has minor impacts on water quality;</td>
<td>3.</td>
</tr>
<tr>
<td></td>
<td>4. Has some impacts on aquatic ecology;</td>
<td></td>
</tr>
<tr>
<td></td>
<td>5. Construction and resettlement activities generate short-term adverse impacts on the environment.</td>
<td></td>
</tr>
</tbody>
</table>

### Overall Analysis

From the social and environmental perspectives, the implementation alternative is superior to the zero alternative.

### 6.2 Comparison and Selection of Sewage Treatment Techniques

#### 6.2.1 Selection of Techniques

Construction and operation of sewage treatment works are restrained and affected by many factors. Among them, selection and optimization of sewage treatment techniques have decisive impacts on operation effectiveness and cost of sewage treatment works, so practical and economically rational treatment techniques should be selected according to the idea of overall optimization and by combining design scale, sewage quality features and effluent quality requirements, as well as local realities and requirements to achieve cost-effectiveness, efficiency and energy saving.

Sewage treatment techniques are compared and selected based on the following principles after considering their safety, economy and applicability:

1. Economy, applicability and easy-for-management: treatment techniques with low construction cost, few running expense, low energy consumption and or energy consumption, simple operation and management, convenient maintenance, and stable and reliable effluent quality are preferred.

2. Realize biodegradation and ecological removal of nitrogen and phosphorus by fully utilizing terrain and topography of villages, available ditches and abandoned low-lying lands and by using biological and ecological combination treatment technique to lower sewage treatment energy consumption and save construction and operation cost.
3. Strengthen domestic sewage reduction at the source and tail water recycling by combining local agricultural production.

4. Flexible technique operation: the operation can be flexibly adjusted according to indicators of C, N and P in the influent and improved discharge standard in the future.

5. Pay attention to environment protection, odor prevention, noise control, and environment beauty.

6.2.2 Assessment of Techniques

Sewage to be treated by this subproject is rural domestic sewage and its main features include: sewage amount is low but the fluctuation is large and has strong seasonality; compared with municipal sewage, rural sewage, dominated by organic pollutants and almost containing no poisonous and harmful organic pollutants, has lower concentration of pollutants (COD≤300mg/L, BOD5≤150mg/L). Moreover, rural domestic sewage has good biodegradability and can be easily treated.

Influent to be treated under the subproject is domestic sewage dispersed in residents and farmer households. Techniques with small construction investment and simple and relatively independent operation and maintenance are required according to water quality features and treatment degree required by the discharge. Therefore, constructed wetland treatment system and integrated sewage treatment equipment are selected as the alternatives, which are separately discussed. One of them is selected as the sewage treatment technique.

1. Alternative 1: constructed wetland treatment system

(1) Features of constructed wetland treatment system

Constructed wetland is a sustainable sewage treatment technique developed at the end of 1970s, and it refers to the human constructed, supervised and controlled ground similar to the marsh. The design is to realize the purification of sewage through the optimization of physical, chemical and biological functions in the wetland natural ecological system, and through the coordination of these three functions. The structure can be briefed as that in a low-lying land with certain length-width ratio and bottom slope, fill soil and packing with certain grade (such as sand) based on certain slope ratio to form the packed bed, sewage flows on the surface of packing or packed bed, and plant some artistic and commercial aquatic plants with good treatment performance, high survival rate, strong water resistance and long growth cycle (such as reed, water hyacinth and cattail, etc), thereby forming an constructed wetland ecological system that has strong decontamination capability and is fit for living of wetland animals and plants. Based on the way of sewage flow, the constructed wetland treatment system can be divided into surface flow wetland, horizontal underflow constructed wetland and vertical underflow constructed wetland. Advantages of the
system are indicated below:

① Construction and operation costs are low; Compared with traditional sewage treatment techniques, the constructed wetland has obvious advantages of lower investment and operation cost. The investment for constructed wetland in rural areas is normally 1/3~1/2 less than that for traditional sewage treatment techniques as the artificial density is relatively small. During the treatment, constructed wetland basically adopts the way of gravity flow, basically no energy consumption during the treatment, so the operation cost is low.

② Easy to maintain and technical complexity is low;

③ Can achieve effective and reliable wastewater treatment;

④ Can buffer the shock to hydraulic power and pollutant load;

⑤ Can directly and indirectly provide benefits, such as aquatic products, animal products, paper-making raw materials, building materials, greening, wild animal habitat, entertainment and education.

(2) Technological process

The proposed constructed wetland treatment system technique is “anaerobic hydrolysis + drop-aeration contact oxidation + constructed wetland” according to actual conditions of towns and townships at Ruijin Mianjiang River basin and from the perspective of integrating economic socioeconomic benefits with environmental benefits.

The technological process for sewage treatment is shown in following chart.

Figure 6.2-1 Process Flow Chart of Constructed Wetland

![Process Flow Chart of Constructed Wetland](image)

This combination process is cascaded by three treatment units of anaerobic hydrolysis tank, drop-aeration contact oxidation tank and constructed wetland, which has strong shock load resistance capability. Among them, the drop-aeration contact oxidation technology lifts the effluent of anaerobic hydrolysis tank to inlet and outlet bar screens of contact oxidation tank by using the miniature sewage lifting pump for graded drop to form water curtain and water drop natural aeration, without requiring the aeration device, which can remove pollutants such as nitrogen and phosphorus, thereby greatly lowering energy consumption of biological sewage treatment.

(3) Main buildings and structures
Main buildings and structures are shown in Table 6.2-1.

<table>
<thead>
<tr>
<th>No.</th>
<th>Buildings and Structures</th>
<th>Size</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Bar screen tank</td>
<td>1.1m×1.0m×1.5m</td>
<td>Underground brick structure, joint</td>
</tr>
<tr>
<td></td>
<td>way construction</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Sedimentation tank</td>
<td>1.1m×1.0m×1.5m</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Anaerobic hydrolysis tank</td>
<td>15.0m×8.0m×2.5m</td>
<td>Buried reinforced concrete structure</td>
</tr>
<tr>
<td>4</td>
<td>Drop-aeration contact oxidation</td>
<td>9.0m×5.0m×2.0m</td>
<td>Aboveground brick structure</td>
</tr>
<tr>
<td>5</td>
<td>Multiple-stage constructed wetland system</td>
<td>78.0m×30.0m×1.15m</td>
<td>Two-stage series operation</td>
</tr>
<tr>
<td></td>
<td></td>
<td>78.0m×30.0m×1.15m</td>
<td></td>
</tr>
</tbody>
</table>

2. Alternative 2: integrated sewage treatment equipment

(1) Features of integrated sewage treatment equipment

Integrated sewage treatmet equipment and devices are many and the type is also various, which is mainly targeted to the industrial enterprise with less sewage discharge, cities without sewage interception or lacking land, or rural areas with scattered residents, and small factories and mines, hospitals and hotels, etc.

The integrated sewage treatment system has the following features:

①Small land occupancy, can be buried underground;
②Full automatic control, personnel management not necessary;
③Simple operation, convenient maintenance;
④Low noise, free from extraneous odor;
⑤Long service life

(2) Technological process

The integrated A2/O + sand filtering treatment technique is considered to be used to process rural domestic sewage according to actual conditions of towns in Ruijin and following the ideas of stable operation, reliable effect and mature technology.

(3) Main buildings and structures

Main buildings and structures are shown in Table 6.2-2.
### Table 6.2-2 Main Buildings and Structures

<table>
<thead>
<tr>
<th>No.</th>
<th>Buildings and Structures</th>
<th>Design Parameters</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Bar screen</td>
<td>Distance between bars: 2-5mm</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Anaerobic tank</td>
<td>SRT=1.5h</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Anoxic tank</td>
<td>SRT=2h</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Bio-contact oxidation tank</td>
<td>Divided into two stages; biochemical time: 6h; the first stage uses type NZP-I packing and the second stage uses type NZP-II packing; load processing: 14kg BOD/m3·d</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Secondary sedimentation tank</td>
<td>0.9-1.2m³/m²·d</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Running sand filtering and disinfecting tank</td>
<td>SRT=30-35min</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Sludge tank</td>
<td>Sludge nitrification system is provided inside; clear liquid above the sludge tank backflows to the regulating tank</td>
<td></td>
</tr>
</tbody>
</table>

### 3. Comparison of sewage treatment technique alternatives

Comparison and selection of two sewage treatment technique alternatives are shown in Table 6.2-3 and Table 6.2-4.

### Table 6.2-3 Comparison and Selection of Sewage Treatment Technique Alternatives

(Treatment capacity: 500m³/d)

<table>
<thead>
<tr>
<th>Treatment Technique Comparison Item</th>
<th>Constructed Wetland</th>
<th>Integrated A²/O+ Sand Filtering</th>
</tr>
</thead>
<tbody>
<tr>
<td>Land occupancy area</td>
<td>Land occupied: 1447-2000m²</td>
<td>Land occupied: 450m²; land occupied for biological tank: 220m²</td>
</tr>
<tr>
<td>One-off total investment</td>
<td>About: RMB 600,000</td>
<td>About RMB 900,000</td>
</tr>
<tr>
<td>Total operation cost</td>
<td>RMB 0.08/t</td>
<td>RMB 0.85/t</td>
</tr>
<tr>
<td>Operation management and routine maintenance</td>
<td>Simple</td>
<td>More complicated</td>
</tr>
<tr>
<td>Load shock resistance capability</td>
<td>Weak</td>
<td>Good</td>
</tr>
<tr>
<td>Expenses for sludge treatment</td>
<td>RMB 0.01/t</td>
<td>RMB 0.15/t</td>
</tr>
<tr>
<td>Depreciation of equipment</td>
<td>RMB 0.14/t</td>
<td>RMB 0.19/t</td>
</tr>
<tr>
<td>Effluent quality (PPM)</td>
<td>COD&lt;50</td>
<td>COD&lt;40</td>
</tr>
<tr>
<td></td>
<td>NH₃-N&lt;8</td>
<td>NH₃-N&lt;5</td>
</tr>
<tr>
<td></td>
<td>SS&lt;10</td>
<td>SS&lt;5</td>
</tr>
<tr>
<td>Comparison Results</td>
<td>Compared Alternative</td>
<td>Recommended Alternative</td>
</tr>
</tbody>
</table>
### Table 6.2-4 Comparison and Selection of Sewage Treatment Technique Alternatives

(Treatment capacity: 1200m$^3$/d)

<table>
<thead>
<tr>
<th>Treatment Technique Comparison Item</th>
<th>Constructed Wetland</th>
<th>Integrated A$_2$/O+ Sand Filtering</th>
</tr>
</thead>
<tbody>
<tr>
<td>Land occupancy area</td>
<td>Land occupancy: 4500-5500m$^2$</td>
<td>Land occupancy: 900m$^2$, land occupancy for biological tank: 440m$^2$</td>
</tr>
<tr>
<td>Total investment</td>
<td>About RMB 800,000</td>
<td>About RMB 1.70 million</td>
</tr>
<tr>
<td>Total operation cost</td>
<td>RMB 0.07/t</td>
<td>RMB 0.80/t</td>
</tr>
<tr>
<td>Operating management and routine maintenance</td>
<td>Simple</td>
<td>More complicated</td>
</tr>
<tr>
<td>Load shock resistance capability</td>
<td>Weak</td>
<td>Good</td>
</tr>
<tr>
<td>Expenses for sludge treatment</td>
<td>RMB 0.01/t</td>
<td>RMB 0.14/t</td>
</tr>
<tr>
<td>Depreciation of equipment</td>
<td>RMB 0.10/t</td>
<td>RMB 0.17/t</td>
</tr>
<tr>
<td>Effluent quality (PPM)</td>
<td>COD&lt;50, NH$_3$-N&lt;8, SS&lt;10</td>
<td>COD&lt;40, NH$_3$-N&lt;5, SS&lt;5</td>
</tr>
<tr>
<td>Comparison Results</td>
<td>Recommended Alternative</td>
<td>Compared Alternative</td>
</tr>
</tbody>
</table>

Based on the above comparisons, both constructed wetland and integrated treatment technique have advantages and disadvantages. As these two methods are widely used in domestic rural sewage treatment, the technology is mature, technique operation is stable and effluent quality meet standards. The constructed wetland is superior to the integrated equipment technique in terms of engineering investment, operation cost, operation management and routine maintenance, but its disadvantage is large land occupancy. The integrated equipment, featuring small land occupancy and good effluent quality, has advantages when land is the primary constraint. As Rentian Rural Wastewater Treatment Component is constrained by water supply, the treatment technique of integrated A$_2}$/O + sand filtering is recommended. Under the Yeping Rural Wastewater Treatment Component, more land is available and there are more natural wetlands and mudflats, which can be used as good places for treatment of rural wastewater through minor renovations. From the perspectives of lower engineering investment and convenient operation and management, constructed wetland is more suitable for treating rural wastewater in Yeping Township.
7 Environment Risk Analysis and Mitigation Measures

7.1 Identification of Environmental Risks

7.1.1 Construction Period

According to the subproject’s engineering features and relationship between the subproject and surrounding environment, the environment risks during the construction period are mainly reflected: construction areas and partial roads are arranged along the river, so traffic accidents such as vehicle collision and side overturning crash, etc may occur as passing vehicles are many, thereby polluting water quality of the river; the behavior that discharging various construction wastewater, without being treated, into river failing to follow requirements of environmental protection measures, thereby the risk of river water quality pollution; moreover, there may be the risk of alien species invasion during the afforestation construction.

7.1.2 Operation Period

According to the subproject’s operation features and relationship between the subproject and surrounding environment, the environment risks during the operation period are mainly reflected: risks of integrated A^2/O equipment operating accidents to the environment; risks of septic tank and inspection well to worker’s human health.

7.2 Impact Analysis of Environmental Risks

7.2.1 Construction Period

1) Water pollution risks

Key environmental risks during subproject implementation are water pollution risks. During construction, vehicles would frequently go to and from construction sites. This would increase incidence of road traffic accidents, hence increasing the probability of environmental risks resulted from severe water pollution during transportation of dangerous chemicals (especially on roads along rivers) due to chemicals being poured into rivers as a result of traffic accidents.

Also during construction, construction workers may not follow environmental protection measures and directly discharge untreated wastewater into river courses, hence resulting in water pollution.

2) Foreign species invasion risks

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 subproject is to construct water sources and cultivate forests at key road sections along the Ridong Reservoir and it is a trans-basin or trans-boundary engineering; the subproject doesn’t involve the international trade, so no unconscious introduction because of the international trade will be made; furthermore, the subproject 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

No alien invasive species along the Ridong reservoir is determined according to the document of State Environmental Protection Administration (HuanFa [2003] No.11: Notice of the State Environmental Protection Administration of China on Promulgating the List of the First Group of Alien Invasive Species of China) and by combining on-the-spot investigation. Therefore, the possibility that the subproject implementation causes further transmission and diffusion of existing alien invasive species doesn’t exist.

7.2.2 Operation Period

Environmental risks during the operation period of the subproject mainly are risks to environment by A²/O equipment running accidents, and risks to staff’s health by septic tank and inspection well

7.2.2.1 Analysis of risks from integrated A²/O equipment running accidents

1) Accident type
Accidents mainly occur due to failure of sewage treatment system equipment.

In the design, main equipment to be used would be high quality domestic equipment. Monitoring instrument and control system has higher automatic monitoring level. Therefore, the possibility of equipment failure accidents for the sewage treatment system is small.

Partial or all sewage directly discharge due to equipment failure, or maintenance or repair of sewage treatment works and the maximum discharge is all influent. Under such circumstances, the concentration of discharged pollutants is the influent concentration of sewage treatment works.

2) Predication for accident discharge impacts

The calculation for contribution value of various pollutants to the environment under accident discharge is shown in Section 5.2.2 Environmental Impact Assessment and Environmental Protection Measures.

Concentration of CODcr and ammonia nitrogen, and composition of background values under accident discharge conditions also meet requirements of category III in Environmental Quality Standards for Surface Water (GB3838-2002).

7.2.2.2 Analysis of risks from septic tank and inspection well accidents

Septic tanks and inspection wells won’t cause risk accidents under normal conditions; however, partial organic substances in sewage generate methane, carbon dioxide, nitrogen, ammonia and hydrogen sulfide, etc due to anaerobic decomposition. Among them, methane belongs to inflammable and explosive gas, and hydrogen sulfide belongs to poisonous gas and generates fetor. These inflammable and explosive, and poisonous and harmful gases may endanger staff’s safety and health under accidents or emergencies (poisoning, explosion).

7.3 Environmental Risks Prevention and Mitigation Measures

The proposed prevention and mitigation measures for identified potential environmental risks during subproject construction and operation are listed in Table 7.3-1.

<table>
<thead>
<tr>
<th>Period</th>
<th>Type of Risk</th>
<th>Prevention and Mitigation Measures</th>
</tr>
</thead>
</table>
| Construction | Water pollution risks | 1) Environmental protection measures shall be in place for construction wastewater and domestic sewage treatment during construction, and periodic construction site inspection shall be done. Direct discharge of construction wastewater or domestic sewage to river course or bed shall be strictly prohibited.  
2) More stringent traffic control shall be provided for dangerous road sections and traffic-intensive roads by installing more traffic signs and improving road surface maintenance |
<table>
<thead>
<tr>
<th>Period</th>
<th>Type of Risk</th>
<th>Prevention and Mitigation Measures</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>to reduce risk probability.</td>
</tr>
<tr>
<td></td>
<td>Foreign species invasion risks</td>
<td>When restoring vegetation ecology in the construction areas after construction completion, local species shall be selected and introduction of foreign species is prohibited; quantity and composition of organism species in the subproject areas shall be surveyed and monitored on a regular basis. 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.</td>
</tr>
<tr>
<td></td>
<td>Integrated A²/O equipment operation accident</td>
<td>(1) Strengthen management and equipment maintenance works, and keep serviceability rate of equipment and high efficiency of treatment. Enough spare parts should be reserved for key equipment. Standby equipment or replaced equipment should be timely maintained and repaired, and periodically checked to ensure they can be timely used as demand; (2) Time of equipment maintenance and repair should be thoughtfully arranged and they should be executed when the water yield is small, and in the season or time period with good water quality as far as possible; (3) Strengthen staff’s operation skill training, establish and strictly implement running management system and operation responsibility system, and prevent the potential operation accident.</td>
</tr>
</tbody>
</table>
| Operation | Septic tank and inspection well accident | (1) Mitigation measures for septic tanks  
① The septic tanks should be periodically cleaned and dregs should be removed, and also should be frequently checked and timely repaired to ensure smoothness and perfectness of muck pipelines, muck pipeline connecting well and septic tank;  
② The septic tanks should be free from phenomena such as thick hardening or overflowing. The hardening thickness in the septic tank can’t exceed 40mm;  
③ It is not allowed to pour wastes, pollutants and sundries into the septic tank, or stacking sundries or building houses above the septic tank, and not allowed to reconstruct the sewage pipeline without permission;  
④ The cover plate of the septic tank should be covered tightly in normal times to avoid accident;  
⑤ Hot work beside the septic tank is prohibited.  
⑥ Septic tank cleaning: Before cleaning the septic tank, it is required to set the warning sign, remove barriers at the surface of the septic tank and ensure the traffic smoothness; before opening the septic tank cover, it is required to evacuate operators; steel bar and anvil, etc can’t be used for prying the septic tank cover to avoid spark, thereby causing burning or explosion; when motor is used for pumping or draining sewage, leakage of motor, power source, line and switch, etc should be checked to avoid shock accident; before the worker enters the septic tank for desilting, carbonic oxide, carbon dioxide, hydrogen sulfide, methane and harmful gases should be removed through natural ventilation; moreover, the instrument should be used for detection and the worker can’t enter the tank for working unless innocuousness and safety are determined; the operating personnel who enters the septic tank should wear the anti-static clothes. It is not allowed to enter the septic tank with keys and hard metals; the operating personnel above the septic tank should hold the safety belts with hands and can keep the contact with the operating personnel who enters the septic tank; after completing the cleaning, timely repair after recovering the septic tank cover and the trench cover. The warning sign or the protective fence should be provided if works can’t be completed in the same day. Liquid and dreg from septic tank cleaning must be transported to the professional treatment plant designated by the municipal sanitation competent department for treatment. The quality of water discharged after being treated should meet specified discharge standards. Stacking of dregs must be managed by the designated person and records should be well made to avoid the cross contamination. |
<table>
<thead>
<tr>
<th>Period</th>
<th>Type of Risk</th>
<th>Prevention and Mitigation Measures</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(2) Mitigation measures for inspection well</td>
<td>Before cleaning the inspection well, it is required to set the warning sign, remove barriers at the road and ensure the traffic smoothness; Steel bar and anvil, etc can’t be used for prying the inspection well cover to avoid spark, thereby causing burning or explosion; When motor is used for pumping or draining sewage, leakage of motor, power source, line and switch, etc should be checked to avoid shock accident; Before the worker enters the inspection well for desilting, carbonic oxide, carbon dioxide, hydrogen sulfide, methane and harmful gases should be removed through natural ventilation; moreover, the instrument should be used for detection and the worker can’t enter the well for working unless innocuousness and safety are determined; The operating personnel who enters the well should wear the anti-static clothes. It is not allowed to enter the well with keys and hard metals; The operating personnel above the well should hold the safety belts with hands and can keep the contact with the operating personnel who enters the well; After completing the cleaning, timely repair after recovering the inspection well cover. The warning sign or the protective fence should be provided if works can’t be completed in the same day. Sludge from inspection well cleaning must be transported to the professional treatment plant designated by the municipal sanitation competent department for treatment.</td>
</tr>
</tbody>
</table>
8 Resettlement Plan

8.1 Resettlement Overview

World Bank-financed Jiangxi Poyang Lake Basin and Ecological Economic Zone Small Town Development Demonstration Project - Ruijin City Mianjiang River (Lucao lake) Wetland Protection and Utilization Subproject involves Ridong County, Rentian Town, Yeping County and Xianghu Town, etc in Ruijin City. Land acquisition involves 302 persons of 82 households in 3 villages: Gaoxuan Village of Rentian Town, Xinyuan Village of Yeping County and Ruilv Village of Huangbai County. The subproject construction involves land acquisition and resettlement, which unavoidably may affect original production and living conditions of local residents. In order to ensure that people affected by land acquisition of public development projects get legal compensation to guarantee their living standards are at least no lower than that those under the no-project scenario or improved, the Leading Group Office of JPESTP prepared the resettlement plan in accordance with relevant laws and regulations of the People’s Republic of China and Jiangxi Province and safeguard policy of the World Bank-OP4.12/BP4.12 “Involuntary Resettlement”.

In order to prepare the plan, the preparation unit completed the investigation for various affected physical indicators in the subproject areas in March, 2012 under the guidance of resettlement expert of Hohai University in Nanjing, and the cooperation of People’s Government of Ruijin City, the PMO and other relevant institutions. Moreover, the investigation team investigated families (14 households) affected by the subproject land acquisition. Investigation contents mainly include family members, land acquisition impacts, family economic conditions and resettlement wishes, etc. The investigation group also listened to the comments of village committee, villager group and villagers concerning land acquisition, demolition and resettlement, and had a wide negotiation and obtained vast quantities of information, and completed resettlement action plan (RAP) in June 2012 based on the above activities. This chapter is an excerpt of the RAP.

8.2 Applicable Legal Framework

1) Land Administration Law of the People’s Republic of China (in effect on January 1, 1999 and revised on August 28, 2004);
2) Regulations on Implementing Land Administration Law of the People’s Republic of China (in effect on January 1, 1999);
3) Regulations on Administration of Housing Demolition in Cities (in effect on November 1, 2001);
4) Decision of the State Council on Deepening Reform and Carrying out Stringent Land Administration (Document No. 28 issued by State Council on October 21, 2004);
5) Guiding Views on Improving Land Compensation and Resettlement System (Document No. 238 issued by Ministry of Land Resources on November 3, 2004);
8.3 Land Acquisition

The subproject needs to permanently acquire 78 collective land plots and all of them are mudflat and water area, which involves three villages of three counties under Ruijin City and affects 302 people of 82 households. Urban collective land acquired by the subproject is shown in Table 8.3-1.

<table>
<thead>
<tr>
<th>Subproject</th>
<th>Township/Town</th>
<th>Village</th>
<th>Permanent Collective Land Acquisition (mu)</th>
<th>Affected Houses</th>
<th>Affected People</th>
<th>Type of Land</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mianjiang River Wetland Subproject</td>
<td>Rentian Town</td>
<td>Gaoxuan Village</td>
<td>21</td>
<td>26</td>
<td>95</td>
<td>Mudflat</td>
</tr>
<tr>
<td></td>
<td>Yeping Township</td>
<td>Xinyuan Village</td>
<td>31</td>
<td>32</td>
<td>120</td>
<td>Water Area</td>
</tr>
<tr>
<td></td>
<td>Huangbai Township</td>
<td>Ruliu Village</td>
<td>26</td>
<td>24</td>
<td>87</td>
<td>Water Area</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td></td>
<td>78</td>
<td>82</td>
<td>302</td>
<td></td>
</tr>
</tbody>
</table>

8.4 Situation of Affected People

8.4.1 Affected Population

The Ruijin City Mianjiang River (Lucao Lake) Wetland Protection and Utilization Subproject involves 302 people of 82 households. For the purpose of this EIA, 78 people of 16 households were surveyed, accounting for 16% of total 100 rural households. The agricultural population accounts for 99% of the total, among them, women account for 50%, people over 60 years old account for 10% and school-age children account for 23%.

8.4.2 Economic Situation of Affected People

1) Land resource conditions

In the investigated areas, land occupancy per capita is about 0.86 mu. Most cultivated land is paddy
field, for which rice is mostly planted. The annual production of rice is 500kg.

2) Income and spending of farmer household

According to sample investigation statistics, the annual average income for rural family in the project affected area is RMB 12140 and the annual average spending is RMB 8400, annual net income is RMB 10500 and annual net income per capita is RMB 2884.62.

As the agricultural products have low price, agricultural income is low, which takes small proportion in total income of the resident and is only 18.12%. Migrant workers earn the most, which occupies 65.90% of the total income. Partial work in local enterprises and public institutions and their income accounts for 8.24% of the total income.

In various spending of the resident, the largest spending is the purchase of subsidiary food for daily life, and the spending for human relationships, which accounts for 35.71% of all spending; expenses for schooling of children are also important part for household expenses, which accounts for 8.33% of all spending; however, hospitalization costs also account for 4.76% of all spending.

8.5 Resettlement

8.5.1 Grievance Redress Mechanism

1) Complaint-lodging channel
During project implementation, both changes in actual conditions and deviations in operations can lead to complaints of the affected people. Lessons learned from many ongoing and completed projects reveal that complaints of the affected people mainly involve physical indicators, compensation rates and funding. To lodge complaints about or report these potential problems, the affected people can use the following four channels and means.

- A petition office is set up at the county and the city (district) or even the province where resettlement takes place to receive, investigate and handle general complaints lodged by the general public, including the affected people.

- Local resettlement management organization at each level established according to law has the power to monitor resettlement activities of its immediate lower level in accordance with law, and can deal with complaint issues related to resettlement;

- Independent resettlement monitoring and evaluation agency monitors resettlement implementation according to relevant national stipulations and is responsible for safeguarding lawful rights and interests of the affected people and can deal with complaint issues related to infringement of rights and interests of affected people or reflect them to relevant authorities.
Legal departments such as administrative supervision, audit, discipline inspection, justice and supervision, are provided at the national, provincial, city and county levels to address relevant law-breaking or rule-breaking cases reported by the affected people.

Complaint-lodging system for the project is provided in Figure 8.5-1.

Figure 8.5-1 Structure of Complaint-Lodging System for the Affected People
2) Complaint-logging procedures
During the resettlement preparation and implementation of the project, attention is always paid to the participation of affected people and demolished units, and the complaint mechanism is established. Complaint-logging procedures for affected people are as follows:

Stage 1: if the affected people are not happy about the resettlement plan, they can lodge the complaint in oral or written form to the project housing demolition and resettlement office; in case of the oral complaint, the project housing demolition and resettlement office should handle and have a written record, and should solve within two weeks.

Stage 2: if the affected people are still not happy about the decisions made in stage 1, they can lodge the complaint to the project headquarters of the city after receiving the decisions; the project headquarters should make decisions within two weeks.

Stage 3: if the affected people are still not happy about the decisions made by the project headquarters, they can lodge the complaint to the project leading group of the city after receiving the decisions; the project leading group should make decisions within two weeks.

Stage 4: if the affected people are still not happy about the decisions made by the project leading group of the city, they can appeal to the civil court according to code of civil law after receiving the decisions.

(1) Complaints about land acquisition, housing demolition and resettlement are reported in oral or written form to village committees, which are required to solve or respond to the complaints; if such complaints cannot be solved at the village level, grievances can be raised directly to town/township or county/district project management agencies, which shall coordinate with relevant authorities to solve the complaints. If no response is received within three weeks or complainants are not happy the results, the affected people can appeal in written form to higher level project management agency;

(2) After receiving an appeal, the higher level project management agency shall address the appeal within three weeks; if it fails to address the appeal or the affected people are not happy about the results, the affected people can file a lawsuit with county/district people’s court in accordance with
legal procedures. The affected people can also directly file a lawsuit with county/district people’s court;

(3) If the affected people are still not happy about the judgment made by county/district people’s court, they can appeal to their local municipal intermediate people’s court. Judgment made by the intermediate court is final, which must be implemented by the affected people even they are still not happy.

8.5.2 Monitoring and Evaluation

To ensure smooth RAP implementation and properly resettle the affected people, the project would conduct on a regular basis monitoring of land acquisition, demolition and resettlement activities following requirements in the World Bank’s OP4.12 on Involuntary Resettlement and Operational Guidelines for Restttelent Monitoring and Evaluation under World Bank-financed Projects. Such monitoring comprises internal monitoring by resettlement agencies and independent external monitoring.

8.5.3 Resettlement Cost Estimate

Total estimated resettlement cost of the project is 842,600 yuan, including 655,200 yuan for permanent occupation of collective land, or 77.76% of the total; 164,800 yuan for various taxes and fees, or 19.56% of the total; 50,000 yuan for external monitoring, or 5.93% of the total; and 65,500 yuan for contingencies, or 7.77% of the total.
9 Public Consultation and Information Disclosure

9.1 Purpose

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, keeing 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 feed back 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 subproject’s design and implementation, thereby maximizing comprehensive and long-term benefits of the subproject.

9.2 Survey Approaches and Process

During the evaluation, ways such as site visit, on-site notice, online disclosure, questionnaire, discussion meeting, report disclosure and newspaper disclosure are combined for public consultation and information disclosure. The disclosure website is the website of the people’s government of Ruijin city www.ruijin.com.cn. Data related to public consultation and information disclosure are shown in Annex 4.

Pursuant to requirements of PRC Environmental Impact Assessment Law, Tentative Methods for Public Participation in Environmental Impact Assessment issued by the Ministry of Environmental Protection and the World Bank Operation Policy OP4.01, two rounds of public consultation and information disclosure were conducted in the EIA process. The first round was conducted after environmental issues were screened and before EIA TOR was finalized and the second round was conducted after the draft EIA was prepared. During the assessment, approaches such as site visit, on-site notice, online disclosure, questionnaire, discussion meeting, report disclosure and newspaper disclosure are combined for public consultation and information disclosure. The subproject conducted two rounds of site visit (a total of 96 people were visited), one round of on-site notice, 2 rounds of online disclosure, one round of questionnaire survey, one round of discussion meeting, two rounds of report disclosure and one round of newspaper disclosure. The disclosure website is the website of the People’s Government of Ruijin City www.ruijin.com.cn. Newspaper disclosure was conducted on Southern Yangtze River Metropolitan News on August 30, 2012. Materials related to public consultation and information disclosure are shown in Annex 4 and Table 9.2-1.
<table>
<thead>
<tr>
<th>Stage</th>
<th>Approach</th>
<th>Contents</th>
<th>Participants</th>
<th>Date/Duration</th>
<th>Venue</th>
<th>World Bank Requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td>First Round</td>
<td>Site visit</td>
<td>Informing subproject overview and collecting public views and comments over the subproject.</td>
<td>About 38 people from 20 households in the subproject areas</td>
<td>May 9-10, 2012</td>
<td>Hupo Village, Xiajie Village, Gaoxuan Village, Xinyuan Village, Juelin Village, Zhugang Village</td>
<td>OP4.01: Frist public consultation is conducted before screening of environmental issues and finalization of EA TOR.</td>
</tr>
<tr>
<td></td>
<td>On-site notice</td>
<td>Informing subproject overview, contents of EIA TOR, proposed environmental protection measures to be taken, names and contact information of subproject owner and EIA institutes, and collecting public views and comments.</td>
<td>Residents in the subproject areas</td>
<td>May 9, 2012</td>
<td>Hupo Village, Xiajie Village, Gaoxuan Village, Xinyuan Village, Juelin Village, Zhugang Village</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Online disclosure</td>
<td>Informing subproject overview, environmental impacts and relevant mitigation measures, and collecting public views and comments.</td>
<td>Affected residents. Total 50 copies of questionnaire were distributed and 50 valid copies were returned.</td>
<td>May 9-6 June 5, 2012</td>
<td>Hupo Village, Xiajie Village, Gaoxuan Village, Xinyuan Village, Juelin Village, Zhugang Village</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Questionnaire</td>
<td>Abbreviated EIA disclosure informing subproject overview, draft EIA conclusion, proposed environmental protection measures to be taken, and names and contact information of subproject owner and EIA institutes, and collecting public views and comments.</td>
<td>Residents in the subproject areas</td>
<td>July 13-25, 2012</td>
<td>Ruijin PMO and village committees</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Online disclosure</td>
<td>Full EIA disclosure placing draft of full EIA at PPMO and Ruijin City PMO for public access and collecting further comments of the public.</td>
<td>Residents in the subproject areas</td>
<td>August 3, 2012</td>
<td>Ruijin City PMO and village committees</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Site visit</td>
<td>Informing EIA conclusion and proposed environmental protection measures to be taken, collecting further comments of the public and discussing issues of public concern.</td>
<td>Residents in the subproject areas, about 58 from 30 households</td>
<td>July 25-26, 2012</td>
<td>Hupo Village, Xiajie Village, Gaoxuan Village, Xinyuan Village, Juelin Village, Zhugang Village</td>
<td>OP4.01: second public consultation is conducted after completion of EA draft and before EA finalization.</td>
</tr>
<tr>
<td></td>
<td>Discussion meeting</td>
<td>Informing EIA conclusion, environmental impacts and relevant mitigation measures, listening to public comments, requirements and suggestions, and discussing issues of public concern.</td>
<td>Residents in the subproject areas, representatives of farmers affected by land acquisition</td>
<td>July 25, 2012</td>
<td>Hupo Village, Xiajie Village, Gaoxuan Village, Xinyuan Village, Juelin Village, Zhugang Village</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Full EIA disclosure</td>
<td>Placing draft of full EIA at PPMO and Ruijin City PMO for public access and collecting further comments of the public.</td>
<td>Residents in the subproject areas</td>
<td>August 3, 2012</td>
<td>Ruijin City PMO and village committees</td>
<td></td>
</tr>
</tbody>
</table>
9.3 Public Consultation and Survey Process and Contents

9.3.1 First Site Visit

The unit, after screening the subproject environment problems and before finalizing the outline (EIA TOR), took the first visit and investigation for 38 persons of 20 households at the subproject location from May 9, 2012 to May 10, 2012 to notify them of subproject overview and collect preliminary views of the public about the subproject.

(1) Investigation results and suggestions

During visit and investigation, the public takes the positive attitude towards the subproject construction, without dissenting opinions. The summarization of public comments or suggestions is shown in Table 9.3-1.

<table>
<thead>
<tr>
<th>Main Public Comments</th>
<th>Addressing of Public Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Hope to complete the subproject construction to serve people in the subproject area as far as possible. 2. Try to shorten the construction period to eliminate the temporary impacts during the construction period as early as possible such as construction dust and landscape impacts, etc.</td>
<td>1. The construction unit thanks support of the public for the subproject, actively takes the public’s opinions and reasonably arranges the construction period. 2. In order to reduce dust from construction, site layout is optimized: keep the material yard far away from the resident area and frequently sprinkle on the road to prevent environmental pollution by dust raised by the passing vehicles. 3. In order to control the impacts of construction period on the landscape, the construction unit indicates that it will strengthen the management for construction environment and strictly implement environmental measures during the construction period for civilized construction.</td>
</tr>
</tbody>
</table>

9.3.2 First On-site Notice and Online Disclosure

After accepting the EIA task, the EIA institutes issued public notices at Hupo Village, Xiajie Village, Gaoxuan Village, Xinyuan Village, Julin Village and Zhugang Village on May 9, 2012, and uploaded notices at the website of People's Government of Ruijin City (www.ruijin.com.cn) on May 23, 2012. The notice clearly informs subproject features, EIA procedures and contents, main items proposed to seek for public comments, main approaches for public consultation and effective
time of public consultation. There are no dissenting opinions for the subproject and also no feedback concerning serious negative environmental impacts during the disclosure period.

9.3.3 Questionnaire Survey

In the progress of site survey and environmental status investigation, we conducted extensive consultation with government departments at each level and the general public at the areas that the subproject involve and visited subproject areas and the people affected by land acquisition to get to know the public’s attitude towards the subproject and listen to their comments and suggestions. In order to widely collect public comments for the subproject, we distributed the uniform questionnaire, which fully describes subproject profile, potential environmental impacts and related environmental protection measures. We totally distributed 50 questionnaires and took back 50 effective questionnaires during public consultation and social survey period.

(1) Survey participants

Survey participants are mainly local affected people and people concerned about the subproject and focus of the survey is on local residents in the subproject areas who could be affected by the subproject. Basic information of survey participants is shown in Table 9.3-2.

| Table 9.3-2 Participants of Questionnaire Survey for Public Consultation |
|-----------------------------|-------------------------------|------------------|
| Item                        | Survey Outcome (Person)       | % of Total Surveyed |
| Sex                         |                               |                  |
| 1) Male                     | 28                            | 56%              |
| 2) Female                   | 22                            | 44%              |
| Age                         |                               |                  |
| 1) Under 18                 | 4                             | 8%               |
| 2) 18-39                    | 36                            | 72%              |
| 3) 40-59                    | 7                             | 14%              |
| 4) Above 60                 | 3                             | 6%               |
| Occupation                  |                               |                  |
| 1) Official                 | 5                             | 10%              |
| 2) Worker                   | 6                             | 12%              |
| 3) Farmer                   | 27                            | 54%              |
| 4) Freelancer               | 12                            | 24%              |
| Level of Education          |                               |                  |
| 1) College and above        | 5                             | 10%              |
| 2) High school              | 29                            | 58%              |
| 3) Junior middle school     | 7                             | 14%              |
| 4) Primary school           | 9                             | 18%              |
| Ethnic Group                |                               |                  |
| 1) Han                      | 50                            | 100%             |
| 2) Other                    | 0                             | 0                |

(2) Survey results and suggestions
Results of the survey show positive attitude of the public towards the proposed subproject. Of the 50 participants, 3 responded “do not care” and the rest 47 responded “support subproject implementation”, believing after its completion, the subproject would improve local ecological and living environment, promote local socioeconomic development and offer real benefits to the general public.

The public considers that the impacts of the subproject construction on the environment are mainly shown in the subproject construction period. The construction period will temporarily have certain negative impacts on the local environment, which are mainly reflected: the construction noise will have impacts on nearby residents and local environment, and other impacts are heavy traffic and temporary land occupation during the construction period, so reasonable environmental protection measures and subproject management should be taken to control and migrate. The statistics of questionnaire survey results are shown in Table 9.3-3.

<table>
<thead>
<tr>
<th>Item</th>
<th>Results</th>
<th>Number of People</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Do you know the subproject?</td>
<td>①Yes</td>
<td>40</td>
<td>80%</td>
</tr>
<tr>
<td></td>
<td>②Yes, but only a little bit</td>
<td>6</td>
<td>12%</td>
</tr>
<tr>
<td></td>
<td>③No</td>
<td>4</td>
<td>8%</td>
</tr>
<tr>
<td>2. Your hope towards land acquired by the subproject is</td>
<td>①Reasonable financial compensation</td>
<td>46</td>
<td>82%</td>
</tr>
<tr>
<td></td>
<td>②Land allocation at a different location or resettlement</td>
<td>4</td>
<td>8%</td>
</tr>
<tr>
<td></td>
<td>③No acquisition</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>3. In your view, what are the key environmental issues/problems during subproject implementation? (multiple choice allowed)</td>
<td>①Construction noise</td>
<td>11</td>
<td>22%</td>
</tr>
<tr>
<td></td>
<td>②Dust due to construction activities</td>
<td>37</td>
<td>74%</td>
</tr>
<tr>
<td></td>
<td>③Temporary land occupation for construction</td>
<td>42</td>
<td>84%</td>
</tr>
<tr>
<td></td>
<td>④Traffic jam during construction</td>
<td>35</td>
<td>70%</td>
</tr>
<tr>
<td></td>
<td>⑤Construction safety</td>
<td>9</td>
<td>18%</td>
</tr>
<tr>
<td>4. In your view, what are the key environmental issues/problems during subproject operation? (multiple choice allowed)</td>
<td>①Water pollution</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>②Air pollution</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>③Noise pollution</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>④Ecological damage</td>
<td>2</td>
<td>4%</td>
</tr>
<tr>
<td></td>
<td>⑤Landscape impact</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>⑥No impact</td>
<td>48</td>
<td>96%</td>
</tr>
<tr>
<td>5. Do you think implementation of the subproject contributes to local socioeconomic development?</td>
<td>①Yes</td>
<td>47</td>
<td>84%</td>
</tr>
<tr>
<td></td>
<td>②No</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>③Not sure</td>
<td>3</td>
<td>6%</td>
</tr>
<tr>
<td>6. In your view, what are the benefits resulting from implementation of the subproject? (multiple choice allowed)</td>
<td>①Contributing to enabling local resource advantages</td>
<td>46</td>
<td>92%</td>
</tr>
<tr>
<td></td>
<td>②Contributing to protecting local ecological environment</td>
<td>50</td>
<td>100%</td>
</tr>
<tr>
<td>Item</td>
<td>Results</td>
<td></td>
<td></td>
</tr>
<tr>
<td>------</td>
<td>---------</td>
<td></td>
<td></td>
</tr>
<tr>
<td>③Improving life quality of local people</td>
<td>47 94%</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

7. What’s your attitude towards the subproject?

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>①Support</td>
<td>47 94%</td>
</tr>
<tr>
<td>②Oppose</td>
<td>0 0%</td>
</tr>
<tr>
<td>③Do not care</td>
<td>3 6%</td>
</tr>
</tbody>
</table>

3) Addressing of public feedback

The investigation results fed back from the questionnaire (shown in table 9.3-3) indicate that most publics take the positive attitude on the subproject construction. Of course, the public also proposes the environmental problems that they worry about when giving favorable considerations to the active role of subproject construction, which are mainly reflected that they require to practically and properly solving noise and dust during construction, temporary land occupation and heavy traffic caused by subproject construction, etc. The addressing of above key public commonents is shown in Table 9.3-4.

<table>
<thead>
<tr>
<th>No.</th>
<th>Key Public Comments</th>
<th>Key Publics Proposing Comments</th>
<th>Addressing of Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Noise during the construction period</td>
<td>Professionals, government officials and people in the subproject areas</td>
<td>Fully analyze the scope and degree of impacts caused by the noise during the subproject construction period; take effective noise reduction measures for the construction period.</td>
</tr>
<tr>
<td>2</td>
<td>Dust during construction period</td>
<td>Professionals, government officials and people in the subproject areas</td>
<td>Fully analyze the scope and degree of impacts caused by dust during construction; take effective dust reduction measures for the construction period.</td>
</tr>
<tr>
<td>3</td>
<td>Subproject temporary land occupation</td>
<td>Professionals and people in the subproject areas</td>
<td>Reasonably optimize the subproject layout, reduce land occupation and timely repair land temporarily occupied by the construction.</td>
</tr>
<tr>
<td>4</td>
<td>Heavy traffic</td>
<td>People in the subproject areas</td>
<td>Reasonably design the construction transportation routes to prevent them from crossing the resident intensive areas, and coordinate the time of vehicle passing to avoid the heavy traffic; take reducing the impacts on living of residents along the route as the premises.</td>
</tr>
</tbody>
</table>

9.3.4 Second Online Disclosure and Abbreviated EIA Disclosure

The EIA institutes placed the abbreviated EIA at Ruijin City PMO and village committees on July 13, 2012 and conducted the second online disclosure on the web of Ruijin City People’s
government (www.ruijin.com.cn), disclosing to the public conclusions of the draft EIA, the subproject’s environmental impacts and proposed mitigation measures to be taken, key subject matters for public comments and main approaches and validity period of public consultation. During the disclosure period, no counterviews and other comments were received.

9.3.5 Second Site Visit

The EIA institutes carried out the second site visit to and survey of 58 people from 30 households in the subproject areas from July 25 to July 26, 2012 after completing the draft EIA and before finalizing the draft, keeping the public informed of EIA conclusions, information on the first public consultation and collect their further comments on the subproject.

(1) Survey results and suggestions

During the site survey, the public took positive attitude towards implementation of the subproject, agreed to environmental protection measures proposed in the EIA and did not express any counterview. Public comments and suggestions are summarized in Table 9.3-5.

<table>
<thead>
<tr>
<th>No.</th>
<th>Key Public Comments</th>
<th>Addressing of Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Hope the subproject to be completed as quickly as possible and strengthen management of the subproject to realize its value.</td>
<td>The implementing agency indicated that it would take public comments and strengthen management of the subproject during its construction period to reduce impacts on people in the subproject areas and realize the subproject’s value.</td>
</tr>
</tbody>
</table>

9.3.6 Discussion Meeting

In order to further enhance public understanding of the subproject, thereby proposing further suggestions or comments for subproject implementation, the EIA institutes held a discussion meeting on July 25, 2012. Main participants of the meeting include representatives of residents in the subproject areas, government officials and other related stakeholders. The participants believed that the subproject implementation could protect and improve water quality at the water source zones, provide ideal habitats for animals and plants and would provide effective demonstration for the construction of Poyang Lake Basin and Ecological Economic Zone. The public expressed their support to the subproject implementation.

In addition, the public appointed that it would be necessary to control the impacts of dust during construction on surrounding residents. In response, the implementing agency indicated that in order to reduce air pollution, keep the material yard far away from the resident area, isolate feed port and
outlet of construction machinery (such as mixer) and regularly spray water on the pavement to prevent environmental pollution of dust generated by vehicles passing by.

9.3.7 Report Disclosure

On August 3, 2012, the EIA institutes placed copies of the draft EIA at Ruijin City PMO and some village committees for public access. During the disclosure period in August 2012, no counterviews for the subproject or feedback about significant negative environmental impacts were received.

9.3.8 Newspaper Disclosure

To keep the general public informed of environmental impact assessment for JPESTP and collect relevant feedback in a timely manner, the project’s composition, impacts and countermeasures were disclosed on Southern Yangtze River Metropolitan News on August 30, 2012 (see Annex 4 for details).
10 Environmental Management Plan

10.1 Objectives of Environmental Management Plan

Environmental management is an important part of project management and is also an important element in achieving effective environmental protection under the project. The objectives of preparing environmental management plan (EMP) are to improve project activity screening, site selection, design and implementation through developing practicable and feasible measures for mitigating or offsetting adverse environmental impacts and enhancing positive environmental impacts. In short, measures shall be taken during project implementation to mitigate and manage adverse environmental impacts, assess actual effectiveness of mitigation measures through implementing environmental monitoring plan, and based on monitoring results, propose recommendations for further improving mitigation measures.

10.2 EMP Contents

EMP for the project comprises the following:

1) Environmental impacts and mitigation measures: engineering and management measures taken to prevent or mitigate adverse project impacts during construction and operation;
2) Environmental management and supervision plans: environmental supervision activities carried out to ensure environmental protection measures are taken in parallel with project implementation;
3) Environmental monitoring plan: environmental monitoring activities conducted to eliminate environmental pollution during construction and operation and to ensure safe project operation and environmental improvements in the project areas;
4) Capacity building (i.e. staff training) plan: knowledge and skill training organized during project implementation for project management staff, supervision engineers, part-time or full-time environmental management staff to ensure EMP implementation.

10.3 Environmental Management Agencies

Environmental management during construction will be carried out by the implementing agency, environmental supervision engineer and the contractor with focus on management by the owner and environmental engineer. Environmental management during operation will be carried out by PMOs and environmental management stations. Framework of environmental management agencies is provided in Figure 10.3-1 and their roles and responsibilities are indicated in Table 10.3-1.
Figure 10.3-1  Framework of Environmental Agencies under JPESTP

![Diagram showing the framework of environmental agencies under JPESTP](image)

Table 10.3-1  Roles and Responsibilities and Staff Establishment of Environmental Management Agencies

<table>
<thead>
<tr>
<th>Agency</th>
<th>Type</th>
<th>Staff Establishment (No. of People)</th>
<th>Roles and Responsibilities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Various-level Environmental Protection Administrations</td>
<td>Supervision</td>
<td>1</td>
<td>1. Undertakes whole-process environmental monitoring and management in accordance with law, including approval of Project EIA (or subproject EIA/s), environmental monitoring and management during project implementation and operation.</td>
</tr>
<tr>
<td>World Bank</td>
<td>Supervision</td>
<td>1</td>
<td>1. Sends supervision missions every year to supervise project implementation; 2. Reviews implementation of the project’s Loan Agreement and EMP.</td>
</tr>
<tr>
<td>County (City) Health and Epidemic Control Authorities</td>
<td>Supervision, monitoring</td>
<td>1-2</td>
<td>1. Supervises and monitors water quality of water supply subproject; 2. Supervises, provides guidance to and monitors schistosomiasis control under flood control subproject.</td>
</tr>
<tr>
<td>PPMO</td>
<td>Management</td>
<td>1</td>
<td>1. Supervises EMP implementation; 2. Supervises and coordinates enforcement of domestic and World Bank requirements for environmental management;</td>
</tr>
<tr>
<td>County (City) PMO</td>
<td>Management</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>------------------</td>
<td>------------</td>
<td>---</td>
<td></td>
</tr>
</tbody>
</table>
| **3.** Submits relevant reports to the World Bank every six months;  
**4.** Inspects environmental protection activities of project counties (cities);  
**5.** Coordinates with other relevant authorities to address significant environmental issues;  
**6.** Engages panel of external environmental specialists to review environmental protection activities. |

<table>
<thead>
<tr>
<th>County (City) Communications Bureau</th>
<th>Management</th>
<th>1</th>
</tr>
</thead>
</table>
| **1.** Supervises implementation of subproject environmental management rules and institutions;  
**2.** Incorporates environmental protection measures in the EMP into construction contracts;  
**3.** Employs supervision engineer and supervises and coordinates its work (including qualification, responsibilities and management);  
**4.** Organizes EMP implementation;  
**5.** Organizes special-subject study or relevant investigations;  
**6.** Properly documents and compiles complaints during construction and operation, clarifies to the public result of addressing complaints and addresses public complaints;  
**7.** Reviews environmental supervision and environmental consulting reports;  
**8.** Submits quarterly reports (statements) to PPMO;  
**9.** Signs off on site checklists submitted by the contractor and supervision engineer, verifies environmentally sensitive issues and archives the checklists;  
**10.** Receives environmental supervision mission (including World Bank supervision mission). |

<table>
<thead>
<tr>
<th>County (City) Water Bureau</th>
<th>Management</th>
<th>1</th>
</tr>
</thead>
</table>
| **1.** Takes charge of routine environmental supervision and management during construction and operation of road subproject;  
**2.** Takes charge of completion acceptance. |

<table>
<thead>
<tr>
<th>Subproject Owner</th>
<th>Management</th>
<th>1</th>
</tr>
</thead>
</table>
| **1.** Supervises implementation of subproject environmental management rules and institutions;  
**2.** Supervises and coordinates work of supervision engineer (including qualification, responsibilities and management);  
**3.** Organizes special-subject study or relevant investigations;  
**4.** Properly documents and compiles complaints during construction and operation, clarifies to the public result of addressing complaints and addresses public complaints;  
**5.** Reviews environmental supervision and environmental consulting reports;  
**6.** Takes charge of subproject’s soil and water conservation supervision and management;  
**7.** Takes charge of routine environmental supervision and management under flood control and water supply subprojects;  
**8.** Takes charge of soil and water conservation works completion acceptance. |
<table>
<thead>
<tr>
<th>EIA Institute</th>
<th>IEA</th>
<th>A few</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Visits project sites and conducts EIA;</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Prepares EMP.</td>
<td></td>
<td></td>
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<tr>
<td>6. Submits quarterly reports (statements) to PPMO and county (city) PMO;</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. Signs off on site checklists submitted by the contractor and supervision engineer, verifies environmentally sensitive issues and archives the checklists;</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8. Receives environmental supervision mission (including World Bank supervision mission).</td>
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</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Supervision Engineer (also undertakes environmental supervision)</th>
<th>Consulting</th>
<th>1-2</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Supervision engineer is employed separately by PPMO or county (city) PMO;</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Supervises and inspects domestic sewage treatment, production wastewater treatment, implementation of soil erosion, waste gas, dust and noise control measures, disposal of production and domestic garbage and epidemic control;</td>
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</tr>
<tr>
<td>3. Fills out on a regular basis all checklists in the annexes of ECOP;</td>
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</tr>
<tr>
<td>4. Proposes and follows up on solutions to rectify environmental issues/problems encountered by the contractor during construction, including issuing rectification notices and checklists and archiving relevant documentation;</td>
<td></td>
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</tr>
<tr>
<td>5. Submits to county (city) PMO weekly implementation progress reports.</td>
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<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Contractor</th>
<th>Implementation</th>
<th>Many</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Develops environmental protection measures to be implemented during construction;</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Accepts supervision and inspection of all aspects of environmental protection by supervision engineer, World Bank and various-level environmental protection administrations;</td>
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<td></td>
</tr>
<tr>
<td>3. Sets up a feedback mechanism and completes rectification within 3 working days after receiving rectification notice (or within 10 working days when addressing of issues/problems needs coordination by management agencies);</td>
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</tr>
<tr>
<td>4. Prepares, together with supervision engineer, prior to construction commencement and submits to county (city) PMO a construction site checklist;</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Submits to county (city) PMO weekly implementation progress reports.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Environmental Monitoring Agency</th>
<th>Monitoring</th>
<th>1-2</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Undertakes environmental monitoring during implementation and operation following EMP requirements, archives and submits to county (city) PMO monitoring reports.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Soil and Water Conservation Agency</th>
<th>Monitoring</th>
<th>1-2</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Undertakes soil and water conservation monitoring during implementation and operation following requirements in Soil and Water Conservation Monitoring Plan, archives and submits to county (city) PMO monitoring reports.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
10.3.1 Implementing Agency

10.3.1.1 Management Institution

The PPMO is responsible for environmental management, which would set up an Environmental Management Center with 2-3 full-time staff and a number of part-time staff, which will be responsible for overall leadership and organization of environmental protection activities during project implementation.

10.3.1.2 Management Tasks

During project implementation, the implementing agency will be responsible for environmental protection and management activities in all project areas from construction initiation to completion acceptance, including preparation of implementation plan for environmental protection measures, outsourcing and review of preliminary design, tendering design, construction organization, environmental monitoring and soil and water conservation monitoring, environmental supervision and completion acceptance. Specific tasks are listed below:

1) Environmental protection and soil and water conservation design management

   a) Preparing Plan for Implementing Environmental Protection Measures during Implementation of JPESTP based on the approved EIA, soil and water conservation plans and relevant approvals;
   b) Entrusting qualified design institute(s) to carry out design of environmental protection works according to the above implementation plan;
   c) After results of preliminary design for environmental protection facilities are reviewed and approved by environmental protection administrations, tendering design and construction design would be carried out.

2) Management of tendering for environmental protection and soil and water conservation works

   The implementing agency is responsible for preparing and reviewing environmental protection articles in the tender documents and contracts and ensuring all approved environmental protection measures are incorporated into the tender documents and contracts; carrying out in a timely manner public tendering for each scheme according to design outcomes and progress to ensure environmental protection and soil and water conservation measures are implemented as scheduled.

3) Environmental monitoring management

   a) Preparing environmental monitoring and soil and water conservation monitoring plans following approved EIA, soil and water conservation plans and relevant approvals;
   b) Reviewing qualifications of environmental monitoring and soil and water conservation monitoring agencies, managing contracts for environmental monitoring and soil and water
conservation monitoring, conducting inspections and assessment on laboratories of monitoring agencies; reviewing monitoring reports submitted by monitoring agencies, analyzing reliability of monitoring outcomes and environmental issues/problems as reflected in the reports;
c) Making use of monitoring outcomes to test implementation effectiveness of environmental protection and soil and water conservation measures and urging the contractor to develop and implement corresponding solutions to environmental impact issues/problems as reflected in the monitoring outcomes.

4) Routine management during construction

a) Developing annual environmental protection plan;
b) Reviewing and allocating annual budget for environmental protection;
c) Supervising implementation of environmental protection measures by the contractor;
d) Coordinating with environmental protection administrations and other administrations;
e) Addressing project-related pollution incidents and disputes and reporting them to higher-level authorities;
f) Preparing annual environmental protection reports and submitting monthly, quarterly and annual statements to higher-level authorities;
g) Organizing environmental education and training.

5) Management of completion acceptance of environmental protection facilities

a) Entrusting evaluation agency(ies) with relevant qualifications to prepare Report on Survey of Completion Acceptance of environmental protection works under Yan’an Water Supply Project;
b) Organizing acceptance of single and special works and acceptance during construction;
c) Organizing acceptance of special or comprehensive environmental protection works while carrying out acceptance of the overall project;
d) Inviting local environmental protection and water administrations to chair acceptance of environmental protection works.

10.3.2 Environmental Supervision

10.3.2.1 Purpose of Supervision

During project implementation, the construction supervision engineer (also serves as environmental supervision engineer) shall follow requirements in environmental protection design, conduct environmental supervision during construction, carry out all-round supervision and inspection of implementation of environmental protection measures by construction units and effectiveness of these measures, and address and resolve in a timely manner environmental pollution incidents. Outcomes of environmental supervision during construction will be used as the
basis for project acceptance and will be incorporated into the acceptance report as a special chapter.

10.3.2.2 Roles and Responsibilities of Environmental Supervision Engineer

The environmental supervision engineer shall follow national and local governments’ guidelines, policies, decrees, laws and regulations on environmental protection and supervise contractors to implement environmental protection-related articles in their contracts. Main roles and responsibilities are to:

1. prepare environmental supervision plan and develop subjects and items of environmental supervision;
2. take charge of reviewing environmental protection articles in tendering and bidding documents;
3. conduct supervision over contractors to prevent and mitigate construction-induced environmental pollution and destructions to farmland and wild flora and fauna, as well as prevent fire;
4. carry out all-round supervision and inspection of implementation of environmental protection measures by construction units and effectiveness of these measures, building on survey and monitoring data; and address and resolve in a timely manner environmental pollution incidents;
5. conduct all-round inspection of cleaning and restoration of dump sites and construction “footprints” by construction units, including side slope stability, restoration of construction footprints, afforestation and afforestation rate;
6. be responsible for implementing environmental supervision, reviewing relevant environmental reporting, and working out requirements for construction management corresponding to results of air quality, ambient air and noise monitoring to minimize adverse environmental impacts of construction; and
7. maintain good supervision documentation during daily work, prepare supervision report and participate in completion acceptance.

10.3.2.3 Management Agency and Work Procedures

Environmental supervision is an important component of environmental management and is relatively independent. Therefore, an independent and qualified environmental supervision agency shall be established. In compliance with contract articles and national environmental protection law, regulations and policies, the agency shall supervise, review and evaluate implementation of environmental protection measures by construction units, and timely identify and rectify construction activities in violation of contract articles and national environmental protection requirements. Organizational setup and work procedures are given in Figure 10.3-1.
10.3.3 Environmental Management by the Contractor

10.3.3.1 Management Agency

The contractor shall set up Environmental Protection and Management Office as a key agency responsible for implementing environmental protection during construction. When implementing environmental protection, the office shall strictly follow provisions on environmental protection and soil and water conservation as specified in the contract and bidding documents.

10.3.3.2 Management Roles and Responsibilities

The contractor shall be responsible for managing its own environmental protection activities and those during production and construction. Specifically, the contractor shall:

(1) provide at least one full-time staff to be responsible for environmental work, who shall receive environmental training so that he/she is qualified for the job;
(2) prepare annual environmental protection plan;
(3) inspect progress in construction of environmental protection facilities and quality, operation and testing of these facilities, address issues/problems during implementation;
(4) communicate and consult during construction with the general public in the project areas, set up a bulletin board in each construction site, keep the general public informed of specific construction activities and construction time, and provide them with contact person(s) and telephone number(s) so that they can complain about and provide suggestions on construction activities;
(5) maintain accounting on use of annual environmental protection budget;
(6) report on implementation of environmental protection articles in the contract. The contractor is
urged to monitor its environmental activities and provide a daily or weekly report on environmental performance. The PMO and Construction Supervision Group would supervise these activities and review the report.

(7) The contractor shall keep a deposit out of its contract value in an amount equivalent to about 3% of its annual budget to ensure that it satisfactorily carries out environmental management.

10.4 Summary of Environmental Protection Measures

Following EIA results in Chapter 5, environmental protection measures for different stages of the project are summarized in Table 10.4-1.
<table>
<thead>
<tr>
<th>Stage</th>
<th>Medium</th>
<th>Mitigation Measures</th>
<th>Implementing Agency</th>
<th>Supervision Agency</th>
<th>Monitoring Agency</th>
<th>Monitoring Item</th>
<th>EMP Cost (10,000 yuan)</th>
</tr>
</thead>
</table>
| Design    |             | (1) Tree species would be carefully selected when designing afforestation models to protect the safety of local tree species and avoid disturbances of foreign tree species. When selecting land for afforestation, existing forest with canopy density greater than 0.2 cannot be selected to avoid and bushes and thinly stocked secondary forest land shall be selected as much as possible as they can provide habitats and shelters to local wildlife.  
(2) When design septic tank, reasonable construction process and scientific construction method shall be designed. The location of material stock yard shall be reasonably chosen to prevent soil erosion; the location of septic tank shall be reasonably selected to be away from kitch as far as possible. Water quality requirements and maintenance requirements shall be well balanced.  
(3) When designing garbage collection station, appropriate garbage collection station construction way shall be chosen in combination of current rural conditions; the economic and reasonable waste transportation route with minimum times of passing through the village shall be considered.  
(4) When designing rural sewage treatment engineering, appropriate sewage treatment process shall be selected through scheme comparison; the site selected shall be located at downwind direction with maximum wind direction frequency and good engineering geological conditions, while at the same time taking into consideration the possibility for expansion and the convenience for discharge and utilization of sewage and sludge. | Design institute     | Owner          |                   |                   |                     |
| Construction | Ecological Environment | Terrestrial ecology (1) Construction workers shall be arranged to live, whenever and wherever possible, in houses of residents nearby construction areas to reduce building of construction camps. When building of construction camps is needed, their management shall be strengthened by building administration and living facilities in the designated locations to minimize land and vegetation occupation, damages to natural vegetation and losses of natural productivity;  
(2) During construction, protection measures shall be taken to address surface disturbances due to construction activities. For exposed slopeland, engineering measures shall be adopted to reduce soil erosion while land reafforestation shall be conducted in a timely manner in | Contractor          | Owner          |                   |                   |                     |
combination with landscaping and garden greening;
(3) Warning signs will be put up in construction sites to indicate construction areas. Construction activities will be confined in the pre-designated areas. Construction workers are not allowed to enter non-construction areas to avoid damages to vegetation outside construction areas;
(4) Construction management shall be strengthened and low-noise equipment shall be selected as much as possible to minimize impacts on terrestrial animals and plants;
(5) Ecological protection dissemination and education will be provided for construction workers and residents nearby construction areas during construction in the forms of public notice and brochure. Capture of frogs, snakes, birds and beasts shall be prohibited to reduce impacts of construction activities on local terrestrial animals and effective measures shall be taken to control harms from mice;
(6) Measures shall be taken during afforestation to prevent introduction of invasive organisms.
(7) When restoring vegetation ecology in the construction areas after construction completion, local species shall be selected and introduction of foreign species is prohibited; quantity and composition of organism species in the project areas shall be surveyed and monitored on a regular basis. 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.

Aquatic ecology
1) Environmental protection awareness shall be improved. Environmental and resource protection shall be fully considered during construction. The principle of “Three Synchronous Actions” for project construction and resource protection shall be adhered to;
2) Activities including sand and gravel acquisition from the river course, dumping of construction debris to river, change of river route and increase of sediment charge shall be prohibited during construction, as these activities would have significant direct impacts on fish growth and reproduction as well as fish habitat;
3) Destroyed vegetation shall be recovered as soon as possible to prevent soil and water loss, avoid and reduce silt and hazardous substances into rivers and consequent adverse impacts on water environment and fishery;
4) Construction of rural wastewater treatment facilities shall be accelerated and management and supervision shall be strengthened to ensure environmental requirements are strictly enforced for construction. Domestic sewage and industrial wastewater are prohibited to be discharged into drinking water source protection areas and other

Contractor  Owner
### Water Environment

#### Wastewater from concrete mixing

1. Process of flocculation sedimentation in an intermittent manner will be adopted to treat wastewater from concrete mixing system. Two containers with volume more than 1 m³ for each would be provided for each mixer and used alternately. Attention shall be paid to cleaning the containers on a regular basis. Supernatant will be pumped back for flushing concrete mixing system.
2. Direct discharge of wastewater from production activities into river courses is strictly prohibited.

#### Wastewater from vehicle and ground flushing

1. Set up a settling pond with capacity greater than 33 m³ at each of the vehicle flushing site and effluent is used for watering construction access roads. Silt shall be cleaned on a regular basis.
2. Direct discharge of wastewater from production activities into river courses is strictly prohibited.

#### Domestic sewage

1. Most construction workers would rent houses of villagers along the construction sites and only some would live in a few construction camps at Lucao Lake Wetland Environmental Education Base. Oil trapping tank and septic tank would be used for treatment of domestic sewage at these camps and effluent would be used for farmland irrigation after meeting the Dry Farming Standard in Farmland Irrigation Water Quality Standards (GB5084-2005).
2. Direct discharge of wastewater from production activities into river courses is strictly prohibited.

### Soil and Water Conservation

Specific measures for soil erosion control include:

1. **Ridong Reservoir Wetland Protection and Conservation**
2. **Engineering Measure**
   - Intercepting/drainage ditch: in the course of garbage collection station, the intercepting ditch made of mortar laid stone excavates original side slope within 5m, to block the flowing of the rainwater fallen from original slope into the site, the total length of intercepting/drainage ditch is 120m in north. Both are built by mortar laid stone.
3. **Temporary soil and water conservation measures**
   - Temporary drainage ditch and temporary settling pit: during the stage of sewage interception engineering construction, the surrounding area of engineering construction lays drainage ditch to drain the rainwater within the site and to protect the construction area from being eroded by rainwater and thus resulting in water loss and soil erosion. The total length of temporary drainage ditch laid is 220m, with one temporary Settling Pond being set for every 100m along temporary drainage ditch.

<table>
<thead>
<tr>
<th>Contractor</th>
<th>Owner</th>
<th>Qualified agency engaged by the project owner through contracting</th>
</tr>
</thead>
<tbody>
<tr>
<td>pH, SS</td>
<td>3/year</td>
<td>pH, SS, COD&lt;sub&gt;5&lt;/sub&gt;, BOD&lt;sub&gt;5&lt;/sub&gt;, plant and animal oil</td>
</tr>
<tr>
<td>SS, petroleum</td>
<td>4/year</td>
<td>Water-induced soil erosion monitoring at selected points</td>
</tr>
<tr>
<td>Contractor</td>
<td>Owner</td>
<td>Qualified agency engaged by the project owner through contracting</td>
</tr>
</tbody>
</table>
to subside temporary drainage ditch runoff sediment, the excavated earth of intercepting ditch is piled up at the downside of the slope, with water blocking weir being constructed using rammed method.

2) Rentian Wetland Purification, Protection and Utilization
(1) Engineering Measures
The intercepting ditch is laid round integrated A2/O equipment to prevent surface runoff carrying sediment outside the site from entering integrated A2/O equipment, the total length of the layout is 448m, the intercepting ditch is built with mortar laid stone.

②Settling Pond
Settling pits are arranged at the exit on both sides of the intercepting ditch, after surface runoff intercepted by the intercepting ditch enters Settling Pondfor desilting, the clean water is drained into Mianjiang River, two settling pits are laid and built using red brick masonry.

(2) Vegetation Measures
Rentian Wetland Purification and Protection Area arranges sewage intercepting pipeline and sewage inspection well, which needs to excavate 5,000m of pipe trench, after the pipe trench is laid well, the earth is backfilled and the site is leveled with 1.0hm² of hybrid grass seeds being planted.

(3) Temporary Soil and Water Conservation Measures
Temporary soil and water conservation measures for Rentian Wetland Purification and Protection Area include: first, temporary intercepting ditches are excavated at both sides of the pipe trench prior to the laying of the pipe in the course of pipe trench excavation, to prevent the flowing of slope runoff occurred due to rainfall in the course of pipe trench excavation into the pipe trench to cause man-made water loss and soil erosion, the total length of temporary intercepting ditch is 10,000m. Second, one temporary Settling Pondis laid for every 100m to match with temporary drainage ditch, a total of 100 settling pits are set. Third, the excavated earth of intercepting ditch is piled up at the downside of the slope, with water blocking weir being constructed using rammed method.

3)Yeping Wetland Purification, Protection and Utilization
(1) Engineering Measures
①Intercepting Ditch
The intercepting ditch is arranged around integrated A2/O equipment to prevent surface runoff carrying sediment outside the side from entering integrated A2/O equipment, the total length of the layout is 448m, the
intercepting ditch is built using mortar laid stone.

② Settling Pond
The settling pits are set at the exit on both sides of the intercepting ditch, after surface runoff intercepted by the intercepting ditch enters settling pit, the clean water is drained into Mianjiang River, two settling pits are constructed using red brick masonry.

(2) Vegetation Measures
Yeping Wetland Purification and Protection Area arranges sewage interception pipeline and sewage inspection well, which needs to excavate 8,000m of pipe trench, after the pipe trench is laid well, the earth is backfilled and the site is leveled with 1.6hm² of hybrid grass seeds being planted.

(3) Temporary Soil and Water Conservation Measures
Temporary water conservation measures of Yeping Wetland Purification and Protection Area include: first, temporary intercepting ditch is excavated at both sides of the pipe trench prior to the laying of the pipeline in the course of pipe trench excavation to prevent the flowing of slope runoff occurred due to rainfall in the course of pipe trench excavation into the pipe trench to cause man-made water loss and soil erosion, the total length of temporary intercepting ditch is 16,000m. Second, one temporary Settling Pond is set for every 100m to match with temporary intercepting ditch, a total of 160 settling pits are set. Third, the excavated earth of intercepting ditch is piled up at the downside of the slope, with water incepting weir being constructed adopting rammed method.

4) Xianghu Yaoqianba Wetland Rehabilitation, Protection and Utilization
(1) Engineering Measures
① Intercepting/Drainage Ditch
The drainage ditch is arranged at the edge of flood control dam above Mianjiang River Xianghu Section Restoration Beach and natural confluence gallery, the total length of the layout is 1,932m, constructed with mortar laid stone.

② Vegetation Measures
The mudflat part below Xianghu Wetland Utilization and Protection Project Fending Groin conducts comprehensive restoration, and then planted with 5,800m² of hybrid grass seeds for water conservation.

(3) Temporary Soil and Water Conservation Measures
During the construction of the flood bank in Xianghu Wetland Utilization and Protection Area, one is to lay 5,600m of temporary
drainage ditch along foundation excavation section of sewage interception pipeline laying, two is to arrange one temporary Settling Pond for every 100m to match with temporary drainage ditch, a total of 56 temporary settling pits are excavated, three is to pile up the excavated earth of intercepting ditch at the downside of the slope with water blocking weir being constructed adopting rammed method.

5) Forest Marshland Protection and Utilization
In Forest Marshland Wetland Protection and Utilization Area, the mudflat section is restored by planting camphor trees and bamboos, in the stage of construction and soil preparation, hybrid grass seeds is sowed for water conservation.

6) Lucao Lake Wetland Ecological Environment Protection and Management
(1) Vegetation Measures
①Landscaping
In Lucao Lake Wetland Ecological Environment Protection and Control Area, a large volume of earth is excavated in center lake, the excavated earth is used for build-up slope in green leisure area to form leisure landscape with topographic relief. To prevent water loss and soil erosion, landscaping is adopted and grass seeds are sowed for harnessing. Thus its soil and water conservation function can be made into full play in earlier stage, while being fully utilized in landscape planting in later stage.

(2) Temporary Soil and Water Conservation Measures
In Lucao Lake Wetland Ecological Environment Protection and Control Area, one is to conduct foundation excavation at the entry activity area and laying 1,130m of temporary drainage ditch at the stage of project construction, one Settling Pond is set for every 100m and 960m of temporary water blocking weir is built; two is to arrange 3,260m of temporary intercepting ditch along the surrounding area of center lake excavation area, with one temporary Settling Pond being set for every 100m; three is to lay 4,200m of temporary drainage ditch in the course of water and power supply pipe trench excavation, with one temporary Settling Pond being set for every 100m; four is to lay 9,680m of temporary drainage ditch in the course of road construction, with one temporary Settling Pond being set for every 100m.
<table>
<thead>
<tr>
<th>Environment</th>
<th>Dust from concrete system</th>
<th>Traffic dust</th>
<th>Waste gas from fuel combustion</th>
<th>Acoustic Environment</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(1) Construction techniques and equipment Concrete mixing system with dust collection device shall be selected whenever possible. Sealed up containers shall be chosen for concrete transportation to avoid dust pollution during transportation. (2) Dust control measures Water spraying is needed for residents of Zhugang and Ruilu Villages living around the construction site and plants would be planted around the processing system to mitigate dust pollution.</td>
<td>(1) Permanent construction access roads shall be hardened as early as possible. Full-time team for road maintenance and cleaning shall be established, especially for temporary roads with macadam pavement in order to prevent dust suspension and maintain normal road operation; (2) Prohibiting overloaded transportation vehicles and promote covered transportation to reduce dust pollution caused by construction debris; (3) Setting speed limit signs in construction and living areas to prevent dust suspension caused by overspeed which may pose health impacts; (4) Planting trees along roads to reduce dust impacts, which is included in soil and water conservation measures.</td>
<td>(1) Construction machinery and transportation vehicles in compliance with national health standards shall be selected to reduce generation of waste gas from fuel combustion. Meanwhile, exhaust gas purifiers shall be installed to ensure waste gas emission is up to applicable standards. (2) Retirement Standard for In-use Vehicles shall be strictly followed and mandatory retirement and renewal regulations shall be implemented. Old vehicles with high fuel consumption, low efficiency and non-compliant waste gas emission shall be replaced in a timely manner. Attention shall be paid to periodical maintenance of machinery and transportation vehicles to keep them in good condition.</td>
<td>(1) Avoid night construction or transportation as much as possible; (2) Maintain road and vehicle in good condition, and prohibit operation of overloaded vehicle; (3) Construction and transportation vehicles shall comply with Noise Limits to Stationary Vehicles (GB16170-1996) and Allowable Noise Level for Motor Vehicles (GB1495-79) and low-noise vehicles shall be used whenever possible. (4) Take traffic control measures for area with centralized construction activities, set sign for construction site, speed limit, and no horn; (5) Construction machinery and tools meeting relevant national standards must be used and low-noise equipment and techniques shall be selected as much as possible to reduce source intensity; (6) Strengthen equipment maintenance and lubrication to vibration noise</td>
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<tr>
<td></td>
<td>Contractor</td>
<td>Owner</td>
<td>Qualified agency engaged by the project owner through contracting</td>
<td>TSP</td>
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</tbody>
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LeqdB(A)
## Solid Waste

1. Each construction site will be equipped with garbage bins for domestic solid garbage collection and separation. Inorganic solid waste will be hauled to nearby dump sites, food leftovers and kitchen wastes are given to nearby rural residents free of charge for pig feeding, and other organic solid wastes are collected and transported periodically to nearby garbage collection stations or garbage transfer stations for centralized disposal. Other organic waste will be provided to farmers free of charge for composting. In addition, domestic waste, discarded construction materials and solid wastes with recycling value shall be recycled or sold as much as possible.
2. Solid garbage collection and separation at construction sites shall be under integrated management of the contractor. Pesticide shall be sprayed to garbage bins to prevent mosquito and fly breeding.
3. Excavation, filling and debris dumping would result in soil erosion. Soil and water conservation measures shall be taken and cost is included in soil and water conservation budget.

<table>
<thead>
<tr>
<th>Solid Waste</th>
<th>Traffic safety</th>
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</thead>
<tbody>
<tr>
<td>(1) Each construction site will be equipped with garbage bins for domestic solid garbage collection and separation. Inorganic solid waste will be hauled to nearby dump sites, food leftovers and kitchen wastes are given to nearby rural residents free of charge for pig feeding, and other organic solid wastes are collected and transported periodically to nearby garbage collection stations or garbage transfer stations for centralized disposal. Other organic waste will be provided to farmers free of charge for composting. In addition, domestic waste, discarded construction materials and solid wastes with recycling value shall be recycled or sold as much as possible.</td>
<td>(1) Mitigation measures for traffic impacts</td>
</tr>
<tr>
<td>(2) Solid garbage collection and separation at construction sites shall be under integrated management of the contractor. Pesticide shall be sprayed to garbage bins to prevent mosquito and fly breeding.</td>
<td>(1) During road construction, proper link roads with those outside</td>
</tr>
<tr>
<td>(3) Excavation, filling and debris dumping would result in soil erosion. Soil and water conservation measures shall be taken and cost is included in soil and water conservation budget.</td>
<td>Contractor</td>
</tr>
</tbody>
</table>
construction areas shall be provided and traffic diversion be conducted on key affected road sections to avoid adverse impacts;
2) Establishing traffic signs; strengthening traffic management in construction areas; timely deverting traffic on congested road sections;
3) Providing traffic management staff on main road sections close to centralized populous settlements to divert vehicles during construction to ensure smooth traffic;
4) Emergency measures shall be developed in response to possible traffic congestion to ensure traffic flow and safety;
5) Temporary access roads shall be arranged prior to road construction and adequate consideration shall be given to road access safety and convenience of nearby residents. Temporary walls/fences shall be set up to separate construction sites and outside areas while warning signs shall be put up in order to reduce safety accidents caused by construction activities.
6) Storage locations of various materials and equipment shall be consistent with the overall construction layout, and driveway and pedestrian access ways cannot be occupied without permission. Traffic signs and warning lights and lighting during night shall be provided for convenient passing through of vehicles.
7) Traffic signs shall be put up in areas with frequent vehicle flow; reasonable transportation routes shall be selected to avoid crossing residential areas. Transportation shall be well scheduled to avoid traffic congestion and reduce impacts on local residents.
8) In order to ensure construction activities will not damage nearby public facilities, a notification sign shall be put up at entrance of each construction site including information of contractor, supervisor and contact phone number of local EPB.

(2) Construction safety measures:
1) Keep all structures at construction sites in good conditions and shape; temporary structures shall be safe and reliable, can resist shocks from local bad weather, have appropriate lighting and can block some dust and noise;
2) Construction units shall have the capacity to provide emergency rescue that meet relevant requirements and provide first-aid kits for construction sites;
3) Training on occupational health and safety shall be provided to all new construction workers, briefing them about basic operational rules, personal protection rules and steps on how to prevent injuries to other staff;
4) Right sign boards shall be erected for dangerous spots (e.g. power distribution room), devices, materials and emergency exits;
5) Construction units identify and provide construction workers with suitable personal protection devices so adequately protect workers themselves, other workers and occasional visitors. Such devices shall not cause unnecessary inconveniences to users.

<table>
<thead>
<tr>
<th>Human health</th>
<th>Contractor</th>
<th>Owner</th>
<th>Local CDC</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1) Environmental sanitation activities including regular elimination of mouse, mosquito, fly and cockroach are carried out every year at construction sites and camps to reduce vectors of infectious disease. Mousetrap and poison bait are used for mouse killing and pesticide spraying is adopted for killing mosquito, fly and cockroach. (2) Canteen, garbage bin and public toilet management during construction shall be strengthened and periodic sanitation inspection is conducted. In addition, at least twice centralized cleaning shall be done every month. Sanitation management of construction site canteen shall be strengthened and sanitation inspection shall be conducted every quarter. Only persons who have health certificates shall be allowed to provide food services. Full-time cleaning team shall be established to be responsible for cleaning of construction site, office area and living camps. Garbage bins shall be equipped. Public sanitation facilities on the construction sites shall meet national health standards and requirements; (3) Health education targeting at construction workers and local residents shall be enhanced to disseminate knowledge about epidemic prevention through various approaches so as to enhance health knowledge and health protection awareness of local residents.</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Resettlement</th>
<th>Owner</th>
<th>Local government</th>
<th>84.26</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1) Take measures to minimize adverse impacts on the affected people; (2) Compensation and resettlement plans shall be able to improve living standards of the affected people or at least restore them to pre-project levels; (3) Conduct informed consultation with the affected people to enable them to fully participate in resettlement planning and implementation; land compensation is paid to the collectives, which then make corresponding payments to the affected farmers; (4) Pursuant to Land Administration Law of the People’s Republic of China and relevant regulations of Ruijin, land compensation rate for urban land is 1,500 yuan/μm² and that for rural land is 1,400 yuan/μm².</td>
<td></td>
<td></td>
<td>84.26</td>
</tr>
</tbody>
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<table>
<thead>
<tr>
<th>Operation</th>
<th>Surface Water Environment</th>
<th>Owner</th>
<th>Local EPB</th>
<th>3/year</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1) Wastewater at garbage collection spots is collected and poured into inspection wells by sanitation workers, which would be treated, together with septic tank tail water, by integrated A²/O equipment. (2) Wastewater from garbage collection stations is collection interception sewer pipeline and treated by integrated A²/O equipment.</td>
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</tr>
</tbody>
</table>
(3) Wastewater from public toilets of Lucao Lake Wetland Environmental Education Base is treated at ecological wetland and then discharged after meeting relevant standards;

(4) Mitigation measures for operation accidents of integrated A\(^2\)/O equipment:
   ① Strengthen management and equipment maintenance works, and keep serviceability rate of equipment and high efficiency of treatment. Enough spare parts should be reserved for key equipment. Standby equipment or replaced equipment should be timely maintained and repaired, and periodically checked to ensure they can be timely used as demand;
   ② Time of equipment maintenance and repair should be thoughtfully arranged and they should be executed when the water yield is small, and in the season or time period with good water quality as far as possible;
   ③ Strengthen staff’s operation skill training, establish and strictly implement running management system and operation responsibility system, and prevent the potential operation accident.

<table>
<thead>
<tr>
<th>Atmospheric Environment</th>
<th>Mitigation measures for septic tanks:</th>
</tr>
</thead>
<tbody>
<tr>
<td>1)</td>
<td>(1) Cover up and periodically clean up septic tanks</td>
</tr>
<tr>
<td></td>
<td>(2) Plant odor-removing plants such as canna around septic</td>
</tr>
<tr>
<td>2) Mitigation measures for garbage collection spots</td>
<td></td>
</tr>
<tr>
<td>(1)</td>
<td>(1) Flush ground every day and wash garbage vehicles once every week;</td>
</tr>
<tr>
<td></td>
<td>(2) Plant odor-removing plants such as canna around garbage collection stations.</td>
</tr>
<tr>
<td>3) Mitigation measures for garbage collection spots</td>
<td></td>
</tr>
<tr>
<td>(1)</td>
<td>(1) Use plastic bags to collect garbage;</td>
</tr>
<tr>
<td></td>
<td>(2) Use odor remover when necessary.</td>
</tr>
<tr>
<td>4) Mitigation measures for integrated A(^2)/O equipment</td>
<td></td>
</tr>
<tr>
<td>(1)</td>
<td>Strengthen management;</td>
</tr>
<tr>
<td></td>
<td>(2) Plant more trees in the local area and odor-removing plants such as canna in surrounding areas.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Acoustic Environment</th>
<th>Noise mitigation measures for garbage collection stations:</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1)</td>
<td>① Select low-noise and low-vibration garbage transportation vehicles with optimal structure;</td>
</tr>
<tr>
<td></td>
<td>② Optimize transportation route;</td>
</tr>
<tr>
<td></td>
<td>③ Strengthen garbage management and no honking when entering and leaving collection stations.</td>
</tr>
<tr>
<td>(2)</td>
<td>Noise mitigation measures for integrated A(^2)/O equipment:</td>
</tr>
<tr>
<td></td>
<td>① Select low-noise and low-vibration equipment;</td>
</tr>
<tr>
<td></td>
<td>② Set up greening belt in areas around the equipment;</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Owner</th>
<th>Local EPB</th>
<th>LeqdB(A)</th>
<th>1/year</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Local environmental monitoring station</td>
<td></td>
</tr>
</tbody>
</table>
### Noise mitigation measures for Lucao Lake Wetland Environmental Education Base:
1. Strengthen management of the base;
2. Plant trees around the base to create sound barrier.

### Solid Waste
1. Night soil is applied in farmland as fertilizer;
2. Sludge from wastewater treatment is transported to Ruijin Qingshui Village Niulanwo landfill;
3. Domestic waste is transported to Ruijin Qingshui Village Niulanwo landfill.

### Social Environment
1. Mitigation measures for septic tanks
   - 1. The septic tanks should be periodically cleaned and dregs should be removed, and also should be frequently checked and timely repaired to ensure smoothness and perfectness of muck pipelines, muck pipeline connecting well and septic tank;
   - 2. The septic tanks should be free from phenomena such as thick hardening or overflowing. The hardening thickness in the septic tank can’t exceed 40mm;
   - 3. It is not allowed to pour wastes, pollutants and sundries into the septic tank, or stacking sundries or building houses above the septic tank, and not allowed to reconstruct the sewage pipeline without permission;
   - 4. The cover plate of the septic tank should be covered tightly in normal times to avoid accident;
   - 5. Hot work beside the septic tank is prohibited.
   - 6. Septic tank cleaning: Before cleaning the septic tank, it is required to set the warning sign, remove barriers at the surface of the septic tank and ensure the traffic smoothness; before opening the septic tank cover, it is required to evacuate operators; steel bar and anvil, etc can’t be used for prying the septic tank cover to avoid spark, thereby causing burning or explosion; when motor is used for pumping or draining sewage, leakage of motor, power source, line and switch, etc should be checked to avoid shock accident; before the worker enters the septic tank for desilting, carbonic oxide, carbon dioxide, hydrogen sulfide, methane and harmful gases should be removed through natural ventilation; moreover, the instrument should be used for detection and the worker can’t enter the tank for working unless innocuousness and safety are determined; the operating personnel who enters the septic tank should wear the anti-static clothes. It is not allowed to enter the septic tank with keys and hard metals; the operating personnel above the septic tank should hold the safety belts with hands and can keep the contact with the operating personnel who enters the septic tank; after completing the cleaning, timely repair after recovering the septic tank cover and the trench cover. The warning sign or the protective fence should be provided if works can’t be completed in the same day. Liquid and dreg

| Owner | Local EPB | 0.5/year |
from septic tank cleaning must be transported to the professional treatment plant designated by the municipal sanitation competent department for treatment. The quality of water discharged after being treated should meet specified discharge standards. Stacking of dregs must be managed by the designated person and records should be well made to avoid the cross contamination.

Mitigation measures for garbage collection stations:
1) Regular disinfection;
2) Providing sanitation workers with and requiring them to use appropriate personal protection clothing, such as shoes, gloves and gauze masks.

Mitigation measures for inspection well
① Before cleaning the inspection well, it is required to set the warning sign, remove barriers at the road and ensure the traffic smoothness;
② Steel bar and anvil, etc can’t be used for prying the inspection well cover to avoid spark, thereby causing burning or explosion;
③ When motor is used for pumping or draining sewage, leakage of motor, power source, line and switch, etc should be checked to avoid shock accident;
④ Before the worker enters the inspection well for desilting, carbonic oxide, carbon dioxide, hydrogen sulfide, methane and harmful gases should be removed through natural ventilation; moreover, the instrument should be used for detection and the worker can’t enter the well for working unless innocuousness and safety are determined;
⑤ The operating personnel who enters the well should wear the anti-static clothes. It is not allowed to enter the well with keys and hard metals;
⑥ The operating personnel above the well should hold the safety belts with hands and can keep the contact with the operating personnel who enters the well;
⑦ After completing the cleaning, timely repair after recovering the inspection well cover. The warning sign or the protective fence should be provided if works can’t be completed in the same day.
⑧ Sludge from inspection well cleaning must be transported to the professional treatment plant designated by the municipal sanitation competent department for treatment.

Ecological Environment | Terrestrial ecology
---|---
(1) After completion of construction activities, construction sites will be revegetated to provide a stable habitat for terrestrial animals.
(2) Local tree and grass species shall be selected for revegetation of construction sites and selection of original species forming the original natural vegetation would be the best. In particular, manual planting of seedling can be adopted following the principles of mixed tree and grass.

<table>
<thead>
<tr>
<th>Owner</th>
<th>Local EPB</th>
<th>Local CDC</th>
<th>0.1/year</th>
<th>0.5/year</th>
<th>58</th>
</tr>
</thead>
<tbody>
<tr>
<td>Owner</td>
<td>Local municipal engineering administrations</td>
<td></td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>
planting with appropriate density.

(3) For Cinnamomum camphora – an ancient and rare tree, protection measures shall be taken locally, including putting up protection sign board in a prominent location, which also provides description of the tree; routine management of Cinnamomum camphora trees shall be strengthened with vegetation planted around the trees and protection of land from being exposed; between end of autumn and early winter, dry and dead branches shall be cleared to reduce incidence of pests and diseases; firewood, rice straw and other materials piled up around the trees shall be removed to reduce fire risks. For a weakening tree, support shall be provided and mending shall be conducted. For a tree whose trunk is unstable or tilting, reinforcing measures shall be taken and support be provided;

(4) Dissemination of knowledge about Egret, pond herons and other migratory birds shall be enhanced so that people in the project areas are aware of the habitat environment and ecological habits of various migratory birds; protection measures shall be developed, various national laws and decrees on migratory birds protection be strictly enforced, and unauthorized catching and shooting of migratory birds be strictly banned, especially during summer, destroying bird nests and getting bird eggs are not allowed. It is everyone's responsibility to care for and protect migratory birds. Water pollution shall be reduced, destroying forest for reclamation be strictly prohibited and more trees be planted to create favorable living environment for migratory birds.

(5) Publicity campaigns about Rana nigromaculata protection shall be upgraded and catching of tadpoles and killing of Rana nigromaculata shall be strictly banned.

| Acquatic ecology | Environmental protection awareness shall be improved. Environmental and resource protection shall be fully considered during operation. Principle of “Three Synchronous” of project implementation and resource protection shall be adhered to. |  |  |
10.5 Environmental Monitoring and Soil and Water Conservation Monitoring Plans

10.5.1 Objectives of Monitoring
In order to protect regional environment, test and verify results of environmental impact projection and assessment, prevent harms of emergencies to environment, and develop detailed plans for implementing environmental protection measures, it is necessary to carry out environmental monitoring during construction and operation. Implementing environmental monitoring can also provide scientific basis for environmental pollution control, engineering environment management and regional environmental protection activities during construction and operation.

10.5.2 Monitoring Plans
Environmental monitoring plan and soil water conservation monitoring plans during implementation and operation of the project are provided in Table 10.5-1 and Table 10.5-2, respectively.
<table>
<thead>
<tr>
<th>Period</th>
<th>No.</th>
<th>Component</th>
<th>Medium</th>
<th>Location of Monitoring Point</th>
<th>Item</th>
<th>Frequency</th>
<th>Monitoring Cost Unit Cost (yuan)</th>
<th>Total (yuan)</th>
<th>Monitoring Agency</th>
<th>Responsible Agency</th>
<th>Supervision Agency</th>
<th>Standards and Specifications Applied</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1</td>
<td>Ridong Reservoir Wetland Protection and Conservation</td>
<td>Water Environment</td>
<td>Wastewater from concrete mixing system</td>
<td>SS</td>
<td>Monitoring once in each season of every construction year</td>
<td>1350</td>
<td>5400</td>
<td>Project owner</td>
<td>Ruijin City EPB</td>
<td>Water Quality Standards for Recycled Municipal Wastewater and Water for Miscellaneous Urban Uses (GB/T18920-2002), Technical Specifications for Surface Water and Wastewater Monitoring (HJ/T91-2002)</td>
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<table>
<thead>
<tr>
<th>Location</th>
<th>Item</th>
<th>Frequency</th>
<th>Monitoring Cost Unit Cost (yuan)</th>
<th>Total (yuan)</th>
<th>Monitoring Agency</th>
<th>Responsible Agency</th>
<th>Supervision Agency</th>
<th>Standards and Specifications Applied</th>
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</thead>
<tbody>
<tr>
<td>Ridong Reservoir Wetland Protection and Conservation</td>
<td>Water Environment</td>
<td>Wastewater from concrete mixing system</td>
<td>Intake and outlet of treatment system for wastewater from concrete mixing system</td>
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<td>Monitoring once in each season of every construction year</td>
<td>1350</td>
<td>5400</td>
<td>Project owner</td>
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<tr>
<td>Rentian Wetland Purification, Protection and Utilization</td>
<td>Water Environment</td>
<td>Wastewater from concrete mixing system</td>
<td>Intake and outlet of treatment system for wastewater from concrete mixing system</td>
<td>SS</td>
<td>Monitoring once in each season of every construction year</td>
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<td>5400</td>
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</tr>
<tr>
<td>No.</td>
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<td>Location/Agency</td>
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<td>Surface Water Environment</td>
<td>Qingshui section of Mianjiang River</td>
<td>pH, DO, SS, COD&lt;sub&gt;n&lt;/sub&gt;, BOD&lt;sub&gt;5&lt;/sub&gt;, NH&lt;sub&gt;3&lt;/sub&gt;-N</td>
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<tr>
<td>6</td>
<td>Water Environment</td>
<td>Lucao Lake Wetland Environmental Education Base</td>
<td>pH, SS, Petroleum, COD&lt;sub&gt;n&lt;/sub&gt;, BOD&lt;sub&gt;5&lt;/sub&gt;, NH&lt;sub&gt;3&lt;/sub&gt;-N</td>
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<tr>
<td>Operation</td>
<td>Environment</td>
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<td>Parameter</td>
<td>Sampling Frequency</td>
<td>Measurement Period</td>
<td>Data Collection</td>
<td>Standards and Regulations</td>
<td></td>
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<td>Surface Water</td>
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<td>Monitoring once during peak construction period of each year for 2 days and at 06:00-22:00 and 23:00-06:00 every day</td>
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<td>910</td>
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Note: The table above is a summary of the monitoring and testing requirements for various environmental projects. Each project has specific details regarding the monitoring frequency, the substances being tested, and the relevant environmental quality standards. The projects include purification, noise monitoring, water environment monitoring, and ecological surveys for terrestrial and aquatic ecosystems. The table also indicates the project owners and responsible agencies for each monitoring activity.
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</tr>
<tr>
<td>Damaged soil and water conservation facilities</td>
<td>Construction areas</td>
<td>Field survey</td>
<td>Once</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
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</tr>
<tr>
<td>New soil and water conservation facilities</td>
<td>Construction areas</td>
<td>Field survey</td>
<td>③ ③</td>
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<td></td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

Grand total cost for soil and water conservation monitoring is 120,000 yuan.

Note: Under the column of “Frequency and Times”, ①= monitor once every 10 days; ②= monitor once every month; and ③= monitor once every three months.
10.6 Environmental Management Training

10.6.1 Objectives of Training

Objectives of environmental management training are to ensure smooth and effective implementation of environmental management activities, enable relevant staff to familiarize themselves with contents and procedures of environmental management, enhance capacity of environmental management staff, and ensure effective implementation of environmental protection measures. Environmental capacity building is mainly targeted at environmental managers and environmental supervision engineers and training for them is part of project’s technical support. During project implementation, training is also provided to contractors and construction workers. Before construction is initiated, all construction units, operation units and construction supervision engineers are required to participate in compulsory training on environment, health and safety.

10.6.2 Training Participants

The participants are all staff from provincial, municipal and county PMOs, all staff of the Owner and environmental supervision staff, representatives from environmental monitoring agencies, and representatives from key contractors.

10.6.3 Training Contents

1) World Bank environmental safeguard policy, domestic environmental protection laws and regulations, and knowledge about and application of environmental standards;
2) EIA and EMP (including ECOP) for the project;
3) Environmental management regulations for the project;
4) Roles and responsibilities of and relationships among environmental management staff, environmental supervision staff and contractors;
5) Preparation of environmental management report, environmental supervision report, environmental monitoring report and contractor’s monthly report.

10.6.4 Training Program

1) All staff from environmental management offices, all environmental supervision staff and representatives from PMOs at provincial, municipal and county levels

Training is to be conducted by environmental specialists and lasts for 3 days, covering the following:
   i) World Bank safeguard policy and detailed environmental protection rules developed for implementing agency;
   ii) Project’s environmental impacts and environmental monitoring items;
   iii) Operational processes at training venue, including organization, communication, roles and responsibilities, decision-making process and review procedures for reports and
standards;
iv) World Bank’s environmental information filing, disclosure, communication and reporting mechanisms;
v) World Bank health and safety supervision and reporting processes.

2) Representatives from key contractors

Training for representatives from key contractors is to be conducted by environmental and health specialists and lasts for one day, covering the following:
i) Overview of factors leading to environmental impacts and environmental protection measures;
i) Overview of roles and responsibilities of environmental management and environmental supervision staff and key points in environmental reports;
iii) Commonsense knowledge on health and safety;
iv) Penalties for breaching laws, regulations and rules.

10.7 Cost Estimate for Environmental Protection and Soil and Water Conservation and Analysis of Economic Cost-Benefit of Environmental Impacts

10.7.1 Cost Estimate for Environmental Protection and Soil and Water Conservation

10.7.1.1 Fee Composition

As required by relevant rules and specifications, environmental protection cost estimates for the project are consisted of costs for environmental monitoring measures and temporary environmental protection measures, as well as stand-alone environmental protection costs.

10.7.1.2 Base Unit Cost

a) Unit Cost for Labor budget

Pursuant to Regulations Governing the Preparation of Cost Estimates for Soil and Water Conservation Works under Development Projects, the project areas fall under Category VI Salary Area, under which the standard salary is 190 yuan/month and construction allowance is 3.5 yuan/workday, which are used for calculating unit cost for labor budget. Unit cost for labor budget for engineering measures is 2.66 yuan/work-hour and that for phytoto measures is 2.23 yuan/work-hour.

b) Unit price for material budget
Prices of key materials are the same as those of materials for pivotal works and prices of other supporting materials and tree seedlings are determined in making reference to market prices.

10.7.1.3 Unit Costs and Fee Rates for Engineering and Vegetation Measures

Unit costs for engineering and vegetation measures comprise direct engineering costs, indirect costs, and profits and taxes.

1) Direct engineering costs
These include direct costs, other direct costs and on-site expenses.
   (i) Direct costs
   These include staff expenses and those on materials and use of machinery.
   Staff expenses = fixed work amount (workday) × unit cost for staff budget (yuan/workday)
   Material expenses = fixed amount of material use × budgeted unit price
   Expenses for machinery use = fixed use amount (pieces and hours)× hourly cost/piece
   (ii) Other direct costs
   Other direct costs = direct costs × other direct fee rates
   (iii) On-site expenses
   On-site expenses = direct costs × on-site expenses rates

2) Indirect fees
   Indirect fees = direct engineering costs × indirect fee rates

3) Profits
   Profits = (direct engineering costs + indirect costs)× profit rate

4) Taxes
   Taxes = (direct engineering costs + indirect costs + profits) × tax rates

Fee rates for engineering and vegetation measures are listed in Table 10.7-1.

<table>
<thead>
<tr>
<th>No.</th>
<th>Name of Fee Rate</th>
<th>Calculation Basis</th>
<th>Engineering Measures</th>
<th>Phytoto measures</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>Other direct cost</td>
<td>Direct cost</td>
<td>2.3</td>
<td>1.3</td>
</tr>
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<td>2</td>
<td>On-site expenses</td>
<td>Direct cost</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>3</td>
<td>Indirect cost</td>
<td>Direct cost</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>4</td>
<td>Profit</td>
<td>Direct cost + indirect cost</td>
<td>7</td>
<td>5</td>
</tr>
<tr>
<td>5</td>
<td>Tax</td>
<td>Direct cost + indirect cost + profit</td>
<td>3.22</td>
<td>3.22</td>
</tr>
</tbody>
</table>

10.7.1.4 Stand-alone Costs
These mainly include environmental construction management costs, costs for environmental supervision and costs for scientific research, survey, design and consulting services.

1) Construction management costs

Such costs include recurrent costs for environmental management staff, costs for acceptance of completed environmental protection facilities and for environmental campaigns and technical training, of which:

- Recurrent costs for environmental management staff: 3% of actual expenses on environmental protection measures;
- Costs for acceptance of completed environmental protection facilities: calculated based on actual amount of work;
- Costs for environmental campaigns and technical training: 2% of actual expenses on environmental protection measures.

2) Costs for environmental supervision:

Such costs are calculated based on the number and time spent (workday) of environmental supervision staff while making reference to the fee rates for environmental supervision in pivotal works.

3) Costs for scientific research, survey, design and consulting services

Included here are mainly expenses on environmental impact assessment, which are calculated according to relevant fee rates.

10.7.1.5 Compensation on Soil and Water Conservation Facilities

According to Methods for Collection, Use and Management of Soil and Water Conservation Facility Compensation Fees and Soil Erosion Prevention Fees (issued on May 19, 1995 by Jiangxi Provincial Price Bureau), soil and water conservation facility compensation fees of the project are calculated at 0.5 yuan/m².

10.7.1.6 Results of Estimation

Additional investments in environmental protection and soil and water conservation works under JPESTP are 5.1573 million yuan, including 2.1824 million yuan of investment in environmental protection works and 3.1006 million yuan in soil and water conservation works.

1) Estimated environmental protection investment

Estimated environmental protection investment of the project is 2.0268 million yuan, including
1.022565 million yuan in environmental protection measures, 206,800 yuan in temporary environmental protection measures, and 1.0362 yuan of stand-alone costs (see Table 10.7-2 for details).

**Table 10.7-2  Detailed Estimated Investments in Environmental Protection Works under JPESTP**

<table>
<thead>
<tr>
<th>No.</th>
<th>Name of Work or Cost</th>
<th>Unit</th>
<th>Quantity</th>
<th>Unit Cost (yuan)</th>
<th>Total Cost (10,000 yuan)</th>
<th>Remarks</th>
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<tr>
<td></td>
<td>Part One: Environmental Protection Measures</td>
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<tr>
<td></td>
<td>Environmental Monitoring during Construction</td>
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<td></td>
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<td>Construction wastewater monitoring</td>
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<td>Wastewater from concrete mixing system</td>
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<td>Wastewater from vehicle and ground flushing</td>
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<td>Environmental Monitoring during Operation</td>
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<td>Wastewater treatment</td>
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<td>Settling pond for wastewater from flushing of concrete mixing system</td>
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<td>Settling pond for wastewater from vehicle and ground flushing</td>
<td>Piece</td>
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<td>0.4</td>
<td>Costs for civil works construction and operation</td>
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<td>Oil separation pond</td>
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<td>2000</td>
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<td></td>
<td>Sceptic tank</td>
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<td>0.5</td>
<td>Costs for civil works construction and operation</td>
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165
<table>
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<th>Description</th>
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<th>Quantity</th>
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<td>Traffic sign</td>
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<td>1500</td>
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<td>Temporary sound barrier</td>
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<td>3000</td>
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<td>III</td>
<td>Solid Waste Disposal</td>
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<td>150</td>
<td>0.03</td>
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<td>1.65</td>
</tr>
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<td>Dust control through spraying water</td>
<td>Vehicle.month</td>
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<td>5000</td>
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<td>2</td>
<td>Personal protection</td>
<td>Person</td>
<td>50</td>
<td>10</td>
<td>0.05</td>
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<td>3</td>
<td>Vehicle speed limit sign</td>
<td>Piece</td>
<td>6</td>
<td>1000</td>
<td>0.6</td>
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<td>V</td>
<td>Human Health Protection</td>
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<td>13.2</td>
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<td>Cleaning in construction areas</td>
<td>Month</td>
<td>24</td>
<td>2000</td>
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<tr>
<td>2</td>
<td>Disease vector killing</td>
<td>Month</td>
<td>24</td>
<td>500</td>
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<td>3</td>
<td>Sanitation and food hygiene administration</td>
<td>Month</td>
<td>24</td>
<td>3000</td>
<td>7.2</td>
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</table>

Sum of Part One and Part Two: 122.9365

Part Three Stand-alone Costs for Environmental Protection: 79.748

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<th>I</th>
<th>Construction Management Costs</th>
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<th>24.148</th>
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<tbody>
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<td>Recurrent costs for environmental protection</td>
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<td>3.69</td>
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<td></td>
<td>3% of sum of Part One and Part Two</td>
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</tr>
<tr>
<td>2</td>
<td>Costs for acceptance of environmental protection facilities</td>
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<td></td>
<td></td>
<td>18</td>
</tr>
<tr>
<td></td>
<td>Estimated according to actual needs</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Costs for environmental campaigns and technical training</td>
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<td></td>
<td>2.458</td>
</tr>
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<td></td>
<td>2% of sum of Part One and Part Two</td>
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</tr>
<tr>
<td>II</td>
<td>Costs for Environmental Supervision</td>
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<td>84000</td>
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<td>Costs for scientific research, survey, design and consulting services</td>
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<td>1</td>
<td>EIA costs</td>
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<td>22</td>
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</table>

Sum of Part One – Part Three: 202.68

Total Static Investments in Environmental Protection: 202.68

2) Estimated investments in soil and water conservation works

Total additional static investments in soil and water conservation works under the project are 3.3006 million yuan, including 483,900 yuan in engineering measures, 652,400 yuan in phytoto measures, 213,500 yuan in temporary works for construction activities, 677,000 yuan of stand-alone costs, 121,600 yuan of physical contingencies, and 952,200 yuan in compensation on soil and water conservation facilities (see Table 10.7-3 for details).
# Table 10.7-3 Estimated Investments in Soil and Water Conservation Works

<table>
<thead>
<tr>
<th>No.</th>
<th>Name of Works or Cost</th>
<th>Cost for Construction and Installation</th>
<th>Phytoto measures</th>
<th>Stand-alone Costs</th>
<th>Total Investment</th>
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<tr>
<td></td>
<td></td>
<td></td>
<td>Planting Cost</td>
<td>Seedling and Seed Cost</td>
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<td>Ridong Reservoir Wetland Protection and Conservation</td>
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<td>3</td>
<td>Rentian Wetland Purification, Protection and Utilization</td>
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<td>4</td>
<td>Yeping Wetland Protection and Utilization</td>
<td>9.94</td>
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<td>6</td>
<td>Part Two  Phytoto measures</td>
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### 10.7.2 Analysis of Economic Cost-Benefit of Environmental Impacts

This analysis is to use basic rules of environmental economics to comprehensively analyze the economic, social and environmental impacts of project implementation, adopt cost-benefit analysis method to measure and compare in monetary terms the social and environmental costs and benefits of project implementation, and judge the rationale of project implementation from the perspectives of environmental protection and sustainable development.

1) Environmental benefits

(1) Reducing point source pollution load

Rendian wastewater treatment facility can treat 500m$^3$/day of wastewater and reduced pollutants in wastewater are COD-85kg/day, BOD$_5$-35kg/day, SS-55kg/day, NH$_3$-N-6.5kg/day and TP-1.8kg/day, respectively.

Yeping wastewater treatment facility can treat 1,200m$^3$/day of wastewater and reduced pollutants in wastewater are COD-204kg/day, BOD$_5$-84kg/day, SS-132kg/day, NH$_3$-N-15.6kg/day and TP-4.32kg/day, respectively.

(2) Effectively reducing non-point source pollution load to Mianjiang River

Implementation of the subproject can stop most pollutants in storm water runoff from entering into the river, effectively intercept and treat various wastewater generated in rural areas through Xianghu Interception Sewer Network, reduce the amount of pollutants entering the river and restore the river’s self-cleaning capacity. The network could reduce CODcr by 595 tons a year and NH$_3$-N by 31 tons a year while the constructed wetland could reduce CODcr by 79.3 tons a year and NH$_3$-N by 10.5 tons a year.

2) Economic benefits
This project is a non-profit-making project and as such, financial analysis would not involve internal rate of financial return, profit-loss balance, rate of investment return or other financial evaluation indicators of profit-making projects. Project implementation highlights ecological and environmental benefits of Poyang Lake Basin Eco-economic Zone and small town development while related environmental education bases established under the project can enhance environmental protection awareness of local people. It is estimated that annual economic benefits of the project would reach 18 million yuan.

10.8 EMP Information Management

10.8.1 Information Sharing

For the purpose of carrying out environmental management, necessary information sharing is needed among city (county) PMOs, owners, contractors and operators and all staff within these entities, which also need to disclose relevant information to external parties (stakeholders and the general public). Internal information sharing can be carried out through meetings and internal bulletins, but a formal meeting needs to be held every month and all information sharing activities shall be recorded and archived. External information sharing is carried out biannually or annually. Information sharing activities with partners shall be recorded and archived.

10.8.2 Documentation

To ensure effective operation of environmental management system, the project owner must organize to establish a sound documentation system and maintain records on the following:

1. Requirements of laws and regulations;
2. Environmental media and relevant environmental impacts;
3. Training;
4. Supervision, verification and maintenance activities;
5. Monitoring data;
6. Effectiveness of remedy and mitigation measures;
7. Information on stakeholders;
8. Approval and verification documents;
9. Review

In addition, necessary control is needed for the above records, including identification, collection, categorization, archiving, storage, management, maintenance, storage period, and disposal of these records.
10.8.3 Reporting

During project implementation, the PPMO, all County (City) PMOs, owners and environmental supervision agencies of JPESTP shall record and report in a timely manner to pertinent departments project progress, EMP implementation and environment quality monitoring results. Specific tasks include:

(1) Environmental supervision engineer of the project documents in detail EMP implementation by month and submit in a timely manner weekly and monthly reports to the project owner and respective county (city) PMO, which shall cover implementation of environmental protection measures, status of environmental monitoring and monitoring data;

(2) The contractor and operator documents in detail project progress and EMP implementation by quarter, submits in a timely manner quarterly report to the respective county (city) PMO and provides a copy to the respective county (city) environmental protection bureau (EPB);

(3) After completing monitoring activities, the monitoring agency submits in a timely manner monitoring report to the project owner (operator) and environmental supervision engineer;

(4) County (City) PMO submits in a timely manner project progress report to PPMO and provides a copy to the provincial EPB. Such report (e.g., monthly report, quarterly report or annual report) must cover EMP progress, such as EMP implementation progress and effectiveness and especially environmental monitoring results;

(5) In the event of incidents in serious violation of environmental protection regulations, the environmental supervision engineer and county (city) PMO shall report such incidents to the local environmental protection administration and to higher level environmental protection administrations when necessary;

(6) The project’s EMP implementation report for each year must be prepared and submitted to the World Bank by March 31 of the next year. The report mainly includes the following:

a) Implementation of training program;
b) Project progress;
c) Implementation of environmental protection measures, status of environmental monitoring and key monitoring results;
d) Whether there are public grievances; if incurred, such grievances, their solutions and degree of public satisfaction shall be recorded;
e) EMP implementation plan for the next year.
11 Conclusion and Recommendations

11.1 Conclusion

Jiangxi Poyang Lake Basin and Ecological Economic Zone Small Town Development Demonstration Project (JPESTP) – Ruijin City Mianjiang River (Lucao Lake) Wetland Protection and Utilization Subproject comprises three components of Mianjiang River Upstream Wetland Protection and Purification, Mianjiang River Midstream and Downstream Wetland Ecology Restoration and Utilization, and Lucao Lake Wetland Ecological Environment Protection. Of which, Mianjiang River Upstream Wetland Protection and Purification Component includes Ridiang Reservoir Wetland Protection and Conservation Area and Rentian Wetland Purification, Protection and Utilization Area; Mianjiang River Midstream and Downstream Wetland Ecology Restoration and Utilization Component covers Yeping Wetland Purification, Protection and Utilization Area, Xianghu Yaoqianba Wetland Rehabilitation, Protection and Utilization Area, and Forest Marshland Protection and Utilization Area; Lucao Lake Wetland Ecological Environment Protection Component is where Lucao Lake Wetland Enviromental Education Base) Component is located. Total cost estimate of the subproject is RMB1,438.012 million yuan, which includes a proposed World Bank loan of RMB719.006 million yuan (or 50% of total cost) and RMB719.006 million yuan (or 50% of total) of counterpart funding.

11.1.1 Status Quo Environment Assessment

1) Ambient air

All pollutant indicators of monitoring points in the subproject areas meet Category II Standard in Ambient Air Quality Standards (GB3095-1996), suggesting good ambient air quality in the subproject areas.

2) Surface water environment


3) Acoustic environment

LeqdB(A) in the subproject areas is 47.3-49.7dB(A) at daytime and 31.4-33.2dB(A) at nighttime, which meet Category II Zone Standard in Acoustic Environment Quality Standards (GB3096-2008), indicating good acoustic environment in the subproject areas.
4) Ecological environment

The subproject is located in the Mianjiang River watershed, where biodiversity is rich and ecological environment is good.

11.1.2 Environmental Impact Assessment

Environmental impacts of the subproject include:

1) Key positive impacts

After subproject completion, environmental pollution of rural domestic sewage, agricultural return water and domestic waste can be reduced to some extent and the role of wetland in reducing and purifying pollutants can be maximized. Subproject implementation have significant implications for ensuring Mianjiang River water quality, protecting wetland ecosystem, facilitating construction of Poyang Lake Basin Eco-economic Zone and promote socioeconomic development.

2) Key adverse impacts

Construction activities, land occupation for construction, stacking of spoil and debris and land acquisition would have direct adverse impacts on local ecological environment. Through implementing engineering and vegetation measures proposed in the report for soil erosion control, incremental soil erosion can be effectively reduced and controlled. Environmental impacts of wastewater, solid waste, noise and dust during construction would be minimal. After implementing corresponding mitigations measures as proposed in the report, these adverse impacts would be effectively mitigated.

11.1.3 Overall Conclusion

Implementation of the subproject meets requirements in relevant national industrial policies, is the need of ecological environment protection, is an important component of ecological construction in Ruijin City and is the need for coordinated environmental and economic development. Implementation of the subproject would not only create an ecological label for the city of Ruijin and protect drinking water sources in neighboring towns and townships, but also provide excellent recreational places for the city’s residents. Hence, the subproject would have significant ecological, cultural and economic values.

Therefore, implementation of the subproject is extremely necessary, is an important measure for achieving double wins in regional socioeconomic development and environmental protection, and would have a demonstration role for implementation of other projects in the upstream of Poyang Lake Basin Eco-economic Zone.

The report argues that pollution load in the Mianjiang River can be reduced through existing
economically viable and technologically accessible management measures and this would have positive impacts on the Mianjiang River and Poyang Lake Basin and only minor impacts on other environmental settings. Therefore, from the environmental perspective, implementation of the subproject is feasible.

11.2 Recommendations

1) This subproject would be co-financed by the World Bank and the government. The EIA is prepared following both domestic EIA law, regulations and relevant guidelines and the World Bank’s safeguard policies. The subproject owner and construction units are required to strictly follow environmental management and monitoring plans as well as all environmental protection measures.

2) The subproject would involve land acquisition. As such, the subproject can only be launched after corresponding land acquisition compensation and resettlement activities are completed.
Map 1  Geographical Location of the Subproject

Legend

- Blue: Administrative Boundary of Jiangxi Province
- Red Dot: Location of the Subproject
Map 2  Distribution of Monitoring Points

Legend:
- Air monitoring point
- Surface water monitoring point
- Noise monitoring point

Proportional scale: 1: 100000
Map 3  Plan of Nan Lake Ecological Wetland Treatment Process
Annex I Environmental Codes of Practice

1. ECOP for Small Civil Works

2. ECOP for Afforestation

3. ECOP for Garbage Collection Stations

4. ECOP for Septic Tanks

5. ECOP for Rural Domestic Wastewater Treatment

6. ECOP for Wetland Protection and Rehabilitation

7. ECOP for Interception Sewer Pipeline
Annex II  Procedures for Routine Equipment Maintenance, Inspection and Management of Waste Water Treatment Stations

1. Equipment Management Procedures

a. Supervise equipment management institutions, formulate specific work standards, management rules, safe production operation procedures for each post, assign a certain number of professional personnel, and implement the post economic responsibility system.
b. Equipment management, maintenance and inspection personnel shall know well about treatment process, safety production procedures, equipment operation requirements and technical indicators of waste water treatment stations.
c. Equipment management, maintenance and inspection personnel shall make regular inspection tours for equipment operation.
d. Equipment inspectors shall conduct inspections on schedule, make accurate inspection records and clean and clear reports.
e. In case of abnormal equipment operation, inspectors shall make schemes and handle them timely.
f. Equipment shall be kept clean, without water, oil and gas leakage.
g. Regular inspections shall be conducted, and lubricating oil or grease shall be added or replaced according to different equipment operation requirements.
h. Electric switches, instruments and apparatus, and meters of equipment shall be regularly inspected and adjusted.

2. Safety Codes for Maintenance Work

a. Maintenance personnel shall receive technical trainings and put the production into practice before the work.
b. Equipment management, maintenance and inspection personnel shall strictly execute the safe operation and production procedures for their posts, particularly to take strict precautions against such accidents as blast, electric shock, poisoning, skidding and drowning.
c. After inspection and before recovery of operation, inspections shall be made for lubrication and power connection of equipment. Equipment shall be put into operation after readiness for operation.
d. After equipment inspection, inspection personnel shall follow the electrician operation procedures for electric switch.
e. Any switch shall be interrupted from power supply and marked with a maintenance sign before maintenance.
f. Smoking and fire use are strictly prohibited in sludge treatment areas, grill wells and Bio-P tanks. Fire operation without authorization is prohibited. A hot work permit is required before
hot works.
g. Rainwater, snow or ice shall be timely cleaned in rainy or snowy weathers. Precaution shall be
given to anti-skidding in inspection tour and operation on structures.
h. In case of typhoon or fresh breeze, two persons at minimum are required for inspection tour
and operation on structures, and precautionary measures shall be adopted.
i. Any structures, container and pipe culvert that contain harmful gas or flammable gas shall be
ventilated and inspected before evacuation and maintenance. Before hot works, the
concentration of flammable gas shall be determined (the methane content shall be controlled
below 5%), while the oxygen content shall be controlled below 18%. In case of excess of the
safety standards, forced ventilation shall be adopted to enable the air contained in line with the
safety standards before operation. Before operation in pipes, channels or integrated equipment
containers, they shall be tested for toxic gas in accordance with the Technical Specification for
Safety of Urban Sewer Maintenance, and operators are required to be accompanied by a
guarder, wear gas masks when necessary, tie off a lifeline and contact with the guarder anytime.
j. In cleaning equipment and surroundings, the part of equipment in operation is prohibited from
being wiped, and wash water shall not be splashed on cable heads and electrified and lubricated
parts of electrical machines.
k. Equipment maintenance and management personnel shall wear a complete set of work-wear
and adopt safety defense measures. They are strictly prohibited from drinking alcohols and
wearing slippers, high-heeled shoes and skirts on duty.
l. Any structure that contains harmful gas and inflammable gas and has off-flavor and a humid
environment shall be ventilated.
m. Firefighting equipment shall be inspected and replaced in any structure with electrical
equipment and any flammable and explosive place in accordance with the provisions of
relevant regulations. The firefighting equipment shall be complete and effective. Personnel
shall know well about storage sites and use methods of the firefighting equipment.
n. Flammable and explosive articles shall not be stored in duty rooms and control rooms.
o. Equipment maintenance and management personnel shall know well about first aid in case of
electric shock.
p. All temporary lines shall comply with safety standards and be removed immediately after use.

3. Codes for Equipment Maintenance

a. Equipment maintenance and management personnel shall know well about the regulations for
maintenance of electric instrument and equipment.
b. structures, integrated equipment and various sluice valves, guardrails, crawling ladders,
pipelines, supports and cover plates shall be regularly inspected. Maintenance and antiseptic
treatment shall be made for them timely in accordance with technical requirements (generally
once every two years). Damaged lighting equipment shall be timely replaced.
c. Various equipment connectors shall be regularly inspected and fastened. Wearing parts such as
couplers, seals and packing shall be regularly replaced.
d. Various sluice valves shall be regularly inspected for start and stop. Screw rods shall be injected
with lubricating grease.

e. Electric control cabinets shall be regularly inspected and cleaned, and test for various technical performances.

f. Electric valves shall be regularly inspected for their limit switches, manual and electric interlocking devices.

g. Filling and oil sealing sites shall be regularly inspected for sealing and handled if necessary. Filler and lubricating oil and grease shall be added or replaced as required.

h. Collecting wells and grill wells shall be cleaned once every year. Excess sludge that impacts equipment operation shall be timely cleaned.

i. Various machines and equipment shall be inspected and overhauled to meet such technical requirements as concentricity, static balance or dynamic balance.

j. Any lubricating oil, lubricating grease and other clutters generated from maintenance of machines and equipment shall not be randomly littered into waste water treatment facilities.

k. Ventilation equipment of all machine rooms shall be regularly inspected and maintained.

l. Wastes such as mud, sand and residues generated from the inspection process shall be transported to designated sites for united disposal.

m. Waste water discharged from integrated equipment, sludge concentration tanks and filter chambers shall flow into collecting wells or accident emergency pools.

4. Technical Indicators for Maintenance and Inspection

a. Personnel shall comply with the provisions of safe production regulations and systems for waste water treatment stations.

b. The serviceability rate of non-production line equipment and facilities shall reach 95%.

c. The accident injury rate shall be controlled below 1.5. Any major casualty accident shall be completely eliminated.

d. Efforts shall be made to improve equipment management, strengthen economic accounting, and measure and examine costs and energy consumption.
Annex III  Noise Monitoring Report

Xinjian County Environmental Monitoring Station
Test Report
XHJD (2012) QT - No. 012

Project name: Ruijin City Mianjiang River (Lucao Lake) Wetland
Protection and Utilization Subproject

Entrusting unit: Jiangxi Academy of Sciences
Testing category: Monitoring of current status
Report date: June 20, 2012
Statement for Test Report

1. This station is an environmental monitoring institution established by the environmental protection administration of Xinjian County People’s Government in accordance with the laws, and has been reviewed and approved by the Jiangxi Provincial Bureau of Quality and Technical Supervision for measurement authentication (certificate No. (05) LR (G) Z (U0384)).

2. This station guarantees to conduct inspections in a scientific, accurate and fair manner, be responsible for testing data and maintain confidentiality for the samples and technical materials provided by entrusting units.

3. This report becomes invalid without mark, signatures of the report drafters, the auditor and the issuer, or special seal for business or seal on the perforation.

4. Any objection to the test report shall be proposed to us within 10 days upon receipt of the report. Overdue is inadmissible.

5. This report shall not be used for advertising without consent.

6. This test report shall not be wholly or partially duplicated without the written approval of this station.

7. Results of the test only correspond to the samples provided.

Xinjian County Environmental Monitoring Station
Telephone: 3741281
Fax: 3741252
Postcode: 330100
Address: No. 628, Xinjian Avenue, Xinjian County
### Test Report of Xinjian County Environmental Monitoring Station

**Code:** XHJ (2012) QT - No. 012  
**Page 1 of 2**

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<th>Sample status (working condition in sampling)</th>
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<td>13910598251</td>
<td>No. 382, Shangfang Road, Nanchang</td>
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**Test conclusion:**

/  

Special seal for business  
June 20, 2012

**Note:** (When necessary)

1. Environmental test condition: conformity to environmental test condition.
2. Exceptions of high standard methods:
3. Uncertainty of test results:
4. Others:

**Remarks:** This report is responsible for the samples provided only.

Made by:  
Reviewed by:  
Date:  
Date:
# Noise Test Report of Xinjian County Environmental Monitoring Station

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| Monitoring date     | June 18, 2012 | Report date | June 20, 2012 |

## Test Results

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**Executive standard dB (A):**

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<td>See sketch maps for the geographic location of the construction project and the monitoring on the surrounding environment</td>
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**Remarks:** Above test data shows the equivalent continuous sound level with background value revised.

Made by: [Signature] Reviewed by: [Signature]
Date: [Date] Date: [Date]
Annex IV  Relevant Materials of Public Consultation and Information Disclosure

1. Announcement for First Information Disclosure

World Bank-financed Jiangxi Poyang Lake Basin and Ecological Economic Zone Small Town Development Demonstration Project

First Information Disclosure for Environmental Impact Assessment of Ruijin City Mianjiang River (Lucao Lake) Wetland Protection and Utilization Subproject

I. Subproject Overview

Name: World Bank-financed Jiangxi Poyang Lake Basin and Ecological Economic Zone Small Town Development Demonstration Project - Ruijin City Mianjiang River (Lucao Lake) Wetland Protection and Utilization Subproject

Nature: new construction

Location: Mianjiang River Basin, Ruijin, Jiangxi Province

Construction overview: The subproject is consisted of three components: Mianjiang Upper Reaches Wetland Protection and Purification Zone, Mianjiang Middle and Lower Reaches Wetland Ecological Recovery and Utilization Area and Lucao Lake Wetland Ecological Protection Area. The works include septic tanks, garbage collection points and points, waste interception pipeline network, rural waste water treatment system and wetland protection and restoration works. The construction period is five years. Its total investment is RMB143.8012 million, including RMB71.9006 million of loan from World Bank and RMB71.9006 million of domestic fund, each accounting for 50%.

II. Information of the Construction Unit

Implementing agency: Office of Leading Goup for World Bank-financed Jiangxi Poyang Lake Basin and Ecological Economic Zone Small Town Development Demonstration Project

Contact: Hu Bailin
Telephone: 0797-2521779

III. Information of Environmental Impact Assessment Institutes
IV. Main Tasks of Environmental Impact Assessment

(1) Preparation stage: Study on relevant national and local laws and regulations, planning, functional zonings, technical guidelines, relevant standards and construction project-related technical materials; preliminary engineering analysis on composition and main pollutants of the construction project; survey on current environmental status of the environmental impact area of the construction project; definition of key points of the assessment; and the first information disclosure and public consultation for the subproject.

(2) Formal work stage: further study and analysis, adequate survey on current environmental status, monitoring and evaluation of current status of environment quality; prediction and assessment on environmental impacts of the construction project according to source intensity and current status materials of environmental quality; assessment on potential environmental impacts brought by the construction project, countermeasures for preventing or alleviate the adverse environmental impacts.

(3) Report preparation stage: Summary and analysis on materials and data collected in previous stages, definition of feasibility of the construction project from the angle of environmental protection, and preparation of the environmental impact report; prior to the submission of the report to relevant department for examination and approval, public opinions shall be solicited by means of information announcement, questionnaire survey and expert consultation, in order to explain for accepting or rejecting relevant opinions, while constantly improving the environmental impact report according to opinions from all parties. The construction unit submits the final environmental impact report to relevant departments and applies for administrative examination and approval.

V. Scope and Major Items of Public Consultation

1. Scope of Public Consultation
Pursuant to features of environmental impacts of the subproject, the public refers to residents and schools in the subproject areas and people who are interested in the subproject.

2. Major items of Public Consultation

(1) Public awareness of the subproject, its significance and functions;

(2) Public attitudes towards implementation of the subproject;

(3) Public views about environmental pollution caused by construction of the subproject;

(4) Public suggestions about and requirements for measures for mitigating social and environmental impacts of the subproject.

VI. Approaches of Public Consultation

You can feed your valuable opinions and suggestions back to the construction unit and the environmental impact assessment unit through telephone, e-mail and mail. Any public opinion shall be proposed within 10 working days after the publishing of the announcement.

EIA institutes would document public views and suggestions in EIA and report these views and suggestions to the implementing agency and design institute of the subproject as well as relevant departments.

2. Announcement for Second Information Disclosure

**World Bank-financed Jiangxi Poyang Lake Basin and Ecological Economic Zone Small Town Development Demonstration Project**

**Second Information Disclosure for Environmental Impact Assessment of Ruijin City Mianjiang River (Lucao Lake) Wetland Protection and Utilization Subproject**

The draft Environmental Impact Assessment of “World Bank-financed Jiangxi Poyang Lake Basin and Ecological Economic Zone Small Town Development Demonstration Project - Ruijin City Mianjiang River (Lucao Lake) Wetland Protection and Utilization Subproject” has been completed. In accordance with regulations of *Interim Measures for Public Participation of Environmental Impact Assessment*, relevant content of environmental impact assessment will be announced. Your suggestions and advice are welcome and thank you for your comments!

I. Overview of the Subproject

Location: upper, middle and lower reaches of Mianjiang River, Ruijin City, Jiangxi Province and
Northern Suburb, Ruijin City

Implementing Agency: Leading Group Office of World Bank-financed Jiangxi Poyang Lake Basin and Ecological Economic Zone Small Town Development Demonstration Project

Profile of subproject: The subproject is divided into upper reaches wetland protection and purifying area subproject of Mianjiang River, middle and lower reaches wetland restoration and Utilization Area subproject of Mianjiang River and Lucao Lake wetland ecological environment protection subproject. The subproject includes septic tank, garbage collection station and collection spots, waste water interception pipeline network, rural waste water treatment system and wetland protection and restoration project. The total investment of project is RMB14,380,120.00, of which, the loan of World Bank is RMB71,900,600.00, accounting for 50%; and domestic funds are RMB RMB71,900,600.00, accounting for 50%.

II. Potential Environmental Impacts of the Subproject

Ruijin City Mianjiang River (Lucao Lake) Wetland Protection and Utilization Subproject is an environmental protection project featured by pollution control of rural domestic waste water and domestic solid waste as well as wetland protection and restoration. The construction and operation of project will have positive and negative impacts on the environment.

Key positive impacts: After the subproject is completed, it can effectively control the pollution of rural domestic waste water and domestic solid waste on environment, and give full play to the role of subduction and purification of wetland on pollutants. The construction of project plays a positive role in water quality guarantee of Mianjiang River and ecosystem conservation of wetland, and thus will boost the construction of Poyang Lake Ecological Economic Zone and social and economic development.

Key adverse impacts: The wastewater, construction waste, construction noise and construction dust during construction have minor impacts on the environment, and after taking appropriate control measures put forward in the report, these adverse environmental impacts can be effectively reduced. Construction activities, land temporarily occupied by the subproject, stack of spoil, land acquisition and others that directly affect the ecological environment are the major adverse environmental impact factors. After taking soil erosion control measures and biological measures proposed in this report, soil erosion can be effectively mitigated and controlled, and ecological environment of landscape can be restored.

III. Mitigation Measures for Adverse Environmental Impacts

In order to reduce the environmental impacts of the subproject, low-noise construction machinery is used at nighttime, and strong-noise machinery is prohibited during construction; solid waste and wastewater shall be stored in temporary septic tanks and garbage pits and shall be timely removed.
and transported; to avoid soil erosion caused by surface runoff during the rainy season, use sandbags or straw mats to suppress slope for temporary protection. Land acquisition for the subproject would lead to a number of social issues and land requisition compensation policies and procedures shall be effectively implemented. Publicity and education of ecological protection on constructors and nearby residents shall be strengthened in the construction period. Ecological restoration and compensation shall be implemented after construction to mitigate the impacts of construction on ecology.

IV. Feedback on First Information Disclosure

The first public participation and information disclosure was carried out between May 9-June 5, 2012. Public opinions and suggestions received are as follows:

(1) They hope the subproject to be completed as soon as possible to serve the people in the subproject areas;

(2) Shorten construction period to the greatest extent, and eliminate the transient impacts of construction at an early date, such as dust and landscape impacts.

(3) All respondents agree to implementation of the subproject.

In responding to the above public views, the implementing agency indicated that it would actively take public views, arrange construction period rationally, strictly implement environmental protection measures and strengthen environmental and construction management.

V Main Conclusions of Environmental Impact Assessment

Implementation of the subproject would have some adverse environmental impacts mainly during construction, which mainly include impacts on ecological environment and impacts of soil erosion. These impacts are relatively minor and after taking corresponding environmental protection measures, they can be mitigated to some extent. The subproject would have positive impacts on local residents and local ecological and economic development. Therefore, from the perspective of environmental protection, World Bank-financed Jiangxi Poyang Lake Basin and Ecological Economic Zone Small Town Development Demonstration Project - Ruijin City Mianjiang River (Lucao Lake) Wetland Protection and Utilization Subproject has no restrictive environmental impact factors and the implementation is feasible.

VI Method and Duration for Accessing the EIA

Method: The EIA is placed at Ruijin City PMO and village committees for public access.

Duration: July 13, 2012-July 25, 2012
Within the period, the general public may request the EIA institutes to provide relevant supplementary information via e-mail.

VII Scope and Main Issues of Public Consultation

The announcement aims to ask for comments and suggestions of the public on potential environmental during the construction and operation of the subproject; comments and suggestions about mitigation measures; and other comments and suggestions.

VIII. Approaches of Public Consultation

You may contact the implementing agency or EIA institutes by telephone, letters or other forms. Contact details are as follows:

Implementing Agency: Leading Group Office of World Bank-financed Jiangxi Poyang Lake Basin and Ecological Economic Zone Small Town Development Demonstration Project
Address: No. 26 Mianshui Road, Xianghu Town, Ruijin City
Tel: 0797-2521779

EIA institutes: Institute of Poyang Lake Eco-economics, Jiangxi University of Finance and Economics, Beijing Huaqing Lishui Environmental Technology Co., Ltd., Environmental Engineering Technology Development Center, Jiangxi Academy of Sciences

Mailing address: 10# Multiple-purpose Building, Northern Section, Jiangxi University of Finance and Economics (Jiaoqiao Campus), Lushannan Avenue, Nanchang City, Jiangxi Province
Tel.: 0791-83810553

3. Questionnaire of Public Consultation

<table>
<thead>
<tr>
<th>Name</th>
<th>World Bank-financed Jiangxi Poyang Lake Basin and Ecological Economic Zone Small Town Development Demonstration Project - Ruijin City Mianjiang River (Lucao Lake) Wetland Protection and Utilization Subproject</th>
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<tbody>
<tr>
<td>Location</td>
<td>Mianjiang River, Ruijin City, Jiangxi Province</td>
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</tbody>
</table>

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Overview
Contents: The subproject is consisted of three components: upper reaches of Mianjiang River and purification zone, wetland restoration and utilization of middle and lower reaches of Mianjiang River, and ecological environmental protection of Lucao Lake wetland. The works include septic tanks, garbage collection station and collection spot, wastewater pipeline network, wastewater treatment system in rural areas and wetland conservation and restoration works.

Adverse impacts of the subproject on the environment are mainly concentrated in the construction period. Construction activities would generate “three wastes”, noise and other pollutants. Construction activities would have adverse impacts on ecological environment, water environment, atmospheric and acoustic environment, but with the end of construction period, impacts on the environment would disappear accordingly. In order to reduce environmental impacts of the subproject, low-noise construction machinery would be used at nighttime and strong-noise machinery would be prohibited; solid waste and wastewater would be stored in temporary septic tanks and garbage pits and would be removed and transported in a timely manner; to avoid soil erosion caused by surface runoff during the rainy season, sandbags or straw mats would be used as a means of temporary protection.

Implementation of the subproject would effectively prevent pollutants from entering the Mianjiang River, guarantee water quality of Mianjiang River and safety of drinking water for surrounding residents, restore beach wetland, create good habitat environment, enhance biodiversity and ultimately improve ecological environment of Poyang Lake Basin. At the same time, it would improve public awareness of environmental protection and promote the harmonious coexistence of man and nature through advocacy, education, display and other means. Construction and rehabilitation of wetlands and mudflats along the river would also provide a good place for research and monitoring.

<table>
<thead>
<tr>
<th>Name</th>
<th>Sex</th>
<th>Age</th>
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<tr>
<td>Nationality</td>
<td>Educational background</td>
<td>Company or address</td>
<td>Tel</td>
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1. Do you know this project? □Yes □Know a few □No

2. What is your expectation for land acquisition of project? □Reasonable economic compensation □Additional land allotment or resettlement □Cannot be expropriated

3. What do you think will be the major environmental problems in the construction of project? (multiple choice) □Construction noise □Construction dust □Temporary land occupation □Traffic jam caused by construction □Construction safety □Waste water □Soil erosion □Ecological destruction □Landscape impacts □Others

4. What main environmental impacts do you think the service of project will have? (multiple choice) □Water pollution □Air pollution □Noise pollution □Ecological destruction □Landscape □Others

5 Do you think the construction of project will be beneficial for local economic development? □Yes □No □Unknown

6. What effects do you think the subproject would have? (multiple choice) □Good for giving playing local resource advantages □In favor of protecting local ecological environment □Improve the quality of life of local people
7. What is attitude towards this project? (please state the reason if there are any objections)

[ ] Support [ ] Against [ ] Indifferent

Other comments and suggestions

Note: 1. Please put “√” for each question. For example, “√” refers to “agree”.

2. Describe the specific requirements on other comments and suggestions in writing. If more space is needed, attach an extra sheet of paper.

4. Minutes of Discussion Meeting

(1) Time: 2:30pm, July 25, 2012
(2) Venue: Meeting Room of Project of Ruijin City
(3) Content: Public consultation and information disclosure discussion meeting of World Bank-financed Jiangxi Poyang Lake Basin and Ecological Economic Zone Small Town Development Demonstration Project—Ruijin City Mianjiang River (Lucao Lake) Wetland Protection and Utilization Subproject
(4) Attendees: Hu Bailin, Yang Xiaochu, Yang Ruibin from Project Office of Ruijin City, Xie Changsheng from Ridong Forestry Workstation, Liu Haifei from Ridong Huyang Village, Xu Fulin from Gaoxuan Village, Rentian Town, Lai Musheng from Rentian Town, Liu Jiujiu from Xiajie Village, Rentian Town, Zhu Juanhong from Xianghu Town, Huang Bigui from Gangbei Village and Zhao Kai, Huang Dan and Xie Longjun et al. from environmental assessment organization unit.
(5) Moderator: Hu Bailin
(6) Minutes of Meeting

The meeting conducted public consultation and information disclosure on the environmental assessment work of Ruijin City Mianjiang River (Lucao Lake) Wetland Protection and Utilization Subproject, held discussions on possible impacts on environment and control measures of the subproject, and a consensus was reached. Minutes of the meeting are provided below:

① Information disclosure

The EIA institutes provided an overview of Ruijin City Mianjiang River (Lucao Lake) Wetland Protection and Utilization Subproject, conclusions of draft EIA, environmental impacts of the subproject and proposed measures to be taken, and gave a brief description of the significance and follow-up matters of JPESTP.

② Positive benefits of subproject

After its completion, the subproject could effectively control environmental pollution of rural domestic sewage and waste and maximize the role of wetland in absorbing and purifying pollutants. Implementation of the subproject would play a positive role in assuring water quality of Mianjiang
River and ecosystem conservation of wetland, and would boost the construction of Poyang Lake Ecological Economic Zone and social and economic development.

③ Public views and explanations given by implementing agency

Public views:

a. The public expressed support to the subproject implementation and hoped that it could be operated as early as possible to serve the people of Ruijin City.

b. Dust shall be controlled during construction to reduce adverse impacts on the nearby residents.

Explanations given by the implementing agency: Thank you for your support. To reduce air pollution, material yard and other dust materials would be kept far away from populated area. The feed port and outlet of construction machinery (such as mixer) shall be isolated. The pavement would be watered regularly to avoid dust pollution generated by vehicles passing by.

④ Meeting Summary

All attendees expressed their views at the meeting and the EIA institutes responded to these views. At the same time, the attendees agreed that implementation of Ruijin City Mianjiang River (Lucao Lake) Wetland Protection and Utilization Subproject was a good thing benefiting local people, and they would give strong support and full cooperation.
5. Pictures of Notice

Pictures of On-site Notice

First Online Disclosure

Second Online Disclosure
6. Pictures of Report Disclosure

7. Pictures of Newspaper Disclosure