Jiangxi Xinjiang Bazizui Navigation-Power Junction Project Environmental Impact Analysis

Client: **Jiangxi Provincial Port & Waterway Construction Investment Co., Ltd.**

Evaluation Unit: **CCCC Second Harbor Consultants Co., Ltd.**

August, 2017

Preface

1 Background and Features of the Construction Project

Xin River, one of the five great rivers of Poyang Lake Water System, has a total length of 328km and drainage area of 16890km^2. As per the *Planning on the Layout of National Inland Waterways and Ports* approved by the State Council of the People's Republic of China, Xin River is determined as one of the 18 primary high-grade waterways. As per the related planning, the 244km waterway from Xin River mouth to Chuxi River mouth, will adopt the three-level channelization in combination with waterway regulation to reach the standards of third-level waterway, namely, to construct Jiebei Junction, Bazizui Junction (inclusive of Hushanzui and Mopiling), and Shuanggang Junction, together with the regulation works of waterway in reservoir area and waterway in lake area. The body of Jiebei Junction was completed in 1997. The normal water storage level in design is 26m. Due to the reservoir inundation, the reservoir only maintains a water storage level of 24m, which makes it impossible to achieve its navigation function. Therefore, the future technical transformation is required. Currently, the preliminary works of Bazizui Navigation-Power Junction and Shuanggang Navigation Junction are ongoing. After the completion and operation of this project together with the Shuanggang Navigation Junction project and the Jiebei Junction technical transformation project, combined with necessary waterway regulation engineering, the planning target for Xin River national high-grade waterway can be basically realized.

In order to build up the Xin River high-grade waterway, a large quantity of investigation, research, planning and design works are carried out for Xin River high-grade waterway by related national ministries and local governments. As a result, such reports as *Planning on the Layout of National Inland Waterways and Ports, Jiangxi Inland Waterway Navigation Development Planning (2020), Xin River High Grade Navigation Construction Planning (2011-2015), Jiangxi "13th Five-year" Comprehensive Transport System Development Panning* and others are prepared.

As per the Planning on the Layout of National Inland Waterways and Ports published by Ministry of Transport of the People's Republic of China in 2007, the "two horizontal trunk waterways, one vertical trunk waterway, two high-grade waterway networks and 18 high-grade mainstream and tributary waterways" high-grade waterway layout planning is raised, while Xin River is included. Meanwhile, the grade of 244km waterway from Xin River mouth to Chuxi River mouth is planned as third-level.

As pointed out *in the Jiangxi Inland Waterway Navigation Development Planning* published by Department of Transport of Jiangxi Province in April, 2006, the national high-grade waterway in Jiangxi Province is composed of "two horizontal trunk waterways, and one vertical trunk waterway".

Among which, “two horizontal trunk waterways” refers to Yangtze River Trunk Waterway (Jiangxi Section) located in the northern part of Jiangxi Province, and Xin River linking the east and west of Jiangxi Province, while “one vertical trunk waterway” refers to the Ganjiang River running through the hinterland of Jiangxi Province from north to south. As per the planning, 244km waterway below the Xin River mouth is defined as the third level waterway, while the 111km waterway from Guixi to Shangrao is defined as the fifth level waterway. It is clearly defined that Xin River national high-grade waterway consists of 3 cascades and 4 junctions, namely, Jiebei and Bazizui cascade (including Hushanzui Junction of East River of Xin River, and Mopiling Junction of West River), and Shuanggang Cascade.

As clearly defined in *Xin River High Grade Navigation Construction Planning (2011-2015)* which was published by Jiangxi Development and Reform Commission and Department of Transport of Jiangxi Province in 2013, the overall construction scheme of Xin River waterway is that the 244km waterway from Xin River mouth to Chuxi River mouth, will adopt the three-level channelization in combination with waterway regulation to reach the standards of third-level waterway, namely, to construct Jiebei Junction (existing, but completion or reconstruction is required), Bazizui Junction, and Shuanggang (or Poyang Lake) Junction, carry out the regulation works of waterway in reservoir area and waterway in lake area, and also reconstruct the 7 crossing river bridges whose clearance cannot satisfy the standards of the planned third level waterway.

As per the *Jiangxi “13th Five-year” Comprehensive Transport System Development Panning* published by People’s Government of Jiangxi Province in March, 2017, Bazizui Navigation-Power Junction Project is listed as the key port and waterway projects.

Bazizui Navigation-Power Junction Project is located at the lower course of Xin River, and within the territory of Yugan County, Shangrao City, Jiangxi Province. The recommended dam site is located at the place which is 49km away from the upstream Jiebei Junction dam site, about 12km away from the downstream Yugan County Seat, and 57km away from the planned downstream Shuanggang Navigation Junction. The geographical coordinates of planned dam site are 116°40′30″E and 28°37′20″N. Xin River is divided into East River and West River at Badazui. Therefore, this junction is divided into two dam sites, namely, Hushanzui Junction Dam site of East River and Mopiling Junction Dam site of West River, which are on the same axis. Hushanzui Junction Dam site of East River is located at Xiongjia Village, Baimaqiao Town, Yugan County, while Mopiling Junction Dam site of West River is located at Xindu Village, Hongjiazui Town, Yugan County. The recommended scheme for junction layout is demonstrated as follows from the left bank to the right bank: Earth Dam on the left bank of Mopiling Junction Dam site (the length of leading edge is 215m), Navigation Lock of Mopiling Junction Dam site (the length of leading edge is 43.4m), 20-cell release sluice (the length of leading edge is 342m), water-retaining power house of Mopiling Junction Dam site (the length of leading edge is 75.94m), Fish Way of Mopiling Junction Dam site (the length of leading edge is 8m), linking earth dam between two junctions (the length of leading edge is 408m), Navigation Lock of Hushanzui Junction Dam site (the length of leading edge is 43.4m), Gate Chamber Dam Monolith of Hushanzui Junction Dam site (the length of leading edge is 19m), 12-cell release sluice of Hushanzui Junction Dam site (the length of leading edge is 206m), water-retaining power house of Hushanzui Junction Dam site (the length of leading edge is 70.51m), Fish Way of Hushanzui Junction Dam site (the length of leading edge is 8m), Earth Dam on the right bank of Hushanzui Junction Dam site (the length of leading edge is 52m), and the total length of junction dam crest is 1510m.

The catchment area of the recommended dam site is 15942km^2, while average annual discharge at the dam site is 578m^3/s, and the average annual runoff is 18.228 billion m^3. The normal water storage level of the reservoir, designed flood level, check flood level, total reservoir capacity, reservoir capacity below normal water storage level, and backwater length of reservoir are respectively 18m, 23.69m, 24.30m, 3.44×108m^3, 1.36×108m^3, and 37km. The installed capacity, average annual energy output and total project cost are respectively 12.6MW (including 5.6MW for Hushanzui Power Station and 7MW for Mopiling Power Station), 0.4503×10^{8}kW•h, and RMB 3.999 billion. After the completion of Bazizui Navigation-Power Junction, the canalized waterway will be 37km long. Combined with the relevant waterway regulation works, the navigation conditions of 49km waterways from Jiebei of Xin River to Bazizui will be improved, which will upgrade the waterway grade from Jiebei to Bazizui to third level, and further promote the realization of planning target that the waterway from Xin River mouth to Chuxi River mouth is defined as the third level waterway.

2 Working Procedure of Environment Impact Assessment

On Feb. 13th,2017, Jiangxi Provincial Port＆Waterway Construction Investment Co., LTD entrusted our unit to implement the environment impact assessment of Bazizui navigation-power junction on Xin River in Jiangxi province.

In February 2017, the assessment unit was first publicized on the website of Jiangxi Water Transportation Authority and Yugan county government seven days after the construction unit signed the contract with us.

From February to March of 2017, on the basis of project feasibility report and another materials, we conducted field surveys in project areas, researched natural and ecological environment in affected areas, collected materials concerning local environment protection planning and related environment background, anticipated serious environmental problems of the project and identified environmental protection objectives after we received the assignment.

In March 2017, we drafted the environment impact report.

In March 2017, the construction unit publicized the draft of environment impact report on the website of Jiangxi Water Transportation Authority and Yugan county government for the second time after it was finished. And the construction unit held public hearing and handed out questionnaires to the public.

In July 2017, the construction unit accomplished the public participation research files.

In August 2017, the environment impact report was completed. (the submitted version)

3 The analysis and judgement of related situations

(1) The classification of the report

According to the Classification List of Environment Impact Assessment of Construction Project released by the Environmental Protection Ministry on April 9th 2015, (No.33 administrative order of Environmental Protection Ministry, taking effect on June 1st 2015 and aborted on September 1st 2017) and the Classification List of Environment Impact Assessment of Construction Project released by the Environmental Protection Ministry on 29th June 2017(No.44 administrative order of Environmental Protection Ministry, taking effect on September 1st 2017), the project is classified as navigation-power junction, which is subject to issue Environment Impact Assessment Report.

(2) Assessment Level

Surface water environment: ①sewage discharge quantity: Based on the design of Bazizui navigation-power junction, production sewage generated during the construction period was mainly comprised of gravel processing system and cement maintenance, and sanitary sewage mainly come from construction workers. The sewage discharge during construction peak period is approximately 258.4m^3/d, (sewage from gravel flushing and cement tank flushing is recycled) ②the composition of sewage: the composition of the project's sewage is relatively simple as the main pollutant of production sewage is SS and that of sanitary sewage is BOD5 and COD. ③the level of surface waters: The surface waters of the project area should be classified as big river as the annual flow at Bazizui navigation-power junction reaches 578m3/s. ④water quality requirement: The water protection requirement of Xin river and Baita river is theII~IIIclass standard in *Environment Quality Standard of Surface Water.* *（GB3838-2002）* Based on the assessment principles of *Environment*

Impact Assessment Guiding Rules: Surface Water Environment（HJ/T2.3-1993）, the environment assessment work of this project should be classified as level 3. Considering that the hydrological conditions of reservoir and downstream area will change as the construction of Bazizui navigation-power junction leads to water block and great environment impacts, we upgraded the environment assessment level to level2.

Ecological environment: The reservoir submersion and project land commandeering of Bazizui navigation-power junction do not affect natural reserves, world cultural and natural heritages, scenic spots, forest parks, geological parks, wetlands, virgin forests, endangered animal habitation zones and spawning, feeding and hibernacle locations of important aquatic organisms. The 37km-long and 2710.83hm^2 covered land include reservoir area, project hub area, and temporary facility. Based on the assessment principles of *Environment Impact Assessment Guiding Rules: Surface Ecological Impact（HJ19-2011）*, the ecological impact level should be assessed as level 2. As the construction of Bazizui navigation-power project will lead to the separation of river ecosystem, and the hub operation will lead to changes in the aquatic habitats. Based on this, according to the "*Ecological Impact of Technical Guidelines for Environmental Impact Assessment" (HJ19-2011)* Article 4.2.3, the ecological rating of this project will be upgraded to level 1.

Air environment: Bazizui navigation-power junction is an eco-friendly project which will not emit toxic gases in operation. According to the classification principle of *"Environmental Impact Assessment Technology Guiding Principles: Atmospheric Environment" (HJ2.2-2008)*, the level of atmospheric environmental impact assessment is three.

Sound environment: After the construction of Bazizui navigation-power project is completed, the navigation conditions of the Xin river section will be improved. The increase of shipping volume will have adverse impact on the acoustic environment-sensitive targets around the navigation channel. However, the increase of sensitive target noise level before and after the construction is within 3dB (A) , And the number of affected population does not change much. According to the principle of appraisal and grading of *"Environmental Impact Assessment Technology Guidelines for Sound Environment" (HJ / T2.4-2009)*, the level of sound environmental impact assessment is set at level 3.

Ground water environment: Baizizui navigation-power project is located in the lower reaches of Xinyi River with better water quality. The project will not cause groundwater pollution in project construction and operation, which makes it a non-polluting construction project. The project will cause the change of groundwater flow field and water level after the impoundment. According to the technical classification of groundwater environment impact assessment in Appendix A of the *Technical Guidelines for Environmental Impact Assessment (HJ610-2016)* Baizizui navigation-power junction project belongs to the category 4 of construction projects. There is no concentrated drinking water source protection area in the evaluation area, nor any special groundwater resources protection areas such as hot water, mineral water and hot springs, no key protected areas in ecologically fragile areas, no prone areas with geological disasters, no important wetlands and key prevention and control of soil and water loss District and desertification protection zone; the drinking water source for residents around the reservoir is mainly distributed decentralized well water with a small scale of water supply. The project impoundment operation mainly affects the recharge runoff area and recharge process of centralized underground drinking water sources, so that the sensitivity of groundwater environment of the project is judged as "rather sensitive". According to the classification standard of construction project evaluation grade of *"Environmental Impact Assessment Technical Guidelines Groundwater Environment" (HJ610-2016)*, the grade of groundwater environmental impact assessment of this project is “brief analysis”.

Environment risks: The environmental risks that may occur during the construction of Baizizui navigation-power junction project are mainly the pollution caused by the spills of oil from the construction vessels on the water environment of Xin river. After the Baizizui navigation-power junction project comes into operation, the project itself will not add new sources of risk and there is no significant risk of environmental accidents source. However, the waterway of about 49km in the Bazizui reservoir will be canalized to raise the standard of the waterway from the dam site to the upstream boundary of the dam site to GradeIII. The improved shipping conditions will help to reduce the probability of oil spill accidents (Especially during the dry season), there is still the possibility of polluting water by oil spills (liquids) from ships. During the operation period, risks arising from the leakage of power station units, dam breakage and collapse of the reservoir bank will persist. According to the classification of environmental risk assessment in the Technical Guidelines for Environmental Risk Assessment of Construction Projects, the grade of environmental risk assessment of this project is determined to be Level 2.

4 The main issues of concern and environmental impact

The main environmental issues of environmental impact assessment of Baizizui navigation-power junction project include the submergence of reservoirs and the loss of land resources caused by land occupation and the loss of surface vegetation, the impact of dam blockage on the aquatic ecosystem of Xin River, the water quality of partial river sections during construction, environmental quality of the construction area and acoustic environment and other environmental factors adversely affected.

(1) Terrestrial ecological environment impacts

The reservoir of Baizizui navigation-power junction project has a total flooded area of 2027.19hm^2, a hinterland of 533.94hm^2 (including permanent land occupation of 154.57hm^2 and temporary land occupation of 379.37hm^2) and a reservoir protection area of 149.7hm^2 (including permanent land occupation of 31.63hm^2, Temporary land 118.07hm^2).

The construction of the project will affect the vegetation and plant resources in the assessment area to some extent. The inundation and the vegetation in the construction area are the result of the secondary evolution of man-made long-term continuous disturbance. In order to evaluate the general distribution types of the riparian zone in the low- Plantations, shrubs and shrubs are the dominant species, most of which are common and widely distributed plant species in the region. The project has little effect on plant species and landscape pattern. The construction mainly aims to reduce the above-mentioned area and quantity of vegetation and plants, and will not result in significant changes in plant species composition and plant population structure. After the construction, the natural conditions of the region such as water, heat and soil nutrients are good, which have little effect on the degree of landscape heterogeneity and impedance capability of the regional natural system, and will not bring obvious adverse impacts on the production capacity of the regional natural system Influence, regional landscape structure and function will be gradually restored and developed.

The three camphor trees in the evaluation area are located in the protective embankment in the reservoir area. The impoundment of the reservoir will not have obvious adverse effects on its growth but they may be affected by the flood embankment construction. Monitoring measures shall be taken during the construction to eliminate the destructive impact of the construction. There are 5 species of key protected wild plants in Jiangxi Province, including Tong, Chongyang, Dalbergia, Fructus Giganteum and Anemarrhena asparagus in the evaluation area, all distributed in the hilly land around the Baizizui Reservoir. Construction area and reservoir inundation area range, and wide distribution, Baizizui navigation-power junction of the above-mentioned plants will not have greater adverse impact.

(2) Aquatic ecological impact

The construction of the Baizizui Navigation-power Project will affect the continuity of the river. Fragmentation of the fish habitat will have a barrier effect on the exchange between the upstream and downstream fish stocks of the dam. At the same time, the water level of the reservoir area will increase after the impoundment, The area expanded to form relatively still flow or hydrostatic environment. The flow velocity and bed quality in the reservoir area also changed due to the impoundment of reservoirs, which provided better conditions for the growth and reproduction of planktonic plants and reservoirs Primary productivity will increase.

The impact of Bazizui Navigation Junction Project on fish mainly occurs after the completion of the dam. Based on the analysis of the impacts on the different ecological needs of fish, the construction of Bazizui Navigation Junction Project will mainly exert a great influence on the fish living in the river section of the original reservoir area. The impact on the fish under the dam is mainly to block the long distance migratory upstream route of herring, grass carp, red-eye trout, guan, gan, bian, silver carp, silver carp and other 8 species of fish, making it impossible to reproduce at the original spawning grounds, but for other ecological its impacts are not so pronounced.

(3) Water environment

1) Hydrology conditions

①construction period

The project adopts the second-stage diversion method. During the construction period, the continuous over-flow of the river is still maintained, and no river runoff and dewatering will occur.

②Initial impoundment of reservoir

According to the design of construction organization, at the end of March of the fifth year, the junction will be able to retain water and water storage begins in April. According to the average flow rate Q=961m^3/s in April of the Bazizui navigation junction and the discharge volume of ecological flow of 67.6m3/s (Ecology flow under Daheba in eastern river is 32.4m^3/s and 35.6m3 / s in Daheba in wastern river), it will take 43 hours to level up to the normal level---18m. (136 million m^3 of storage capacity) Initial storage time of reservoir is short, so the impoundment will have less material impact on hydrological conditions.

③hydrological conditions in reservoir area during operation

Bazizui navigation junction is a radial development mode, the reservoir capacity of the building is very small, almost no regulation of runoff performance. Therefore, the average annual average, monthly average and average daily flow rate and water level of the representative design downstream of the Bazizui sluice dam are the same as the annual runoff and water level of the representative design of the dam site under the current conditions. That is, after the Bazizui navigation junction project is completed and put into operation, The downstream average annual average monthly average flow and the average monthly water level and almost unchanged.

Any navigational hub project can not change the distribution of incoming water upstream of the dam site, and the same is true for the Bazizui navigation junction project. After the project is completed and put into operation, it is impossible to change the incoming runoff and interval water flow in the upstream of the dam site. The annual and typical daily runoff of the design representative upstream of the dam site after completion and operation of the project are the same as before the completion of the operation, Design represents the annual runoff and typical daily flow process.

According to the regulation of operation of Bazizui junction, when the incoming water of the dam reaches 1100m3 / s or the downstream water level is 18.0m or more, the reservoirs will need to be fully let loose and recover the natural river status. After the flood, the reservoirs will not be able to start impoundment until the two conditions, ie, the incoming water in the upper reaches is less than 1100 m3 / s and the lower reaches is less than 18.0 m in length. When the incoming water flow at the dam site is equal to the demarcation flow rate of 1100m3 / s, the water level in front of the dam will be 1.65m higher than the natural state, raising the average flow rate over the years by 2.66m and the backwater length of 37km. The lower reaches of the dam flow to water, dam along the upper reaches of the water level the higher the peak is.

The power flow of Bazizui power plant is composed of upstream power flow and interval flow. However, in order to ensure that the shipping base flow discharged by Bazizui power plant is greater than or equal to 67.6m^3/s to meet the shipping and ecological requirements of downstream, one day's water flow has been adjusted appropriately. The inadequate part of the shipping base flow discharged by upstream power plants is supplemented by the Bazizui reservoir. After the project is completed and put into operation, the minimum flow in the downstream of the dam site will increase to over 67.6m^3/s. The non-flood period will be supplemented appropriately with the small flow downstream of the sluice dam. When the upstream coming flow is less than 67.6m^3/s, the downstream flow of the dam will increase to 67.6m^3/s or more.

Bazizui navigation-power junction project is a low dam runoff power station, the water level is lower than the channel, the reservoir is adjusted only in dry season, but the adjustment capacity is also very limited. When the flow rate increases, the downstream water level also rises, and the cross-sectional area of the same section increases correspondingly. After the construction of Bazizui navigation junction project, under different levels of floods, the water area in the reservoir area will be increased in varying degrees, and the corresponding average velocity of the sections will be decreased to some extent. Therefore, the variation of the downstream flow velocity after the completion of downstream is less acute compared with the current situation.

In summary, the operation period of the dam has little influence on the upstream and downstream flow, water level and flow velocity.

④Ecological flow

The ecological flow during initial storage and operation period of the project using the Tennant method, the amount of water needed to maintain the function of river shipping, and the industrial and agricultural production and domestic water consumption is $67.6m^3/s$. Among them, the ecological base flow of Dongdahe Hushanzui Dam is $32.0m^3/s$, and the ecological base flow under the Diaopiling dam in Xin river is $35.6m^3/s$.

During the construction period, the Bazizui navigation-power junction adopts the second-stage diversion scheme. During the construction period, the river still maintains the characteristics of continuous over-flow of the river, and there will be no river runoff and dewatering. The river downstream of the dam can meet the ecological flow requirements.

During the initial storage period and operation period, the flow rate at the dry season is $Q=121m^3/s$ at the Bazizui navigation-power junction dam (in which the flow volume of Dongdahe Hushanzui is $64.2m^3/s$, that of Xidahe Diaopoling is $56.8m^3/s$), which is consistent with the drainage ecological flow of $67.6m^3/s$ ($32.0m^3/s$ in Dongdahe Hushanzui and $35.6m^3/s$ in Xidahe). During the initial storage period and during the operation, the drainage flow at the dam site should be controlled not less than $67.6m^3/s$ to meet the ecological flow requirements.

2)Water temperature

Baizizui reservoir water temperature is a typical hybrid reservoir. Due to the frequent exchange of reservoir water, the water body stays in the reservoir for a short time, the water temperature does not appear to be stratified, and the difference between the reservoir water temperature and the reservoir water temperature is not large.

3)Water quality

①Water quality during construction period

The sources of pollution during the construction period mainly come from flushing wastewater from sand and gravel processing system, flushing wastewater from concrete system, drainage from foundation pit, mechanical oil-containing wastewater and domestic sewage of construction workers.

The main source of water pollution during the construction of sand and gravel washing wastewater. Under normal conditions, the SS concentration of sand and gravel washing wastewater after construction can be reduced below 70mg / L, and all the reuse and zero discharge can be realized without affecting the water quality of Xin River.

The concentration of suspended solids in the regular drainage of foundation pit in this project is about 2000mg/L and the pH value is 9-11. If it is directly discharged, it will adversely affect the water quality in the vicinity of the outlet near the outlet of the Xin River. Therefore, wasted water should be properly processed before discharging into the river. After the measures are taken, the pH value of waste water can be adjusted to 6~9, and the concentration of suspended solids can reach the standard, which can basically reduce the adverse impact on the pH value and SS of Xin River downstream of the outlet.

The amount of concrete tank waste water is small, and pollutants are simple and non-toxic. The full mixing after it is discharged into the water will not have a greater adverse impact on the water. After adopting the corresponding processes to discharge, it basically does not affect the water quality of Xin River.

The project will set up machinery repair shop and mechanical parking lot. The mechanical oil-containing wastewater will be produced during the process of mechanical repair and cleaning. The main pollutant is petroleum, the concentration is about 30-150mg / L, with the characteristics of intermittent discharge. And mechanical parking lot around the drainage ditches, collecting construction machinery flushing waste water, the end of the drain set the filter tank, mechanical oil waste oil through the oil, filtered and precipitated back for sprinkler dust, oil by a qualified unit for recycling, will not have a greater adverse impact on water quality.

The average oil concentration of the bilge of the ship is 3500mg / L. The untreated oil directly discharged from the tank bottom of the ship has a great impact on the surface water environment. The concentration of the discharged standard after treatment is not more than 15mg / L.

The domestic sewage of the construction campsite will produce about 144m3 of domestic sewage on the peak day and the main pollutants will be COD and BOD5 at concentrations of about 300mg / L and 200mg / L, respectively. If it is directly discharged, the water quality will be affected to a certain extent. Sewage treated by complete set of sewage treatment equipment, COD, BOD5 and other pollutants after treatment concentration BOD5 $\leq$ 20mg / L, COD $\leq$ 60mg / L, water for construction roads sprinkler dust and greening water, water quality less affected.

According to the survey, it is estimated that the construction approval time of 4km below the Dapiling dam of western Xin River in preparation for the water intake of Hongjiazui Town Water Works has not been started yet. The construction time has not been confirmed yet. It is suggested that after completion of this project, Township water plant to normal water supply. In addition, normal construction activities at the construction phase of the hub will have less impact on normal water intake and water quality at the intake of the reservoir area and below the dam after the necessary pollution prevention and control measures are taken.

②Water quality during operation period

Through the overall prediction of reservoir water quality during operation, the water quality of Bazizui reservoir in the dry season of 2020 reached the Grade III water quality standard of Surface Water Environmental Quality Standard (GB3838-2002).

Through the calculation and analysis of nitrogen and phosphorus in the Baisezui navigation and hydropower project, the annual average concentration of total nitrogen in water of Bazizui navigation-power junction is <0.30mg/L and the average concentration of total phosphorus is <0.050mg/L. After the construction of Bazizui Navigation-power Project, the reservoir will not eutrophicate in general.

Under the average daily flow rate of 90%, the maximum concentration of ammonia nitrogen in the four water intakes at the reservoir area was 0.932mg / L, the maximum concentration of BOD5 was 5.05mg / L and the maximum concentration of CODmn was 18.0mg / L after dam construction. The concentration of BOD5 in the water near the water intake of the Huangjinbu Industrial Park waterworks was 4.32mg / L, which did not meet the requirements of Class III in the "Surface Water Environmental Quality Standard" (GB3838-2002). The water quality at other water intakes in the reservoir area has reached the ClassIIIstandard in "Surface Water Environmental Quality Standard" (GB3838-2002). In the process of water storage, wastewater discharge may cause pollution to the water intake of waterworks in Huangjinbu Town Industrial Park; other time periods will not have a significant impact on the quality of water intake.

During the wet season, the hydrological situation at the downstream of the Bazizui reservoir dam site is close to the natural state, and the operation of the reservoir has little effect on the water quality of the downstream reaches of the dam. During the dry season, the operation of the Baizizui mouth hydropower junction can increase the downstream flow rate, Have a beneficial effect. After the construction of Bazizui Navigation-power Project, it will not have obvious adverse impacts on the downstream water quality and water environment sensitive targets of dam.

(4) Air and sound environment impacts

The main sources of air pollution in the construction area of Bazizui Navigation Junction Project are dust and dust from construction activities such as earthwork excavation and backfilling, sand and gravel processing, concrete mixing, dusty materials transportation such as cement, and emissions during operation of construction machinery and transportation vehicles Of the fuel gas emissions, the main pollutants TSP, PM10, NO2, etc., of which dust and dust is the main air pollution during construction.

The concentration of TSP in the 150m wind direction of concrete mixing TSP can meet the daily average of 0.30mg / m3 standard of Ambient Air Quality Standard (GB3095-2012). The main production facilities of this project are arranged on central island. The border of the construction site is 200m from the embankment of Dongdahe River on the right bank and 600m from the embankment of Xidahe River on the left bank. Therefore, the production facilities in the construction site have less influence on the sensitive air in the surrounding area of the hub.

The TSP concentration of 160m at the TSP of the transport vehicle can meet the requirements of the unorganized emission monitoring concentration limit (5.0mg / m3) in the Integrated Emission Standard of Air Pollutants (GB16297-1996). During the transportation of materials, Peripheral sensitive points have a certain impact until the end of construction, the impact that eliminate.

The sensitive projects such as the embankment reinforcement project and material transportation in the reservoir area will be affected to a certain extent by residents with sensitive points distributed around the embankment line and the road to be used nearby, but the impact will be short-lived. When the construction is completed and the pollution is completed.

The construction site of Bazizui Navigation-power Junction is central island. The acoustic environment of the left and right banks of the construction site is more than 200m away from the acoustic environment. The fixed point sound source during the construction period has less influence on the sensitive spots around the environment.

The traffic noise at daytime during the construction of the temporary roads and the current roads in the construction basically did not exceed the 10m range on both sides of the highway (Category 4a); night traffic noise basically did not exceed the standard of 15m on both sides of the road. The impact of noise during operation is limited to the boundary of the junction area. The operation of the power station will not cause any noise pollution. The ship noise during the operation period will not cause any noise excessive impact on the residents along the route.

5 Major conclusions of environment impact assessment

The Bazizui Navigation-power Project is the second level in the "Jiepai - Baizuizui - Shuanggang" construction of the Xinjiang National High Grade Waterway. The project construction conforms to the "Development Plan for Inland Waterway Shipping in Jiangxi Province" and the "Development Planning for the Xinjiang High Grade Waterway (2011-2015) "," Jiangxi Province "Thirteen Five" comprehensive transportation system development plan ", in line with national industrial policy requirements. After the construction of Bazizui Navigation-power Project, the canal channel will be 37km long, supplemented by the corresponding waterway improvement project to improve the navigable conditions of the boundary line of XJB to the 49km section of Baizizui and upgrade the grade of the fairway to the Bazizui Section to III Level, to further promote the Xinjiang Guixi estuary ~ Chuxi estuary planning channel III goal of the realization of the project.

The construction of the project does not involve environmental sensitive areas such as nature reserves and there is no major environmental sensitive problem that restricts the construction of the project. Some adverse impacts that may occur in the process of project construction and operation are mainly as follows: flooding of reservoirs and loss of part of land resources and surface vegetation caused by land occupation of the project, the impact of dam blockage on the aquatic ecosystem of Xin River; The water quality in the river section, the ambient air quality in the construction area and the acoustic environment have adverse effects. According to the comprehensive evaluation, all these adverse impacts can be prevented and mitigated after adopting the ecological restoration and environmental protection measures proposed in the report, and the construction of the Bazizui Navigation-power Project is environmentally feasible.

Table of Content

Attachments:

Attachment No. 01 Power of Attorney

Attachment No. 02 *Letter regarding Agreeing to Carry Out the Preliminary Works of Xin River Bazizui Navigation-Power Junction and Xin River Shuanggang Navigation Junction* published by Jiangxi Development and Reform Commission (Gan Fa Gai Jiao Tong [2017] No. 227)

Attachment No. 03 *Letter regarding Approving the Feasibility Study Report of Xin River Bazizui Navigation-Power Junction Project published by Jiangxi Development and Reform Commission* (Gan Fa Gai Jiao Tong [2017] No. 536)

Attachment No. 04 *Confirmation Comments upon Executive Standards of Environment Impact Assessment Carried out for Xin River Bazizui Navigation-Power Junction Project published by Shangrao Environmental Protection Bureau* (Rao Huan Ping Han Zi [2017] No. 8)

Attachment No. 05 *Confirmation Letter upon Executive Standards of Environment Impact Assessment Carried out for Xin River Bazizui Navigation-Power Junction Project published by Yingtan Environmental Protection Bureau*

Attachment No. 06 *Review Comments upon Environment Impact Assessment Report of Ganjiang River and Xin River High Grade Waterway Construction Planning (2011-2015)* Published by Ministry of Environmental Protection of the People's Republic of China (Huan Shen [2013] No. 229)

Attachment No. 07 *Review Group's Review Comments upon Environment Impact Assessment Report of Jiangxi Inland Waterway Navigation Development Planning*

Attachment No. 08 Review Comments upon *Environment Impact Assessment Report of Poyang Lake District Comprehensive Treatment Planning* (Huan Shen [2012] No. 10)

Attachment No. 09 Environmental Status Monitoring Report regarding Jiangxi Xin River Bazizui Navigation Power Junction Project (Gan Huan Jian Zi [2017] No. 021701)

Attachment No. 10 Basic Information Table for EIA Approval of Construction Projects

Attached Drawings:

Attached Drawing No. 01: Geographic Location Map for Bazizui Navigation Power Junction Project

Attached Drawing No. 02: Plan Layout of Xin River Cascade Planning

Attached Drawing No. 03: Vertical Section of Xin River Cascade Planning

Attached Drawing No. 04: Terrestrial Ecology Evaluation Area Scope and Satellite Remote Sensing Image for Bazizui Navigation Power Junction Project

Attached Drawing No. 05: Junction Plan Layout of Bazizui Navigation Power Junction Project

1.Overview

1.1 The origins of the project

Originating from Mountain Yujing in Yushan County near the Zhejiang-Jiangxi border, Xin River is one of the five major rivers of Poyang Lake. It is called Yushanshui before reaching the Shangrao City, and it is named Xin river after Fengxi River joins it. The main stream winds down from east to west, traverses northeastern Jiangxi Province and is divided into two east and west near Daxidu in Yugan County, respectively into Poyang Lake in Zhuhu Mountain and Ruihong. The total area of the Xin River is 16890km^2. The total length of the main stream is 328km. The upper reaches of Shangrao are upstream and the length of the river is 115km. The middle reaches of Shangrao to Yingtan and the river are 144km long. The downstream of Yingtan is 69km long.

Bazizui navigation-power project is located in the lower reaches of Xin River, Shangrao City, Jiangxi Province, Yugan County, the hub of the dam located in the Xin River downstream of the fork in the east and west about 0.9km, the hub of the Xinda River, west of the river building Dongdahe Hushanzui, Xidahe Diaopiling hub, and they are located in the same axis. Dongdahe Hushanzui dam site is located in Xiongjia Village, Baimaqiao Township, Yugan County. The dam site of Xidahe Diaopiling Hub is located in Xindu Village, Hongjiazui Town, Yugan County. The proposed dam site is about 49km away from the Jijiao Hub and about 12km away from Yugan County and the downstream 57km is the proposed Shuanggang shipping hub. It is a navigational hub that is mainly shipping and has the requirements of comprehensive utilization such as power generation. engineering. Recommended dam site control catchment area of 15942km2, dam site for many years the average flow of 578m3 / s, the average annual runoff of 18.228 billion m3; reservoir normal water level 18m, temporarily set to set the dead water level, the reservoir total storage capacity of 344 million m3; normal Storage capacity below 136 million m3 storage capacity; power station installed capacity of 12.6MW, annual average annual generating capacity of 45030000 kW · h, a total investment of 3999000000 yuan. After the completion of the navigation and hydropower project, the channel of canalization will be 37km, supplemented by corresponding waterway improvement works to improve the navigable conditions of 49km from Xinjiangjiepai to Bazizui River and to upgrade the grade of the fairway to the Bazizui Section to level III, further Promote the Xinjiang Guixi Liukou---Chuxihekou planning channel III level planning goals.

According to the relevant provisions of the Law of the People's Republic of China on Environmental Protection, the Law of the People's Republic of China on Environmental Impact Assessment and the Regulations on the Administration of Environmental Protection of Construction Projects, the construction projects for new construction, reconstruction and expansion must carry out environmental impact assessment, In the area where the project is located, we will investigate the current situation of the environment and predict the range and extent of the impact on the environment after the project is completed. We will put forward measures to control pollution so as to meet the environmental protection requirements of the country and the region and achieve the harmonization of economic, social and environmental benefits.

To this end, in February 2017, Jiangxi Province Harbor Air Construction Investment Co., Ltd. entrusted CCCC Second Navigation Engineering Investigation and Design Institute Co., Ltd. (State Environmental Impact Assessment Certificate A No. 2603) to undertake the environmental impact assessment of Xiangjiang Bajianzui Navigation and Hydropower Project Work (see Annex 1). After accepting the entrustment, our unit immediately set up a research group to carry out a detailed study on the project feasibility study project plan. With the strong assistance and assistance of the construction unit and the local government departments concerned, it conducted a field survey of the proposed project and collected relevant data. According to the relevant laws and regulations of the country and local governments and the relevant materials provided by the construction party, the Environmental Impact Report of Xin River Bazizui Navigation-power Junction Project in Jiangxi Province was prepared through the analysis of the contents of the project, the investigation of regional environmental status quo and the assessment of environmental impact. (Submitted for review).

1.2 Assessment purposes

The environmental impact assessment of this project aims to identify the current environmental status of the project area, analyze and forecast the possible impact of the project construction on the surrounding areas, the river ecological environment and the regional social economy, and formulate corresponding countermeasures for the adverse environmental impacts caused by the project. Proving the feasibility of project construction from the perspective of environmental pollution control and ecological protection. Specific purposes are as follows:

(1) To investigate and understand the environmental functions, environmental quality status and development planning requirements of the affected area;

(2) In combination with the implementation of this project, predict and evaluate the adverse impacts on the project area and the river ecosystem during the construction and operation periods;

(3) In view of the adverse impact on the surrounding areas, especially the environment-sensitive spots during the construction period, formulate feasible measures and measures to ensure the smooth construction and operation of the project, give full play to the project's economic, social and ecological benefits, and ensure The living environment, living environment and production environment of residents in the surrounding areas of the project are not seriously disturbed by the construction of the project;

(4) Analyze the possible changes of regional ecological environment, especially river ecological environment and river hydrological conditions and water quality during construction period and operation period, and analyze the extent, scope and intensity of favorable and unfavorable impacts, and demonstrate the project from the viewpoint of ecological environment protection Feasibility of construction

(5) Provide the examination and approval authority for the project with the basis for examination and approval of environmental protection, provide suggestions and conclusions on environmental protection for the project management agency, and provide the design and construction units with

reliable and feasible design for the project construction and construction units to reduce or mitigate adverse environmental impacts in accordance with.

1.3 Document bases

1.3.1 Laws and regulations

(1) Law of the People's Republic of China on Environmental Protection (2015.1.1);
(2) Law of the People's Republic of China on Environmental Impact Assessment (2016.9.1);
(3) Water Law of the People's Republic of China (revised on July 27, 2016);
(4) Land Administration Law of the People's Republic of China (2004.8.28 Amendment);
(5) Soil and Water Conservation Law of the People's Republic of China (2011.3.1);
(6) Forest Law of the People's Republic of China (revised on April 29, 1998);
(7) Law of the People's Republic of China on the Protection of Wild Animals (2017.7.1);
(8) Fisheries Law of the People's Republic of China (revised on August 28, 2004);
(9) Law of the People's Republic of China on Prevention and Control of Water Pollution (2008.6.1);
(10) Law of the People's Republic of China on Prevention and Control of Atmospheric Pollution (2016.1.1);
(11) Law of the People's Republic of China on Prevention and Control of Noise Pollution (1997.3.1);
(12) Law of the People's Republic of China on Prevention and Control of Environmental Pollution Caused by Solid Waste (revised on November 11, 2016);
(13) "Law of the People's Republic of China on the Protection of Cultural Relics" (revised on April 24, 2015);
(14) Law of the People's Republic of China on Prevention and Treatment of Infectious Diseases (revised on June 29, 2013);
(15) Flood Prevention Law of the People's Republic of China (April 24, 2015);
(16) Regulations on Environmental Protection of Construction Projects (1998.11.29);
(17) "Basic Farmland Protection Ordinance" (1999.1.1)
(18) Regulations of the People's Republic of China on the Regulation of Rivers (as revised in March 2017);
(19) Regulations of the People's Republic of China on the Implementation of Soil and Water Conservation Law (revised 2011.1.8);
(20) Regulations on Land Acquisition Compensation and Resettlement for Large and Medium-sized Water Conservancy and Hydropower Projects (2017.6.1);
(21) Regulations on Environmental Protection of Construction Projects in Jiangxi Province (2010.9.17);
(22) Regulations on the Prevention and Control of Environmental Pollution in Jiangxi Province (2009.1.1);
(23) Regulations on the Protection of Ancient and Famous Trees in Jiangxi Province (2005.1.1);
(24) "Urban and Rural Planning Law of the People's Republic of China" (revised on April 24, 2015);
(25) Regulations of the People's Republic of China on the Protection of Wild Plants (1997.1.1);
(26) List of National Key Protected Wild Plants (the first batch) (2001.8.4).

1.3.2 Normative documents

(1) "The People's Republic of China Water Pollution Prevention Law Enforcement Rules" (2000.3);
(2) "Decision of the State Council on Several Issues concerning Environmental Protection" (1996.8);
(3) "List of Classified Management of Environmental Impact Assessment of Construction Projects" (2017.9.1);
(4) Notice on Strengthening Environmental Protection in Hydropower Construction (Huanfa [2005] No. 13);
(5) Circular on Further Strengthening Environmental Protection of Hydropower Construction (Circular No. [2012] 4);
(6) Opinions on Strengthening the Supervision and Management of Ecological Environment Protection by Resources (Huanfa [2004] No. 24);
(7) Letter on Printing and Distributing Technical Guidelines for Environmental Impact Assessment of Low Temperature Water and Over-fish Facilities (for Trial Implementation) of Hydropower Water Conservancy Projects (EIA [2006] No.4, 2006.1);
(8) Circular on Strengthening the Management of Ecological Environment of Natural Resources Development and Construction Projects (State Environmental Protection Administration, 1994.12);
(9) Announcement on Issuing the Requirements for Compiling a Simplified Version of the Environmental Impact Report for Construction Projects (MEP Announcement No. 51 of 2012);
(10) Notice on Further Strengthening the Administration of Environmental Impact Assessment and Prevention of Environmental Risks (Huifa [2012] No. 77);
(11) Notice on Effectively Strengthening Risks Prevention and Control of Strict Environmental Impact Assessment Management (Huifa [2012] No. 98);
(12) "Action Platform for Conservation of Aquatic Living Resources in China" (2006.2);
(13) Provisions on Management of Pollution Prevention and Control of Drinking Water Source Protected Areas (1989.7);
(14) Measures for the Administration of Soil and Water Conservation Plans for Development and Construction Projects (1994.11);
(15) Regulations on Examination, Examination and Approval of Occupied and Expropriated Forest Land (Lin Zi Fa [2003] No. 139 Document);
(16) Measures of Jiangxi Province for the Implementation of the Law of the People's Republic of China on the Protection of Wild Animals (Revised) (1997.8);
(17) Interim Measures for the Protection and Management of Wild Plant Resources in Jiangxi Province (Revised) (1994.6);
(18) Provisional Measures for Forest Land Protection and Management in Jiangxi Province (Revised) (1994.11);
(19) Measures for the Prevention and Control of Drinking Water Source Pollution in Jiangxi Province (Gan Shui'an Ann [2007] No. 19);
(20) Circular on Further Strengthening the Management of Strict Environmental Impact Assessment for the Protection of Aquatic Biological Resources (Huanfa [2013] No. 86).

1.3.3 Technical regulations and standards

(1) "General Guidelines for Technical Guidelines for Environmental Impact Assessment of Construction Projects" (HJ2.1-2016);
(2) Technical Guidelines for Environmental Impact Assessment Atmospheric Environment (HJ2.2-2008);
(3) Technical Guidelines for Environmental Impact Assessment Surface Water Environment (HJ / T2.3-93);
(4) "Environmental Impact Assessment Technology Guidelines Acoustic Environment" (HJ2.4-2009);
(5) "Ecological Impact of Technical Guidelines for Environmental Impact Assessment" (HJ19-2011);
(6) Technical Guidelines for Environmental Impact Assessment for Water Resources and Hydropower Engineering (HJ / T88-2003);
(7) Technical Guidelines for Environmental Impact Assessment Groundwater Environment (HJ 610-2016);
(8) Interim Measures for Public Participation in Environmental Impact Assessment (Huan Fa [2006] No. 28);
(9) Technical Guidelines for Environmental Risk Assessment of Construction Projects (HJ / T169-2004);
(10) Technical Code for Soil and Water Conservation of Water Conservancy and Hydropower Projects (SL575-2012);
(11) "Surface Water Environmental Quality Standard" (GB3838-2002);
(12) Ambient Air Quality Standard (GB3095-2012);
(13) "Acoustic Environment Quality Standard" (GB3096-2008);
(14) Integrated Wastewater Discharge Standard (GB8978-1996);
(15) "Integrated Emission Standard of Air Pollutants" (GB16297-1996);
(16) Emission Standard of Environmental Noise for Construction Site Boundaries (GB12523-2011);
(17) Emission Standards for Environmental Noise at the Factory Boundaries of Industrial Enterprises (GB12348-2008);

1.3.4 Related planning and materials

(1) "National Main Functional Zoning Planning" (2010.12)
(2) "National Ecological Function Zoning" (2008.7);
(3) Water Functional Zoning of National Important Rivers and Lakes (2012.1);
(4) The 13th Five-Year Plan for National Ecological Environment Protection (2016.11);
(5) Plan of National Inland Waterway and Port Layout (2007.7);
(6) Comprehensive Planning of the Yangtze River Basin (2012-2030) (Guohan [2012] No. 220)
(7) Construction Plan of High-grade Channel of Ganjiang and Xinjiang River (2011 ~ 2015) (Jiangxi Provincial Development and Reform Commission and Communications Department, 2013);
(8) "Functional Division of Surface Water (Environment) in Jiangxi Province" (Gan Shui'an Ann [2007] No. 19);
(9) "List of Key Protected Wild Plants in Jiangxi Province" (2005);
(10) "List of Key Protected Wildlife in Jiangxi Province" (1995);

(11) "Red Line Zoning of Ecological Space Protection in Jiangxi Province" (Gan Fu Fa [2016] No. 30);
(12) "Feasibility Study Report of Xiangjiang Bajianzui Hydropower Project" (draft for approval);
(13) Report on Soil and Water Conservation Plan of Xinjiang Bajianzui Navigation and Hydropower Project (Draft for Review)

1.4 Environmental Protection Objectives

1.4.1 Surface Water

(1) Functional Objectives: to carry out the water environmental protection works during the engineering construction period and operation period; to mitigate the adverse effects upon the regional water environment resulted from engineering construction; to prevent the water quality level of Xin River, Baita River, Huangzhuangxi River, Zhuqiao River and other water bodies affected by the engineering from being lowered due to engineering construction and operation; to protect the water quality of surface water environmental sensitive targets from being affected by the engineering construction; and to protect drinking water safety; to ensure that sewage and waste water discharged from the engineering construction area can reach the first level standard of Integrated Wastewater Discharge Standard (GB8978-1996); and to control the local water pollution of the offshore waters of construction area river section and reservoir area river section.

(2) Sensitive Targets: Within the scope of reservoir area of Bazizui Navigation Power Junction Project, there are Daxi Town Shenlin Water Treatment Plant Water Intake and Meigang Town Zhongnian Water Treatment Plant Water Intake, which are located at the left bank of Xin River and respectively about 4.2km and 24.5km away from Bazizui Navigation Power Junction Dam Site; Yangbu Town Caiyuan Treatment Plant Water Intake, Huangjinbu Town Power Plant Water Intake, Huangjinbu Town Industrial Park Water Treatment Plant Intake are located at the right bank of Xin River, which are respectively 8.9km, 25km and 26km away from Bazizui Navigation Power Junction Dam Site; The planned Hongjiazui Town Water Treatment Plant Intake, Jiangbu Town Water Treatment Plant Water Intake, Fenggang Town Heshan Water Treatment Plant Water Intake, and Ruihong Town Water Treatment Plant Water Intake are distributed from the West River Dam Site of Bazizui Navigation Power Junction to the downstream location where water flows from Ruihong Town to the outlet of Poyang Lake, which are respectively 4km, 11km, 15km, and 42km away from Bazizui Navigation Power Junction West River Dam Site; The planned Baimaqiao Town Gaoyuan Water Treatment Plant Water Intake, Yugan County Zhangjiagang Water Treatment Plant Water Intake, and Yugan County Shuanggang Water Treatment Plant Water Intake are distributed from the East River Dam Site of Bazizui Navigation Power Junction to the downstream, which are respectively 7.5km, 8.7km, and 21.5km away from Bazizui Navigation Power Junction East River Dam Site. The surface water environment sensitive targets of Bazizui Navigation Power Junction evaluation area are shown in table 1.4-1 and attached drawing No. 19.

Table 1.4-1 Surface Water Environment Sensitive Targets of Bazizui Navigation Power Junction Evaluation Area

S.N.	Protection Target	Location	Scale
1	Daxi Town Shenlin Water Treatment Plant Water Intake	At the left bank of Xin River, about 4.2km away from the upstream of dam site	Water intaking amount is 9900 m^3/d
2	Yangbu Town Caiyuan Treatment Plant Water Intake	At the right bank of Xin River, about 8.9km away from the upstream of dam site	Water intaking amount is 4900 m^3/d
3	Huangjinbu Town Power Plant Water Intake (Industrial)	At the right bank of Xin River, about 25km away from the upstream of dam site	Water intaking amount is 50000 m^3/d
4	Huangjinbu Town Industrial Park Water Treatment Plant Intake	At the right bank of Xin River, about 26km away from the upstream of dam site	Water intaking amount is 20000 m^3/d
5	Meigang Town Zhongnian Water Treatment Plant Water Intake	At the left bank of Xin River, about 24.5km away from the upstream of dam site	Water intaking amount is 4200 m^3/d
6	Hongjiazui Town Water Treatment Plant Intake (planned)	At the right bank of West River of Xin River, about 4km away from the downstream of West River dam site	Water intaking amount is 9900 m^3/d
7	Jiangbu Town Water Treatment Plant Water Intake	At the right bank of West River of Xin River, about 11km away from the downstream of West River dam site	Water intaking amount is 5000 m^3/d
8	Fenggang Town Heshan Water Treatment Plant Water Intake	At the left bank of West River of Xin River, about 15km away from the downstream of West River dam site	Water intaking amount is 700 m^3/d
9	Ruihong Town Water Treatment Plant Water Intake	At the right bank of West River of Xin River, about 42km away from the downstream of West River dam site	Water intaking amount is 9900 m^3/d
10	Baimaqiao Town Gaoyuan Water Treatment Plant Water Intake	At the right bank of East River of Xin River, about 7.5km away from the downstream of East River dam site	Water intaking amount is 3500m^3/d
11	Yugan County Zhangjiagang Water Treatment Plant Water Intake	At the left bank of East River of Xin River, about 8.7km away from the downstream of East River dam site	Water intaking amount is 20000 m^3/d
12	Yugan County Lusigang Town Shuanggang Water Treatment Plant Water Intake	At the left bank of East River of Xin River, about 21.5km away from the downstream of East River dam site	Water intaking amount is 9900 m^3/d

Notes: Among the above mentioned drinking water source intakes, only No. 11 Yugan County Zhangjiagang Water Treatment Plant Water Intake has already divided the drinking-water source protection area, while the others are town intakes and the division of drinking water source protection area is under way.

1.4.2 Ecological Environment

(1) Functional Objectives: to protect the integrity of regional ecological system and biodiversity. To prevent the present ecological environment of the reservoir area from being severely damaged due to reservoir construction, and also present the regional ecological system structure and function from

being degenerated due to the construction of this project; to protect the zonal vegetation, rare animals and plants, and others of the reservoir area; to mitigate the adverse effects upon aquatic organisms due to change of hydrologic conditions and dam isolation, to protect aquatic biological germplasm resources, and promote the exchange and reproduction of significant fish resources.

(2) Sensitive Targets: including ancient trees, rare animals and plants, rare and migratory fishes, and others. Within the evaluation scope, there is no scenic area, forest park, geopark, important wetland, primary forest, naturally concentrated distribution area of rare and endangered species, fishing spawning area, feeding ground, wintering ground and other ecological sensitive areas. For more details, please refer to table 1.4-2.

Table 1.4-2 Ecological Environment Sensitive Targets

S.N.	Object of Protection	Protected Species	Notes
1	Fishes	migratory fishes at the engineering river section	Mainly including “four major Chinese carps”, namely, black carp, grass carp, Hypophthalmichthys molitrix, and Aristichthys nobilis, and Spualiobarbus Curriculus, Ochetobibus elongates, Elopichthys bambusa, Parabramis pekinensis, and other migratory fishes.
2	Ancient Trees	Cinnamomum camphora, distributed at Daxi Town Fanjiabu Village, and Yangbu Town Yuye Village	Third level ancient tree, Cinnamomum camphora, 3 nos.
3	Rare Plants	There is one kind of Cinnamomum camphora which belongs to second level national protected plant. The key protected wild plants in Jiangxi Province include Adinandra millettii, Bischofia polycarpa, Dalbergia hupeana Hance, Ilex cornuta, and Acer palmatum Thunb.	Except for the ancient trees, Cinnamomum camphoras are widely distributed within the hills of the evaluation area; Adinandra millettii is widely distributed within the surrounding hilly downland; Dalbergia hupeana Hance and Ilex cornuta are widely distributed within the surrounding hilly downland, while the quantity is relatively less; Bischofia polycarpa and Acer palmatum Thunb belong to cultivation type.
4	Rare Animals	There is no national key protected wild animals, while Jiangxi Provincial protected animals mainly include Bufo gargarizans, Rana nigromaculata, turtle, Zaocys dhumnades, Deinagkistrodon, Elapherufldorsfa, Enhydris chinensis, Elaphe taeniura, Egretta garzetta, Anas platyrhynchos, Anas poecilorhyncha, Anas Penelope, Hirundo rustica, Cecropis daurica, and Mustela sibirica, totally 15 species.	Widely distributed within the evaluation area.

1.4.3 Ambient Air

(1) Functional Objectives: To prevent the ambient air quality within the engineering construction area and resettlement area from being declined dramatically due to the construction of this project and resettlement activities. During the construction period, the surrounding ambient air quality of construction area shall reach the second level standard of Ambient Air Quality Standards (GB3095-2012).

(2) Sensitive Targets: Within the engineering junction area, 10 major ambient air and sound environment protection targets, such as Waixiong Village, Bu Village and others are distributed, as shown in table 1.4-3 and attached drawing No. 17. Within the evaluation scope of reservoir protection works, 22 ambient air and sound environment protection targets are distributed, as shown in table 1.4-4 and attached drawing No. 17.

Table 1.4-3 Primary Protection Targets of Ambient Air and Sound Environment within the Junction Area

S.N.	Object of Protection	Location & Distance	Scale and Properties
1	Waixiong Village	About 20m away from the right side of East River Dam Site and 20m away from 3# right bank construction road	About 120 households, 450 persons
2	Waiwang Village	400m away from the upstream at the right side of East River Dam Site	About 50 households, 200 persons
3	Zoujialong Village	400m away from the upstream of West River Dam Site	About 15 households, 50 persons
4	Bu Village	800m away from the downstream of West River Dam Site, 30m away from the planned Sahangba Yongjiu Road at the left bank, and also about 80m away from the boundary of production base at the left bank.	About 120 households, 460 persons
5	Songfangliujia Village	About 60m away from the planned 1# left bank construction road	About 80 households, 300 persons
6	Xiongjia Village	About 20m away from the planned 3# right bank construction road, and about 150m away from the right bank production base	About 100 households, 400 persons
7	Sanbeishanlujia Village	About 20m away from the planned 3# right bank construction road	About 60 households, 240 persons
8	Yuantoulingzhangjia Village	About 20m away from the planned 3# right bank construction road	About 40 households, 160 persons
9	Hongyuandu Village	About 20m away from the planned 3# right bank construction road	About 40 households, 160 persons
10	Mabeizui Village	About 20m away from the planned 3# right bank construction road	About 50 households, 200 persons

Table 1.4-4 Primary Protection Targets of Ambient Air and Sound Environment within the Reservoir Area

S.N.	Left/ Right Bank of Xin River	Object of Protection	Location & Distance	Scale and Properties
1	Left Bank of Xin River	Caishuanglijia Village	About 20m away from Daxiwei levee line and planned road	About 40 households, 160 persons
2		Zheguzui Village	About 20m away from Daxiwei levee line and planned road	About 50 households, 200 persons
3		Xianchengjia Village	About 20m away from Daxiwei levee line and planned road	About 80 households, 300 persons
4		Daxi Village	About 20m away from Daxiwei levee line and planned road	About 200 households, 850 persons
5		Lijianong Village	About 20m away from Daxiwei levee line and planned road	About 180 households, 700 persons
6		Zoufang Village	About 35m away from Daxiwei levee line and planned road	About 300 households, 1000 persons
7		Duanjiahu Village	About 200m away from Duanjiahuwei levee line and planned road	About 25 households, 100 persons
8		Loubu Village	About 50m away from Loubu Village Water Gate and Power Pumping Station	About 50 households, 200 persons
9		Xiabu Village	About 50m away from Jinbuwei levee line and planned road	About 80 households, 320 persons
10		Tukufan Village	About 25m away from Jinbuwei levee line and planned road	About 60 households, 240 persons
11		Sifang Village	About 20m away from Jinbuwei levee line and planned road	About 40 households, 150 persons
12		Jinbu Village	About 20m away from Jinbuwei levee line and planned road	About 400 households, 1200 persons
13		Jinbu Primary School	About 150m away from Jinbuwei levee line and planned road	10 teachers, and 180 students
14	Right Bank of Xin River	Waiwang Village	About 30m away from Zinianwei levee line and planned road	About 50 households, 200 persons
15		Tongkou Village	About 25m away from Zinianwei levee line and planned road	About 35 households, 140 persons
16		Chengjia Village	About 20m away from Zinianwei levee line and planned road	About 200 households, 800 persons
17		Yangbu Village	About 30m away from Yangbuwei Raised Protection Area	About 40 households, 200 persons
18		Hebu Village	About 50m away from Hebu Raised Protection Area	About 100 households, 400 persons
19		Fanjia Village	About 25m away from Shawowei levee	About 40

S.N.	Left/ Right Bank of Xin River	Object of Protection	Location & Distance	Scale and Properties
			line and planned road	households, 150 persons
20		Xiashan Village	About 25m away from Zijiangwei levee line and planned road	About 90 households, 350 persons
21		Caiziwan Village	About 20m away from Hegangwei levee line and planned road	About 55 households, 220 persons
22		Hegang Village	About 30m away from Hegangwei levee line and planned road	About 80 households, 320 persons
23		Hujiazhou Village	About 20m away from Zhuqiaowei levee line and planned road	About 100 households, 400 persons
24		Yujiazhou Village	About 25m away from Zhuqiaowei levee line and planned road	About 70 households, 280 persons
25		Tangbei Village	About 30m away from Zhuqiaowei levee line and planned road	About 300 households, 1200 persons
26		Laowudaijia Village	About 20m away from Zhuqiaowei levee line and planned road	About 50 households, 200 persons
27		Kengkou Village	About 20m away from Tuanhu Farmland levee line and planned road	About 80 households, 320 persons

1.4.4 Sound Environment

(1) Functional Objectives: To prevent the sound environment quality within the engineering construction area and resettlement area from being declined dramatically due to the construction of this project and resettlement activities. During the construction period, the surrounding sound environment quality of construction area shall reach the second level standard of Environmental Quality Standard for Noise (GB3096-2008), while the sound environment quality within the scope of 35m on both banks of waterway shall reach the 4a level standards. During the construction period, Emission Standard of Environment Noise for Boundary of Construction Site (GB12523-2011) shall be executed. During the operation period, second level standards in table one of Emission Standard for Industrial Enterprises Noise at Boundary (GB12348-2008).

(2) Sensitive Targets: The same as ambient air.

1.4.5 Ground Water

After reservoir filling of Bazizui Navigation Power Junction, the ground water level of local areas will change. The primary targets of ground water environment protection of this project are as follows: Daxiwei, Duanjiahuwei, and Jinbuwei located on the left bank of Xin River, and Zinianwei, Zhoujianongwei, Yangbuwei, Pingshangwei, Shawowei, Shixiangwei, Zhuqiaowei, Tuhu Farmaland located on the right bank of Xin River; totally 10 low-lying areas, and reservoir banks where the local farmlands and houses are affected due to the rise in groundwater level. Therefore, the farmland crops in the above mentioned areas shall be protected from reduction of output due to the rise in groundwater level, while the houses shall also be protected from instability due to rise in groundwater level, and uninhabitability due to the wet ground.

Water Treatment Plants are established in all the surrounding towns of the reservoir area within the assessment scope. The residents ' drinking water will be supplied by the water treatment plants which will take water from Xin River. The groundwater type centralized drinking water source protection area is not found. Groundwater wells are scattered in towns Daxi Town, Yangbu Town, Xishanlinchang Town, Huangjinbu Town, Meigang Town and other towns of Yugan County.

1.5 Assessment Standards

As per the *Confirmation Comments upon Executive Standards of Environment Impact Assessment Carried out for Xin River Bazizui Navigation-Power Junction Project in Jiangxi Province* published by Shangrao Environmental Protection Bureau (Rao Huan Ping Han Zi [2017] No. 8) (See Attachment No. 4), and *Confirmation Letter upon Executive Standards of Environment Impact Assessment Carried out for Xin River Bazizui Navigation-Power Junction Project* published by Yingtan Environmental Protection Bureau (See Attachment No. 5), the executive standards for this assessment are as follows:

1.5.1 Environmental Quality Standards

(1) Surface Water

As per *Surface Water (Environmental) Functional Division in Jiangxi Province*, the river section from Xin River Jiebei Junction Dam Site to the cross point of East and West River of Xin River within the territory of Zhoufanshang, Yugan County affected by this project is divided as Scenery and Recreation Water Area, where third level standard of Environmental Quality Standards for Surface Water (GB3838-2002) shall be carried out. The river section from the cross point of East and West River of Xin River within the territory of Zhoufanshang, Yugan County to the location which is 4km away from the upstream of water intake of Xin River East River Yugan County Water Treatment Plant is divided as Scenery and Recreation Water Area, where third level standard of Environmental Quality Standards for Surface Water (GB3838-2002) shall be carried out. The river section from the location which is 4km away from the upstream of water intake of Xin River East River Yugan County Water Treatment Plant to the location which is 1km away from the upstream is divided as second level drinking water source protection area of Yugan County Water Treatment Plant Water Intake, where third level standard of Environmental Quality Standards for Surface Water (GB3838-2002) shall be carried out. The river section from the location which is 1km away from the upstream of water intake of Xin River East River Yugan County Water Treatment Plant to the location which is 0.2km away from the downstream is divided as first level drinking water source protection area of Yugan County Water Treatment Plant Water Intake, where second level standard of Environmental Quality Standards for Surface Water (GB3838-2002) shall be carried out. The river section from the location which is 0.2km away from the downstream of water intake of Xin River East River Yugan County Water Treatment Plant to the mouth where Poyang County Caijiawan East River flows into Le’an River is divided as Scenery Water Area, where third level standard of

Environmental Quality Standards for Surface Water (GB3838-2002) shall be carried out. The river section from the cross point of East and West River of Xin River within the territory of Zhoufanshang, Yugan county to the mouth where Poyang County Ruihong Town Sanjiangkou river flows into Poyang Lake is divided as Scenery Water Area, where third level standard of Environmental Quality Standards for Surface Water (GB3838-2002) shall be carried out. The river section from Baita River within the territory of Xiangshuiqiao, Yujiang County to the mouth where Yujiang County Bata River flows into Xin River is divided as Scenery Water Area, where third level standard of Environmental Quality Standards for Surface Water (GB3838-2002) shall be carried out. For each standard limit, please refer to table 1.5-1.

The Surface water environmental functional division within the assessment area is shown in attached map No. 19, while the location relationship map of this project and drinking water source protection area of Yugan County Water Treatment Plant is shown in attached map No. 20.

Table 1.5-1 Environmental Quality Standards for Surface Water (GB3838-2002) Unit: mg/L (except for pH)

S.N.	Items	Second Level Standard	Third Level Standard
1	PH Value	6~9	6~9
2	Suspended Solids≤	25	30
3	Dissolved Oxygen≥	6	5
4	BOD_5≤	3	4
5	COD≤	15	20
6	Permanganate Index≤	4	6
7	Oil≤	0.05	0.05
8	Total Phosphorus≤	0.1(Lake and Reservoir 0.025)	0.2(Lake and Reservoir 0.05)
9	Ammonia Nitrogen≤	0.5	1.0
10	Total Nitrogen≤	0.5	1.0
11	Volatile Phenol≤	0.002	0.005
12	Hexavalent Chromium≤	0.05	0.05

Notes: SS shall refer to standards in *Quality Standards for Surface Water Resources* (SL63-94).

(2) Ambient Air Quality

The ambient air quality within the evaluation area shall execute the second level standards of *Ambient Air Quality Standards* (GB3095-2012), while each standard limit is shown in table 1.5-2.

Table 1.5-2 Ambient Air Quality Standards (GB3095-2012) Unit: mg/m^3 (Standard State)

Pollutant Name	Value Taking Time	Second Level Criterion
TSP	Annual Mean	0.2
	24-hour Average	0.3
PM_{10}	Annual Mean	0.07
	24-hour Average	0.15
SO_2	Annual Mean	0.06
	24-hour Average	0.15
	1-hour Average	0.50
NO_2	Annual Mean	0.04
	24-hour Average	0.08
	1-hour Average	0.2

(3) Sound Environment

The noise protection zone on both sides of the waterway shall be 35m. Within the protection zone, 4a level standards of *Environmental Quality Standard for Noise* (GB3096-2008) shall be executed. Out of the protection zone, second level standards of *Environmental Quality Standard for Noise* (GB3096-2008) shall be executed. Within the evaluation scope, the sensitive spots such as schools, hospitals, geracomiums and others shall execute the second level standards (as shown in table 1.5-3).

Table 1.5-3 Environmental Quality Standard for Noise (GB3096-2008) Unit: dB(A) (LEQ)

Standard Level	Day-Time	Night-Time
2	60	50
4a	70	55

(3) Ground Water Environment

The ground water within the evaluation area shall execute the third level standards of *Quality Standard for Ground Water* (GB/T14848-93), while each standard limit is shown in table 1.5-4.

Table 1.5-4 Quality Standard for Ground Water (GB/T14848-93) Unit: mg/L (except for pH)

S.N.	Item	Standard Limit
		III
1	pH	6.5~8.5
2	Nitrate	≤20
3	Nitrite	≤0.02
4	Volatile Phenols	≤0.002
5	Total Hardness	≤450
6	Fluoride	≤1.0
7	Sulfate	≤250
8	Chloride	≤250
9	COD_{Mn}	≤3.0
10	As	≤0.05
11	Cd	≤0.01
12	Cr^{+6}	≤0.05
13	Pb	≤0.05

1.5.2 Pollutant Discharge Standards

(1) Wastewater

During the project construction period, the wastewater discharge shall execute the first standard of *Integrated Wastewater Discharge Standard* (GB8978-1996), as shown in table 1.5-5.

Table 1.5-5 Integrated Wastewater Discharge Standard (GB8978-1996) Unit: mg/L

Item	First Level Standard Limit
pH	6～9
Suspended Solids (SS)	70
Biochemical Oxygen Demand after 5 Days (BOD_5)	20
Chemical Oxygen Demand (COD)	100

Item	First Level Standard Limit
Oil	5
Volatile Phenol	0.5
Ammonia Nitrogen	15
Fluoride	10
Phosphate (as P)	0.5
Total Mercury	0.05
Chromium（Hexavalent）	0.5
Total Arsenic	0.5
Total Lead	1.0

(2) Waste Gas

During the project construction period, the waste gas emission shall execute the second standard of *Integrated Emission Standard of Air Pollutants* (GB16279-1996), as shown in table 1.5-6.

Table 1.5-6 Integrated Emission Standard of Air Pollutants (GB16279-1996)

Item	Maximum Concentration Threshold of Fugitive Emission Outside the Scope（mg/m^3）
Particulate Matter	1.0
Nitrogen Oxides	0.12
Sulfur Dioxide	0.4

(3) Noise

During the project construction period, the noise control shall execute the standards of *Emission Standard of Environment Noise for Boundary of Construction Site (GB12523-2011)*. During the operation period, second level standards of *Emission Standard for Industrial Enterprises Noise at Boundary* (GB12348-2008) shall be executed for noise within the boundary of junction area, as shown in table 1.5-7.

Table 1.5-7 Emission Standard of Environment Noise for Boundary of Construction Site, and Emission Standard for Industrial Enterprises Noise at Boundary

Phase	Noise Limits	
	Day-Time	Night-Time
Construction Phase (*Emission Standard of Environment Noise for Boundary of Construction Site*)	70	55
Operation Phase (*Emission Standard for Industrial Enterprises Noise at Boundary*)	60	50

1.6 Evaluation Grade

1.6.1 Surface Water

The basis to determine grades of surface water EIA works are shown as follows: ① Waste water discharge amount: As per the construction organization design of Bazizui Navigation-Power Junction Project, the industrial waste water produced during the project construction period mainly comes from the industrial waste water of sand stone material processing system and waste water of concrete maintenance, while the domestic waste water mainly comes from the domestic waste water produced by the construction personnel. In construction peak, the waste water discharge amount is about

258.4m^3/d (among which, all the sand stone material flushing waste water and concrete material tank flushing waste water are recycled and not discharged after treatment). ② The complexity of waste water quality: During the construction period, the primary pollutants for industrial waste water are SS, while the primary pollutants for domestic waste water are BOD_5 and COD. Therefore, the complexity degree of waste water quality for this project is simple. ③ Surface Water Scale: The average annual discharge at the dam site of Xin River Bazizui Navigation-Power Junction is 578m^3/s, while surface water scale is great river. ④ Surface Water Quality Requirements: The protection requirements for Xin River and Bata River shall be second-third level standard of *Environmental Quality Standards for Surface Water* (GB3838-2002).

Based on the above analysis, and as per the assessment grading principles of *Technical Guidelines for Environmental Impact Assessment Surface Water Environment* (HJ/T2.3-1993), the grade of water environment assessment works in this project shall be third level. Considering that after the completion of Bazizui Navigation-Power Junction, due to the dam isolation, a certain change will occur to the hydrological conditions of the reservoir area and its downstream, which will greatly affect the water environment. In order to fully analyze the impacts upon water environment of reservoir area and its downstream caused by project operation, the water environment assessment grade is upgraded to second level.

1.6.2 Ecological Environment

The reservoir inundation, engineering land occupation and other issues of Bazizui Navigation-Power Junction neither involve natural reserves, World Cultural and Natural Heritage sites and other special ecologically sensitive areas, nor involve landscape and famous scenery, Forest Park, GeoPark, significant wetland, primitive natural forest, naturally concentrated distribution area of rare and endangered species, natural spawning area, feeding ground, and wintering ground of important aquatic life, and other important ecological sensitive areas. The construction area includes reservoir area, engineering junction area, and areas covered by all sorts of temporary construction facilities, with a total length of affected scope of about 37km (backwater area), and a total area of 2710.83hm^2. As per the assessment grading principles of *Technical Guideline for Environmental Impact Assessment Ecological Impact* (HJ19-2011), the ecological assessment grade in this project shall be defined as second level. As the construction of Bazizui Navigation-Power Junction Project will cause isolation to the river ecological system, and junction operation will also cause change to the hydrological conditions of river section, the hydrophytic habitat of the river section will also change accordingly. Therefore, as per the regulations of stipulation No. 4.2.3 in *Technical Guideline for Environmental Impact Assessment Ecological Impact* (HJ19-2011), the ecological assessment grade of this project will be upgraded to first level.

1.6.3 Ambient Air

Bazizui Navigation-Power Junction belongs to the Non-pollution Ecological Project. During its operation period, basically no atmospheric pollutants will be produced. As per the assessment grading principles of Technical *Guidelines for Environmental Impact Assessment Atmospheric Environment* (HJ2.2-2008), the atmospheric environmental impact assessment grade is defined as third level.

1.6.4 Sound Environment

After the completion of Bazizui Navigation-Power Junction, the navigation conditions of Xin River Section will be greatly improved. Therefore, the increased transportation capacity will cause impacts upon noise sensitive targets around the waterway. However, before and after the construction, the noise level increase of sensitive targets within the assessment scope is controlled within 3dB(A), while there is no significant change upon the affected population. As per the assessment grading principles of *Technical Guidelines for Noise Impact Assessment* (HJ/T2.4-2009), the noise impact assessment grade is defined as third level.

1.6.5 Ground Water

Bazizui Navigation-Power Junction Project is located at the Xin River downstream area with better water quality. This project will not cause pollution to the ground water quality during its construction, production and operation period. Therefore, it belongs to Non-Pollution Construction Project. However, After the reservoir filling, during the operation period, this project will cause change to the groundwater flow field and water level. Therefore, as per the attachment A *Industry Category Table of Ground Water Environmental Impact Assessment* in *Technical Guidelines for Environmental Impact Assessment Groundwater Environment* (HJ610-2016), Bazizui Navigation-Power Junction Project belongs to the fourth category construction projects.

Within the assessment area, there is no centralized drinking water source protection area, special groundwater resources protection area such as hot water, mineral water, hot spring and others, key protection zone of ecologically vulnerable areas, geological-hazard-prone areas, significant wetlands, key zones for soil loss control, enclosed and forbidden reserves of desertified land, and others. The drinking water source for residents living around the reservoir is mainly scattered groundwater well, with a little scale of water supply. The reservoir filling and operation will mainly affect the recharge runoff area and recharge process of the centralized ground drilling water source. Therefore, the groundwater sensitive degree of this project is “relatively sensitive”.

As per the assessment grading principles of *Technical Guidelines for Environmental Impact Assessment Groundwater Environment* (HJ610-2016), the groundwater environmental impact assessment grade for this project is defined as simple analysis.

1.6.6 Environmental Risks

During the construction period of Bazizui Navigation-Power Junction Project, the possible environmental risks are mainly the pollution upon the Xin River Water Environment caused by construction ship oil spill. After the completion and operation of Bazizui Navigation-Power Junction Project, the project itself will cause new risk sources, and there is also no significant environmental accidental risk source. However, about 49km of waterways within the Bazizui Reservoir area will be canalized, which will upgrade the waterway standard of river section from project dam site to the upstream Jiebei Dam Site to third level. The improved waterway conditions will be in favor of reducing the occurrence rate of ship oil (liquid) spill accidents (especially in dry season). However, the possibility that the water body will be polluted due to ship oil (liquid) spill accidents still exists. In operation period, there exist risks such as the oil leakage of power station unit, dam break, and reservoir bank collapse, and others.

In summary, as per the regulations of environmental risk assessment work grade division mentioned in *Technical Guidelines for Environmental Risk Assessment on Projects*, the environmental risk assessment work grade of this project is defined as second level.

1.7 Assessment Scope, Period, and Factors

1.7.1 Assessment Scope

The survey and assessment scope of environmental impact of Xin River Bazizui Navigation-Power Junction Project is mainly the involved towns due to reservoir inundation, Xin River Reservoir Area mainstream and its primary tributaries, a certain river sections at the downstream of dam, project construction area (including access road) that will be affected by the project construction and operation. The different environmental factors will be properly extended as per the impact nature and degree affected by the project, so as to properly determine its evaluation scope. The survey and assessment environmental factors mainly include Terrestrial ecosystem, Aquatic ecosystem, water environment, ambient air, sound environment, environmental risk and others (as shown in table 1.7-1).

Table 1.7-1 Primary Environmental Impact Factors and Assessment Scope of Xin River Bazizui Navigation-Power Junction Project in Jiangxi Province

Primary Environmental Impact Factors	Assessment Scope
Surface Water Environment	Reservoir Area River Section: the 37km river section from reservoir area Xin River trunk stream to the terminal of backwater; River section under the dam: the 57km river section from the Xin River East River dam site to the proposed Shuanggang navigation-power junction dam site, and the 55km river section from Xin River West River dam site to Hongrui Town where water flows into the Poyang Lake;
Terrestrial ecosystem	Within the scope of 3km extension around the reservoir normal water level flood line, and 5km extension downstream the dam site, including main project (dam) and auxiliary projects (access road, material yard, and others), construction area, reservoir inundation area, immersion affection zone, waste disposal area, and others.
Aquatic ecosystem	Dam Site Upstream: about 49km river section from reservoir area Xin River Trunk stream to Jiebei Junction dam site. River Section Under the Dam: about 57km river section from the Xin River East River dam site to the proposed Shuanggang navigation-power junction dam site, and the 55km river section from Xin River West River dam site to Hongrui Town where water flows into the Poyang Lake.
Ambient Air	Within the scope of 200m away from the project land acquisition line and 200m away from the both sides of access road.

Primary Environmental Impact Factors	**Assessment Scope**
Sound Environment	The same as ambient air.
Groundwater Environment	After the reservoir filling of Bazizui Navigation-Power Junction, regions where the ground water environment is affected, include 8 towns, such as Yugan County Baimaqiao Town, Daxi Town, Hongjiazui Town, Yangbu Town, Xiashan Town, Huangjinbu Town, Meigang Town, and Yujiang County Jiangjiang Town, and 10 low lying areas that need special attention, such as Daxiwei, Duanjiahuwei, Jinbuwei, Zinianwei at the right bank of Xin River, Zhoujianongwei, Yangbuwei, Pingshangwei, Shawowei-shixiangwei, and Zhuqiaowei, Tuanhu Farmland.
Environmental Risk	The risk assessment scope of ship oil (liquid) spill accidents during the operation stage includes Bazizui Reservoir Area and river section at the downstream of dam, key focus reservoir area, drinking water intakes of river section at the downstream of dam, and other environmental sensitive targets.

(1) Surface Water

When the normal water level of Bazizui Reservoir reaches 18m, the backwater will arrive at the mouth where water from Baita River flows into the Xin River, while the backwater length is 37km. The proposed Shuanggang Navigation Junction is located at the place which is about 57km away from the downstream of East River Dam Site, while the proposed Hongjiazui Town Water Treatment Plant Water Intake is located within the 1km scope from the downstream of West River dam site to Longjin Bridge. Therefore, the water environment assessment scope of Bazizui Navigation-Power Junction is the reservoir water area after reservoir filling, construction river section, and dam downstream river section, about 37km river section from dam site within the reservoir area to the terminals of backwater, about 57km river section from the Xin River East River dam site to the proposed Shuanggang navigation-power junction dam site, and the 55km river section from Xin River West River dam site to Hongrui Town where water flows into the Poyang Lake.

(2) Terrestrial Ecosystem

The terrestrial ecosystem is affected by the project construction mainly due to project construction land occupation and reservoir inundation. Based on this, it is determined that the impact assessment scope of terrestrial ecosystem is 2km extension from the reservoir normal water level, include 8 towns where the project construction land occupation and reservoir inundation are involved, such as Yugan County Baimaqiao Town, Daxi Town, Hongjiazui Town, Yangbu Town, Xiashan Town, Huangjinbu Town, Meigang Town, and Yujiang County Jinjiang Town, and material yard, slag yard, access road, construction camps, dam area and other project construction area. As to the terrestrial ecosystem assessment area scope and satellite remote sensing image of Xin River Bazizui Navigation-Power Junction Project in Jiangxi Province, please refer to attached map No. 4.

(3) Aquatic Ecosystem

The upstream of Bazizui Navigation-Power Junction reservoir is the established Jiebei Junction, while the downstream of Xin River East River is the proposed Shuanggang Navigation Junction, and the West River flows into the Poyang Lake. Considering the relationship between the upstream and downstream navigation power junctions of this project, the assessment scope of this project is about 49km river section from reservoir area Xin River Trunk stream to Jiebei Junction dam site, about 57km river section from the Xin River East River dam site to the proposed Shuanggang navigation-power junction dam site, and the 55km river section from Xin River West River dam site to Hongrui Town where water flows into the Poyang Lake.

(4) Ambient Air

During the operation period of this project, there is no waste gas emission. The ambient air quality is affected by the project mainly due to project construction. Therefore, the assessment scope of ambient air quality in this project is within the scope of 200m away from the project land acquisition line and 200m away from the both sides of access road.

(5) Sound Environment

The project construction noise will affect the noise at the surrounding environmental sensitive spots around the construction area, while the noise forecast assessment scope includes the perimeter of construction area and 200m away from the both sides of access road.

(6) Ground Water

The survey and assessment scope of ground water environment status in this project mainly refers to the regions affected by the ground water level change during the operation period of Bazizui Navigation-Power Junction, including zone of reservoir inundation, Reservoir immersion zone, and others, involving 8 towns, such as Yugan County Baimaqiao Town, Daxi Town, Hongjiazui Town, Yangbu Town, Xiashan Town, Huangjinbu Town, Meigang Town, and Yujiang County Jinjiang Town, and 10 low lying areas that need special attention, such as Daxiwei, Duanjiahuwei, Jinbuwei, Zinianwei at the right bank of Xin River, Zhoujianongwei, Yangbuwei, Pingshangwei, Shawowei-shixiangwei, and Zhuqiaowei, Tuanhu Farmland.

(7) Environmental Risk

The risk assessment scope of ship oil (liquid) spill accidents during the operation stage includes Bazizui Reservoir Area and river section at the downstream of dam, key focus reservoir area, drinking water intakes of river section at the downstream of dam, and other environmental sensitive targets.

1.7.2 Assessment Period

As per the requirements of related guidelines, the EIA period for this project shall be divided into construction period and operation period. As per the overall construction progress schedule for this project, the construction period for this project is 54 months. Combined with the project construction and operation characteristics, the EIA period for this project is determined to be 5 years of construction period and 2 years of operation period (inclusive of 1 year of initial operation stage, and 1 year of normal operation stage). The target year of junction operation is predicted to be in 2020.

1.7.3Assessment Factors

As per the project environmental impact identification, the EIA element and assessment factors are determined, as shown in table 1.7-2.

Table 1.7-2 List of Primary Environmental Impact Factors of Bazizui Navigation-Power Junction Project in Jiangxi Province

Primary Environmental Impact Factors	Assessment Factors	
Surface Water Environment	Current Status Assessment	pH, SS, COD, BOD_5, Dissolved Oxygen, NH_3-N, Total Nitrogen, Total Phosphorus, Permanganate Index, Volatile Phenol, oil, and Hexavalent Chromium.
	Forecast Assessment	Construction Period, SS, pH, COD, and BOD Operation Period: COD, NH_3-N, BOD, and eutrophication
Hydrological Regime	Water level, flow, velocity, and mud and sand	
Terrestrial ecosystem	Terrestrial plant and vegetation, ancient trees, Key rare wild plants, terrestrial animals, ecological integrity, landscape and others.	
Aquatic ecosystem	primary productivity, zoobenthos, Aquatic Vascular Plant, and fish stock	
Ambient Air	TSP, PM_{10}, NO_2, and SO_2	
Sound Environment	Day-night equivalent sound level Leq (A)	
Groundwater Environment	Current Status Assessment	pH, Nitrate, Nitrite, Volatile Phenol, Total Hardness, Fluoride, Sulfate, Chloride, COD_{Mn}, As, Cd, Cr^{+6}, and Pb
	Forecast Assessment	level, quality and immersion of ground water
Reservoir inundation	land resources and utilization, water environment, ecological environment and others	

1.8 Environmental Impact Identification and Assessment Key Points

1.8.1 The identification of environmental impacts

According to the analysis of influencing factors such as engineering construction, reservoir inundation and reservoir operation and the analysis of pollution source intensity, combined with the environmental background characteristics such as environmental quality status, sensitive environmental targets and major environmental issues involved in the project, the environmental impacts of the project are as follows Major environmental factors identified and screened:

(1) Hydrology: water level, flow rate, flow rate
(2) Sediment: river bed erosion downstream of the dam, reservoir sediment deposition
(3) water temperature: reservoir water temperature, release water temperature
(4) water quality: suspended solids, organic pollution, nutrients
(5) Environmental Geology: Stable bank and reservoir leakage

(6) Groundwater: groundwater level, the relationship between the replenishment, immersion
(7) Landscape Ecology: Landscape Pattern, Natural Productivity, Ecological Integrity
(8) terrestrial plants: vegetation, rare plants, old and famous trees
(9) Terrestrial animals: habitat, wildlife, rare animals
(10) Aquatic organisms: aquatic habitats, food organisms, fish, rare aquatic animals
(11) Ecological water: Ecological flow, environmental water consumption
(12) Construction area environment: water quality, ambient air, noise, solid waste
Environmental impact factor identification and evaluation factor screening matrix in Table 1.8-1, the table lists the environmental factors, behavioral engineering factors.

The comprehensive engineering analysis shows that the main influence scope of the project is the project dam area, reservoir inundation area, reservoir periphery area and dam downstream area. The environmental impact factors of the project mainly include: surface water environment (hydrological situation, water temperature and water quality), ecological environment (landscape ecology, terrestrial organisms and aquatic organisms), construction area environment (water quality, ambient air, acoustic environment, solid waste, etc.), Land resources, groundwater environment, environmental geology and soil erosion.

1.8.2 Key points of assessment

It is shown in table 1.8-1 that environmental impact assessment factors include natural environment (hydrology, mud and sand, water temperature, water quality, environmental geology, groundwater, and others), ecological environment (landscape ecology, terrestrial plant, Terrestrial animals, aquatic life, and eco-environmental water use), and others. As per the project tasks and properties, combined with environmental background status of project affected areas and requirements of related guidelines, it is determined to consider the impact of surface water environment and ecological environment caused by the project, and environmental impact caused due to reservoir inundation and project construction as the key points of this project EIA. Besides, as per the existing national environmental protection laws and regulations, and EIA guidelines, water and soil conservation, environmental benefit and cost analysis, environmental risks and other subjects shall also be analyzed.

Table 1.8-1 Matrix Table of Environmental Impact Assessment Factors Identification of Bazizui Navigation-Power Junction Project in Jiangxi Province

▲ **refers to Significant Impact** ● **refers to normal impact** **Gap refers to slight or no impact** ☆ Refers to influence area			Project influence factors												Influence scope				
			Project construction							reservoir inundation and land occupation		Reservoir Operation							
			Preparation period		Construction Period														
			Ground Leveling	Access Road	Material Source Mining	construction diversion	earth-rock excavation	Concrete works	Construction personnel	Project land occupation	reservoir inundation	flood control	Power Generation	Navigation	Inundation Zone	Dam Zone	Dam Upstream river section	Dam Downstream river section	reservoir surrounding areas
Natural Environment	hydrology	Water Level				●					▲	●	●		☆		☆	☆	
		Flow										●	●		☆		☆	☆	
		Velocity				●					●	●	●		☆		☆	☆	
	mud and sand	Scour				●					●	▲	●					☆	
		Silt				●					●						☆		
	water temperature	Reservoir Water Temperature									●	●	●		☆		☆		
		temperature of discharged water									●	●	●					☆	
	water quality	SS			●		●	●							☆			☆	
		organic pollution							●						☆		☆		
		nutrient substance									●				☆				
	environmental geology	Reservoir bank Stability									●						☆		

▲ refers to Significant Impact **● refers to normal impact** **Gap refers to slight or no impact** ☆ Refers to influence area			Project influence factors												Influence scope				
			Project construction							reservoir inundation and land occupation		Reservoir Operation							
			Preparation period			Construction Period													
			Ground Leveling	Access Road	Material Source Mining	construction diversion	earth-rock excavation	Concrete works	Construction personnel	Project land occupation	reservoir inundation	flood control	Power Generation	Navigation	Inundation Zone	Dam Zone	Dam Upstream river section	Dam Downstream river section	reservoir surrounding areas
		reservoir leakage									●					☆			
	groundwater	immersion									●				☆	☆	☆		☆
		supplement and discharge correlation									●				☆	☆	☆		
Ecological Environment	landscape ecology	landscape pattern	●	●	●		●			●	●				☆	☆	☆		☆
		Natural productivity	●	●	●		●			●	●				☆	☆	☆		☆
		ecological integrity	●	●	●		●			●	●				☆	☆	☆		☆
	terrestrial plant	Vegetation	●	●	●		●			●	●				☆	☆			☆
		Rare Plants									●				☆				☆
		Old and Famous Trees									●				☆				☆
	Terrestrial animals	ecological habitats	●	●	●		●			●	●				☆	☆			☆
		Wild animals	●	●	●		●			●	●				☆	☆			☆
		rare animals									●								☆
Ecologic	aquatic	hydrophyti				●		●		●	●	●	●		☆		☆	☆	

▲ refers to Significant Impact ● refers to normal impact Gap refers to slight or no impact ☆ Refers to influence area			Project influence factors													Influence scope				
			Project construction							reservoir inundation and land occupation		Reservoir Operation							
			Preparation period		Construction Period														
			Ground Leveling	Access Road	Material Source Mining	construction diversion	earth-rock excavation	Concrete works	Construction personnel	Project land occupation	reservoir inundation	flood control	Power Generation	Navigation	Inundation Zone	Dam Zone	Dam Upstream river section	Dam Downstream river section	reservoir surrounding areas
al Environment	life	c habitat																	
		food organism				●		●		●	●	●	●		☆		☆	☆	
		fishes				●		●		●	●	●	●		☆		☆	☆	
		rare aquatic animal																☆	
	eco-environmental water use	Ecological Flow				●					●	●	●					☆	
		environmental water use									●	●	●					☆	

1.9 Assessment procedures

The project environmental impact assessment procedure is shown in Figure 1.9-1.

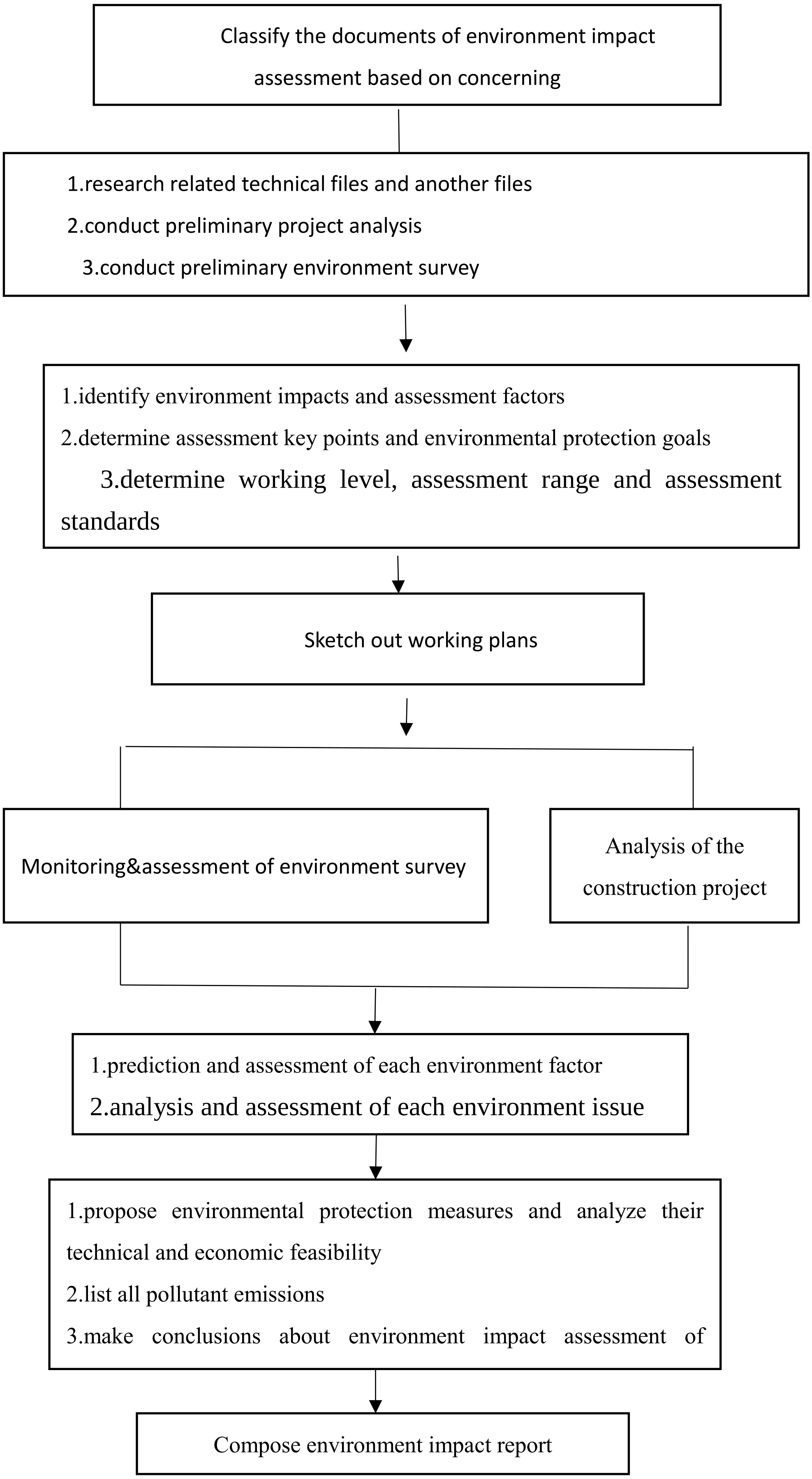


Figure 1.9-1 Figure Technical Procedure of Assessment

2. General situation of engineering

2.1 General situation of river basin and channel

2.1.1 General situation of river basin

Located in the northeast of Jiangxi Province, Poyang Lake in the west coast, the Xin River Basin borders the Huaiyu mountain and Rao River in the north, Wuyi Mountain in the south and Fujian Province in the south, and the hills in the east and adjoins Zhejiang Province. Xin River originated in the county of Yushan County, Zhejiang-Jiangxi border Huaiyu peak Huaiyu, Shangrao City, said Yushan water, Feng River after the introduction of the letter said. The main stream winds down from east to west, traverses northeastern Jiangxi Province and is divided into two east and west near Daxi Du in Yugan County, respectively into Poyang Lake in Zhuhu Mountain and Ruihong. The Xinjiang River basin covers an area of 16890km2, of which the area of Jiangxi province is 15871km2, accounting for 9.5% of the province's land area, and the total length of the main river is 328km.

The whole basin is an irregular rectangle with east-west length of about 190km, width of the north and south of 90km, and basin shape factor of 0.147. The basin is high in the southeast and low in the northwest, surrounded by mountains on both sides of the north and south. The southern part of Wuyi Mountains extends along the border between Fujian and Jiangxi Provinces and stretches for more than 500 kilometers with an altitude of 1000m to 1500m. The highest peak of Huanggang Mountain is 2158m above sea level, which is the first peak in East China. The Huaiyu Mountains in the north is about 1000m above sea level with the main peak Yu Jing Feng 1816m above sea level. The upper reaches of the upper reaches of the coast are dominated by middle and low mountains, and the topography fluctuates greatly. In the middle reaches of the Xinjiang River, the terrain gradually decreases toward the middle from the edge of the north, east and south sides and slopes westward. During this period, there are relatively low- Landform development; downstream of Poyang Lake alluvial plain.The mountainous area accounted for 40%, the hilly area was 35%, and the plain was only 25%.

The main stream of the Xinjiang River is divided into three sections: upper, middle and lower reaches with Shangrao city and Yingtan city as the boundary, the upstream channel is 115 km long, the average 702m drop down more than 6.10 per thousand; The middlestream channel is 144 km long, the average 38m drop down more than 0.263 per thousand, and the average width of the river is 200 ~ 300m; The lowstream channel is 69 km long, the average 10m drop down more than 0.145 per thousand, and the width of the river is 400 ~ 500m.

Jiangxi Xinjiang River Bazizui navigation and power junction project located in Yugan County of Xinjiang River downstream, the dam upstream from Jiepai dam site about 49km, downstream from Yugan county about 12km, is a specialized in shipping, comprehensive utilization of both power generation project, dam catchment area of 15942km2. Xinjiang is divided into the East River and the West River at Bazizui. This project is divided into the East River Hushanzui damsite and the West River Mopiling damsite. There are three large primary tributaries, which are Baita River, Huang Zhuangxi and Zhu Qiao River, between the Jiepai damsite and the Bazizui damsite. The distribution of river system and survey station of Bazizui navigation and power junction project and the location of the project is shown in figure 2.1-1

Baita River: a primary tributary of Xin river, originated in Nanshan, Guangze County, Fujian Province. Its origin is at longitude 117 ° 07 ', latitude 27 ° 36'. It flows from southeast to northwest through Wangjiagang into Jiangxi Province, north through the Sanxi River in Zixi County, Gaobu, Guixi ear, Shangqing Town, fish ponds, Yujiang County Dengjiabu, rake stone, Wang Jiadu , Along the main road including Qingtian Port, Lufang Water and other major tributaries to Jinjiang after the import Xinjiang River, estuary at longitude 116 ° 53 ', latitude 28 ° 23'. The basin area is 2839km2, the length of the main channel is 161.0km, the vertical ratio of the main channel is 1.49 ‰, the average elevation of the basin is 308m, the average gradient of the basin is 0.20m / km2, the average annual precipitation in the basin is 1966.0mm, and the annual average water yield is 34.045 × 108m3. Theoretical reserves of 7.83 × 104kW. There are three hydrological stations in Baiquan, Shenzhen and Rake, as well as rainfall stations such as Baiquan, Henggang, Shenzhen, Shangqing, Guanfang and Rake Stones in the basin. There are medium-sized reservoirs such as Honghu, Gaofang and Majie, Zheng, Red Lion 12 small reservoirs.

Huangzhuang Creek, also known as Huangzhuang Port, is a tributary of the Xin River. It originates from the Yuanshan Pass in the north of Yujiang County such as Fanling Peak and Longfeng Tip. Heyuan is located at 116 ° 55'E and 28 ° 32'N. From north to south, it flows into Huangzhuang Reservoir. After leaving the reservoir, it flows into Huangxin Reservoir via Sannang Bridge, Liujia Bridge and Niaojiaqiao Bridge to Jinjiang Town. The estuary is located at 116 ° 54 'E and 28 ° 24' N. Basin area of 146km2, the main channel length of 22.2km, the main channel vertical ratio of 2.20 ‰, the basin average elevation of 80m, the basin average gradient of 0.890m / km2, the basin average annual rainfall of 1864.5mm, average annual production of 1.688 × 108m3, hydraulic resources The theoretical reserves of 0.22 × 104kW, built Huangzhuang reservoir and Tieshan small reservoirs. The basin topography is dominated by low mound, Huangzhuang River source to SanGangBiao, the river flows through the hilly area, the two sides of the vegetation to Masson pine, miscellaneous shrubbery; SanGangBiao to the estuary, the river flows through the valley plains, open valleys, rivers Curved, riverbed pebbles, sandstone.

Zhuqiao River: A primary tributary of the Xin River, originating from the Huangbaiyuan at the foot of Li Mei mountain in Yugan County, its origin is located at 116 ° 51'E and 28 ° 38'N. From north to south, it flows through SheGeng, Liu mouth of Jiulong port to mouth Liu Jiaxin Jiangxi branch, estuary at longitude 116 ° 47 'east longitude latitude 28 ° 31'. The basin area is 123km2, the length of the main channel is 27.2km, the vertical ratio of the main channel is decreased by 1.55 ‰, the average elevation of the basin is 63m, the average gradient of the basin is 0.780m / km2, the average rainfall in the basin is 1864.5mm and the annual average water production is 1.442 × 108m3. A water footbridge station rainfall, a chicken mouth, Zhai and other small reservoirs.

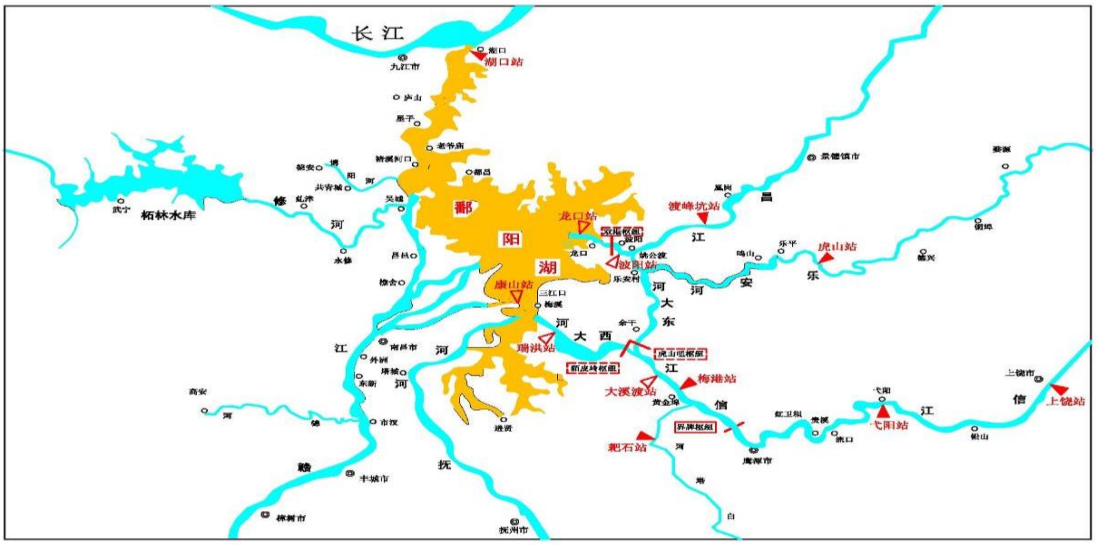


Figure 2.1 The distribution of river system and survey station of Bazizui navigation and power junction project and the location of the project

2.1.2 General situation of channel (see traffic data and forecast volume)

2.1.3 Channel planning

(1) the national inland waterway and port layout planning (2006-2020)

The Ministry of Transport and the National Development and Reform Commission compiled "national inland waterway and port layout planning". To dvocate actively the development and construction of resource-saving and environment-friendly inland water transportation. Planning focused on high-grade inland waterways and ports. Other inland waterways, important ports and general ports will be clearly defined in the inland waterway transportation planning by the people's governments of all provinces (autonomous regions and municipalities directly under the central government).The implementation period of the plan is from 2006 to 2020. The channel layout planning includes Ganjiang and Xinjiang river system which are rich in waterway transportation resource.

The high-grade inland waterways and port layout scheme is shown in figure 23.

(2) Jiangxi province inland river shipping development plan (2020)

Jiangxi Provincial Communications Department compiled "Jiangxi inland river shipping development plan (2020)" in April 2006, and pointed out in the planning:

Xinjiang national high-grade channel planes 3 cascades and 4 junctions, which are Jiepai cascade, Bazizui cascade (including Hushanzui junction of Xinjiang East River and Mopiling junction of West River) and Shuanggang cascade. Among them, the Jiepai junction has been built. Details of each cascade are shown in table 2.1-2.

Table 2.1-2 Xinjiang national high-grade channel cascade development status and planning table

Serial number	Name	General situation of junction					Basic situation of navigation buildings		
		Position	Installed capacity（ten thousand kw）	Normal water level（m）	Total storage capacity（hundred millionm3）	Construction time	Type	Ton	Scale（length*width* water depth）(m)
1	Jiepai	12km in the lower reaches of Yingtan	2	26		1997	lock	1000	182×14×3.5
2	Mopiling	2km downstream of Xinjiang bifurcation	0.44	19.5		2010-2020	lock	500	120×12×3.0
	Hushanzui		0.66	19.5		2010-2020	lock	1000	180×16×3.5
3	Shuanggang	8km in the lower reaches of Poyang		13		2008-2010	lock	1000	180×16×3.5

Note: Bazizui navigation and power junction project includes Mopiling damsite and Hushanzui damsite.

Implementation opinions of channel in 2010:

To complete channel improvement and interrelated supporting measures, focusing on the construction of Ganjiang channel, Xingjiang channel and Ganjiang East River channel which are national high-grade channels.

Xinjiang: To implement the 88km channel regulation works of Shuanggang~Chuxi estuary according to third grade standard; To implement Shuanggang junction project according to third grade standard, playing the project benefits of the junction early which called one dam locks three rivers(Xinjiang,Changjiang and Le'an River), to make 59km from Xinjiang Hushanzui to Shuanggang and 46km from Le'an River Mingshan to Le'an village reach third standard and to improve 51km navigable conditions below Changjiang Huanggang.

Implementation opinions of channel in 2020:

On the basis of channel construction in 2010, to continue the construction of Ganjiang channel, Xinjiang channel which are national high-grade channels, to make them reach planning navigation standard.

(3) The construction planning of Xinjiang high-grade channel (2011~2015)

The Jiangxi Provincial Development and Reform Commission and the Ministry of Communications and Transport of Jiangxi province compiled "high grade waterway construction planning of Xinjiang High-grade channel (2011~2015)" in 2013, and pointed out in the planning:

The overall construction scheme is that the 244km channel of Xinjiang estuary river~Zhuxi estuary intends to take the three canalized combined with channel improvement to reach third channel standard. That is to construct Jiepai junction (already exist, need to be completed or rebuilt), Bazizui junction, Shuanggang (or Poyang Lake) junction, to carry out channel regulation works in channel reservoir area and channel of Lake District and to rebuild and 7 stream crossings which do not meet planning third channel standard.

The goal of the construction of the high-grade channel of Xinjiang in 12th Five-Year is as follows: Accelerate the construction of high-grade channel of Xinjiang, to 2015, Xinjiang Hongwei dam~Bazizui 79km channel basically reach the planning third channel standard and standard rate of high-grade channel reaches 32.5%.

The thought of the construction of the channel of Xinjiang in 12th Five-Year is as follows: Combined with channelization project and channel regulation project, efforts should be made to improve navigation condition of high-grade channel Jiepai~Bazizui of Xinjiang.

"Xinjiang high-grade channel construction plan (2011-2015)" makes it clear that Xinjiang high-grade channel planning construction project during 12th Five-Year is Bazizui junction, supporting construction of Bazizui channel in reservoir area and channel regulation project at variable tail section of reservoir, as well as reconstruction of Huangjinbu Bridge. At present, Bazizui junction, supporting construction of Bazizui channel in reservoir area and channel regulation project at variable tail section of reservoirhas not yet started construction.

The horizontal layout sketch of Xinjiang cascade development plan is shown in Figure 2, and longitudinal profile is shown in Figure 3.

2.1.4 Has been built and under construction project

Xinjiang high-grade channel has built Hongwei dam cascade and Jiepai cascade and situation of two cascades are as follows:

(1) Hongwei dam water conservancy

Hongwei dam water conservancy is a comprehensive utilization project which gives first to irrigation, catchment area of 11650km2 and combined with power generation. The damsite is located at about 3.0km downstream of Guixi City, and the ship lock size is 8 tons. At present, Hongwei dam power station has not power and the junction is planned to be demolished.

(2) Jiepai water conservancy

Xinjiang Jiepai water conservancy damsite is located in the northwest of the village Jiepai about 12km in Yingtan City, dam catchment area of 12277km2, and it is a comprehensive utilization project which gives first to shipping and combined with power generation and irrigation.

Jiepai junction ship lock is located at the right bank of the dam site, the annual capacity of navigation is 5 million 860 thousand tons, and the navigation level is 1000 tons; The right branch of the sluice consists of 12 holes with a total length of 116m and the left sluice consists of 8 holes with a total length of 150m; The spillway consists of 3 holes with a total length of 87.45m; The power station is located on the left bank of the damsite with a installed capacity of 20MW and an annual power output of 86 million 130 thousand kw.h; Earth dam is 122m long; Normal water storage level of junction design is 26m.

The project was started in 1993 and completed in 1997. It was tested in January 1997. At that time, the reservoir compensation for inundation was not properly solved, so that there was a strong response in the affected area of reservoir inundation. To this end, in February 1997 the Jiangxi Provincial People's Government Office issued " Notice on the issuance of 1# start-up and flood loss during the test impoundment survey coordination meeting minutes" and in October 31, 2000 organized Xinjiang Jiepai junction compensation for inundation coordination committee. Then, in August 2001 Jiepai junction reservoir protection works started, and it was completed in August 2002. Although it has been coordinated several times, due to compensation for inundation has not reached a consensus, the junction still maintain 24m operation. It makes the shipping function can not be played and also has an effect on the operational impact of hydraulic turbine to some extent.

2.2 The necessity of engineering construction

(1) It is the need to post "the Belt and Road", the Yangtze River economic belt, the middle reaches of the Yangtze River city group as a national strategy, to accelerate Xinjiang inland shipping development, and to build cross regional industrial cooperation in transport infrastructure framework.

The of national strategy such as the Yangtze River economic belt, the middle reaches of the Yangtze River city group, the Yangtze River Delta Economic Zone, Haixi Economic Zone, Poyang Lake ecological economic zone, the former Central Soviet area revitalization, provincial development strategy such as "to expand the implementation of open Northeast Jiangxi" and a series of municipal development strategy provide an important opportunity for strengthen the relations between the three cities in the northeast of Jiangxi and the Yangtze River Delta, Haixi and the middle reaches of the Yangtze river and active participation in "The Belt and Road" and construction of the Yangtze River Economic belt. The three cities in the northeast of Jiangxi is an important node in the south Shanghai Kunming development axis of the Yangtze River economic belt, is an important part of the middle reaches of the Yangtze River city group and is also the nearest city group in the middle reaches of the Yangtze River area from Yangtze River Delta city group and Haixi city group. With superior traffic location, we should seize the strategic opportunity and take the opportunity of expanding the productive forces layout to the hinterland to build an integrated transportation system which is more close to the interior and more open to the outside world. As an important component of the comprehensive transportation system in Northeast Jiangxi, Xinjiang plays an important role in the interflow of goods and materials inside and outside the region, especially in the transportation of bulk goods. Water transport large capacity, low cost, low energy consumption, low added value, so a large amount of raw materials and finished goods transport using inland river transportation has a natural advantage. In order to fully support multiple development strategy, accelerate the upgrading of Xinjiang grade and shipping capacity, promote the network connection of trunk and tributary, optimize the layout of the port function, strengthen the collection and distribution system construction, build a modern inland shipping system, provide strong support for the regional economic development center along the main road, along the Yangtze River to the hinterland in depth transfer.

(2) It is the need to improve the service level of Xinjiang channel, expand the supply capacity of transportation infrastructure, build a comprehensive transport system, reduce logistics costs, and optimize the regional logistics system.

During 12th Five-Year period, Northeast Jiangxi GDP average annual growth rate remained above

10%, the total economy is increasing year by year, 2015 two cities hinterland GDP amounted to 229 billion yuan, accounting for 14% of the GDP of Jiangxi Province. In 13th Five-Year, hinterland economy will remain in the accelerated period of transformation and upgrade, deepen period of regional integration and opening, contact at home and abroad will be more closely, it will promote the rapid growth of waterway freight transport demand in the region and speed up the industrial layout along the Yangtze river. The change of regional economic industrial structure calls for speeding up the construction of Xinjiang channel, building a trunk-branch combined, water-land transshipment inland waterway system with perfect function as soon as possible to meet the needs of regional economic development.

At present, the construction of Xinjiang high-grade channel is slow, input of channel maintenance funds is not enough, terminal facilities are still relatively backward, scale and specialization degree is low. These result in a large number of water transport goods abandon water to take land. It is understood that the bulk cargo, especially the coal, mainly rely on the railway or river to Jiujiang intermodal transport to the factory, the higher cost of logistics calls for an urgent demand for upgrading Xinjiang channel. The rapid development of hinterland economy requires the three cities in Northeast Jiangxi to expand the supply capacity of transportation infrastructure, and strengthen the coordination and cohesion of various transportation modes. It is an indispensable and important part to build a regional modern comprehensive transportation system to improve Xinjiang channel level and build a large transportation channel which can effectively reduce the logistics cost.

(3) It is the need to fully meet the hinterland freight development, adapt and guide the hinterland industry layout and development, and play the comparative advantage of water transportation to provide strong transportation service guarantee.

The Northeast Jiangxi Province is the most industrial characteristic area in Jiangxi. It has always been the focus of Jiangxi to accept the economic radiation of the Yangtze River Delta and Fujian Delta and undertake the industrial transfer. Nonferrous metals, mineral construction materials, non-metallic minerals and other mineral resources are rich in the Xinjiang River Basin. There are smelting, chemical fertilizer, cement and electric power enterprises along the river. They are also concentrated areas and industrial agglomeration zones of industrial parks. There will be further expand of the photovoltaic energy, nonferrous metals new materials, automobiles and new energy vehicles, machinery and instrument manufacturing and other industrial clusters in the future. Energy, raw materials and finished goods and other materials transportation demand will continue to grow.

With the hinterland economic research, source of goods layout which have greater demand for water transport mainly are Huangjinbu power plant, Guixi power plant, Guixi copper industry base and Guixi Industrial Park. Most of them are along the river and have large potential demand for water transport. From the view of development stage, manufacturing and processing industry in the northeast of Jiangxi will continue for quite a long period and bulk materials transport that suitable for water transport will maintain steady growth. In 2020, 2030 and 2040 forecast of Xinjiang channel freight volume will reach 34 million 200 thousand T, 48 million 600 thousand T, 57 million 800 thousand T, Hushanzui junction cargo lockage will reach 7 million 100 thousand T, 12 million 400 thousand T, 15 million 200 thousand T, Mopiling junction cargo lockage will reach 2 million 600 thousand T, 4 million 600 thousand T, 5 million 700 thousand T. Large scale water transport demand requires the enhancement of transportation capacity guarantee for Xinjiang. It will provide a convenient and economic transportation channel for the raw materials and finished products transportation of the mineral resources development and industrial development along the Yangtze River and it is also conducive to further promote the development and industrial agglomeration along the Yangtze River, and optimize the industrial layout along the river.

(4) As an important infrastructure for upgrading the grade of Xinjiang channel, the project construction is to smooth the whole line of water transportation, upgrade the channel grade, and meet the needs of standardization and large-scale development of inland waterways ships.

In recent years, the inland waterway transport capacity of Jiangxi has maintained rapid growth, the trend of large ship is obvious, and the average tonnage of cargo ships in the province increased from 202T in 2005 to 679T in 2015. Referring to the experience of inland waterway transportation development in other areas, the future of the ship will be further developed to large-scale and standardized along with the upgrading of waterway grade. According to the plan, by 2020, the province's total shipping capacity will reach 2 million 600 thousand T, the average deadweight tonnage of 1400 tons, ship type standardization rate of more than 70%.

With the northeast of Jiangxi and other areas along the Yangtze River and the international markets are becoming increasingly closer, the range of production cooperation increases gradually. In addition to the pursuit of lower transport costs, requirements for ship capacity are also tend to be fast, standardized and specialized. Therefore, in order to adapt to the development trend of large ships, reduce transportation costs, improve transport efficiency, give full play to advantages of Xinjiang, strengthen economic ties and exchange of goods, Xinjiang needs to accelerate the upgrading of channel grade and the implementation of planning. As an important infrastructure to speed up the upgrading of XinJiang channel, the junction is of great significance in smoothing the whole line of water transportation, upgrading the channel grade and adapting to the development of ships.

Bazizui navigation and power junction is in accordance with industrial policy of Jiangxi province and the country, in line with Jiangxi province inland shipping development planning and Xinjiang high-grade channel construction planning. It is the need to promote economic and social development along Xinjiang and adapt to Xinjiang shipping development. The construction of this project is necessary.

2.3 Transport volume forecast and service organization scheme

2.3.1 Planning level year

Forecast base year: 2015; forecast level year: 2020, 2030, 2050.

2.3.2 Traffic Volume Forecast

(see traffic data and forecast chart 2.2-18, table 2.2-22, table 2.2-23)

2.3.3 Navigation standards and operation organization scheme

（1）Navigation standards

According to the National Inland Waterway and Port Layout Plan (National Development and Reform Commission and Ministry of transport, 2007), Jiangxi Inland Waterway Transportation Development Plan (Jiangxi Provincial Communications Department, April 2006), stream, legs below Guixi in the Xin river main stream are planned to be Grade III channels, and the Xin river west river leg are planned to be GradeIVchannel.

This project belongs to the Xin river main river (Grade III channel), so the standard of construction is Grade III waterway standard, and the channel scale is: width of 60m, depth of water 2.2M, turning radius of 480m.

(2) Operation organization scheme

Jiangxi inland ship standard reference "The Yangtze River Guozha standard ship main dimension series" (2012.12) is applicable to the Yangtze River Navigation area. Recommended lockage ship refers to Table 2.3-3. Among them, the design of the ship type of Bazizui junction is 1000t level, taking the 2000t level into consideration.

Table 2.3-3 Lockage standard ship main dimension series of Bazizui junction

Ship type	BOA	LOA	Reference draught	Reference DWT
	m	m	m	t
Yangtze River cargo - 1	6.6	40~45	1.6~1.7	300~450
Yangtze River cargo - 11	8.8	40~55	1.8~2.1	450~700

Yangtze River cargo - 22	11	60~65	2.0~2.5	800~1000
Yangtze River cargo - 27	13	57~65	1.9~3.3	1000~1500
Yangtze River cargo - 34	15	82~88	2.8~3.5	2000~3000

2.4 Project location, Development mode, scale and operation mode

2.4.1. Project location

The project is located at the lower reaches of the Xin river, in Yugan county, Shangrao of Jiangxi province. The dam is located at 49km of the downstream of the dam of Jiepai junction, 12km away from Yugan county. At the 57km of the downstream is the proposed Shuanggang shipping junction. The geographical coordinates of the proposed dam site are 116°40 ', 30', and 28°, 37 ', 20'. The Xin river is divided into East River and West River at Bazizui junction. The junction has two dam sites, one is East River Hushanzui Ju dam, and the other is West River Mopi Ling dam. The two dams are located on the same axis. Catchment area of the recommended dam site is 15942km^2. The average annual runoff of the dam site is 578m^3/s, and the annual average runoff is 1,800,228,000 m^3. Normal Reservoir water level is 18m, total storage capacity is 3.44 x 10^{8}m^3, and the installed capacity is 12.6MW. The average annual power output is 0.4503 x 108kW • H. The location of Bazizui navigation power junction is shown in figure 1

2.4.2 Project development task

The development task of Bazizui navigation power junction is mainly shipping, taking into account the comprehensive utilization of power generation.

2.4.3 Project scale and characteristics

Normal reservoir water level is 18m, and total storage capacity is 3.44 x 10^{8}m^3. The storage capacity is 136 million m^3 below the normal reservoir water level. The installed capacity is 12.6MW (Mopiling 7.0MW and Hushanzui 5.6MW). The navigation grade is Level III, and canalized waterway is 49km. Bazizui navigation- power junction is Level II project. The design of the sluice, lock retaining section, powerhouse, left and right side joint, and the earth and stone dam are designed according to the third level building. Secondary buildings are designed according to the fourth level. Permanent retaining and discharging structures are designed on the conditions that the flood recurrence period is 50 years. Check flood return period is 300 years. As part of the retaining structures, the workshop and lock head are designed the same as that of check flood recurrence period and retaining structures. The design of flood return period is 30 years for downstream flood discharge, energy dissipation and scour prevention structures.

The major project characteristics of the Xin river Bazizui navigation-power junction project is shown in Table 2.3-1.

Table 2.3-1 Bazizui Navigation-power Junction Project Properties

Serial No. & Name	Unit	Amount	Remarks
一、hydrology			
1．Drainage area			
Whole basin	km^2	16890	
Above project dam site	km^2	15942	
2．Using hydrological years	year	62	1952.4~2014.3
3． Mean annual river runoff(MARR)	$X10^8$ m^3	182.28	Dam site
4．Typical flow			
Annual average flow	m^3/s	578	Dam site
Measured maximum flow	m^3/s	13000	Meigang station, June 22,1955
Historical maximum flow	m^3/s	18300	Meigang station, flood in 1878
Normal application (Design) flood standard		P＝2％	
and flow	m^3/s	15600	
Non-normal application(Check)flood standard		P＝0.33％	
and flow	m^3/s	20300	
5．sediment			
Annual average sediment discharge of suspended load	$x10^4t$	204.9	
Annual average sediment discharge of bed load	$x\ 10^4t$	30.7	
二、Reservoir			
1．Reservoir water level			
Check flood level	m	24.30	P=0.33%
Design flood level	m	23.69	P=2%
Normal water level	m	18	
2．Reservoir area of Normal water level	km^2	22.96	
3．Backwater length	km	37	
Total reservoir capacity (Static reservoir capacity below Check flood level)	$x\ 10^8m^3$	3.44	
Reservoir capacity below normal reservoir level	$x\ 10^8m^3$	1.36	
4．Water efficiency	%	40.35	

Serial No. & Name	Unit	Amount	Remarks
三、Flow &Corresponding downstream water level			
1. Designed maximum flow	m^3/s	5620/9980	Hushanzui/Mopiling
Corresponding downstream water level	m	23.52/23.55	Hushanzui/Mopiling
2. Check maximum flow	m^3	7310/13000	Hushanzui/Mopiling
Corresponding downstream water level	m	23.99/24.03	Hushanzui/Mopiling
3. Shipping base flow （P=95%）	m^3/s	31.6/12.3	Hushanzui/Mopiling
Corresponding downstream water level	m	12/10.79	Hushanzui/Mopiling
4. Installed full maximum flow	m^3/s	641	
Corresponding downstream water level	m	14.95	
四、Project benefit index			
1. Navigation benefit			
Improving waterway mileage	km	37	
Channel dimensions	m	60×480×2.2	Width of double&straight line section× bend radius×water depth
Design fleet	t	1000	
Annual throughput capacity	x 10^4t /year	1508	Single way through capacity
2. Power generation benefit			
Installed capacity	MW	12.6	
Guaranteed output (P=90%)	MW		
Annual average generation capacity	x10^4kW·h	4503	
Annual utilization hours	h	3574	
五、General situation of land expropriation			
1. Cultivated land Expropriation .	Mu	1136.82	
2. Forestland expropriation	Mu	200.5	
3. Grassland expropriation	MU	128.53	
4. Expropriation of land for waters and water conservancy facilities	Mu	31700.56	
5. Temporary occupation land	Mu	7461.68	

Serial No. & Name	Unit	Amount	Remarks
六、Key constructions and devices			
1．Retaining structure form			Banks connected to dam section
Ground properties		Gravel stratum/moderate weathering phyllite	Earth dam / reservoir dam section
Basic earthquake intensity / fortification intensity	intensity	VI	
Crest elevation	m	27.0	
Maximum dam height	m	35.0	reservoir dam section
Crest length (fill dam / gravity dam)	m	713	Total of left and right shore
2．Release structure type			Flat lock
Ground properties		moderate weathering phyllite	
Crest elevation	m	11.0	
Pier top elevation	m	27.0	
Overall length of water release section	m	206/342	Hushanzui/Mopiling
Unit-width discharge	$m^3/(s·m)$	35.5/38.0	Hushanzui/Mopiling
Energy dissipation mode		submerged bucket dissipator	
Form, quantity and size of lock gate		Flat panel gate，12 piece/20 piece,14×8.78（width×height）	Hushanzui/Mopiling
Type, quantity and capacity of hoist		Hydraulic hoist，12 piece /20 piece， 2×800kN	Hushanzui/Mopiling
Design flood flow（P=2%）	m^3/s	5620/9980	Hushanzui/Mopiling
Check flood flow（P＝0.33％）	m^3/s	7310/13000	Hushanzui/Mopiling
3．Navigation structure			
type			
Ground property		gravel layer/moderate weathering phyllite	
Effective dimension	m	180×23×4.5/180×23×3.5	Hushanzui/Mopiling
Upstream highest navigable water level	m	22.85/23.00	Hushanzui/Mopiling
Downstream highest navigable water level	m	22.79/22.94	Hushanzui/Mopiling
Upstream lowest navigable water level	m	15.87/15.53	Hushanzui/Mopiling
Downstream lowest navigable water level	m	12.00/13.69	Hushanzui/Mopiling

Serial No. & Name	Unit	Amount	Remarks
Maximum working head	m	6/7.21	Hushanzui/Mopiling
Types of Filling and Emptying Systems		end filling and emptying system	
4．Power plant			
type		Riverbed Hydropower Station	
Ground properties		Batholith	
Main plant size(length×width×height)	m	70.51×62.75×27.5 75.94×67.09×29	Hushanzui/Mopiling
Installation elevation of hydraulic turbine	m	8.3/7.8	Hushanzui/Mopiling
5．Major power generating equipment			
Quantity of hydraulic turbine	piece	2/2	Hushanzui power station/Mopiling power station Bulb- type turbine unit
Type specification		GZ( )-WP-530/GZ( )-WP-590	Hushanzui power station/Mopiling power station
Rated output	MW	2.947/3.684	Hushanzui power station/Mopiling power station
Rated speed	r/min	68.2/60.0	Hushanzui power station/Mopiling power station
Suction height	m	3.15/3.15	Hushanzui power station/Mopiling power station
wheel diameter	m	5.30/5.90	Hushanzui power station/Mopiling power station
Maximum gross head	m	5.00/5.64	Hushanzui power station/Mopiling power station
Minimum net head	m	1.20/1.20	Hushanzui power station/Mopiling power station
Rated head	m	2.30/2.30	Hushanzui power station/Mopiling power station
Rated flow	m^3/s	142.5 /178.1	Hushanzui power station/Mopiling power station

Serial No. & Name	Unit	Amount	Remarks
Generator amount	piece	2/2	Hushanzui power station/Mopiling power station
unit capacity	MW	2.8/3.5	Hushanzui power station/Mopiling power station
Generator power factor		0.85/0.85	Hushanzui power station/Mopiling power station
6．Power line			
Transmission voltage	kV	35/35	Transmission line in Hushanzui power station ： ZB-YJV22-26/35kV-3×95/ Transmission line in Mopiling power station：LGJ-240
number of circuits	circuits	1/1	Hushanzui power station/Mopiling power station
Transmission destination		West river power station/ Nearby substation	Hushanzui power station/Mopiling power station
Transmission distance	km	1 km /10 km	Hushanzui power station/Mopiling power station
七、Main project construction			
1．Amount of main project			
Earth excavation	$x10^4m^3$	1199.5/326	Hushanzui/Mopiling（demolition of cofferdam included）
Rock excavation	$x10^4m^3$	5.7/9.6	Hushanzui/Mopiling（the same below）
Earth and rock filling	$x10^4m^3$	340.6/326.1	
Concrete and reinforced concrete pouring	$x10^4m^3$	35.9/56.7	
Metal structure installation	t	3658/5242	
curtain groutin	m		
Consolidation grouting	m	4231.6/6764.2	
2．Key construction material			
wood	$x10^4m^3$	4.0/6.2	
cement	$x10^4t$	9.0/14.2	

<table>
<tr><td colspan="2">Serial No. & Name</td><td>Unit</td><td>Amount</td><td>Remarks</td></tr>
<tr><td colspan="2">steel</td><td>x10^{4}t</td><td>3.7/6.0</td><td></td></tr>
<tr><td colspan="2">3． Required labor force</td><td></td><td></td><td></td></tr>
<tr><td colspan="2">Total working day</td><td>x10^{4}Working day</td><td>80/90</td><td></td></tr>
<tr><td colspan="2">Peak number of person</td><td>person</td><td>600/900</td><td></td></tr>
<tr><td colspan="2">4． Temporary housing</td><td>m^2</td><td>3.4/5.3</td><td></td></tr>
<tr><td colspan="2">5． Construction power</td><td></td><td></td><td></td></tr>
<tr><td colspan="2">Power supply load</td><td>kW</td><td>5000/7500</td><td></td></tr>
<tr><td colspan="2">6 ． External traffic (highway)</td><td></td><td></td><td></td></tr>
<tr><td colspan="2">Distance</td><td>km</td><td>13/8</td><td>extension</td></tr>
<tr><td colspan="2">Freight volume</td><td>x10^{4}t</td><td>37/57.8</td><td></td></tr>
<tr><td colspan="2">7． Construction diversion mode</td><td></td><td></td><td></td></tr>
<tr><td rowspan="4">construction diversion criteria</td><td>First stage:water release gate</td><td></td><td>Low water period 8~3month20%</td><td></td></tr>
<tr><td>Second stage:water release gate</td><td></td><td>Low water period 8~3month20%</td><td></td></tr>
<tr><td>Power plant</td><td></td><td>Low water period:8~3Month20%</td><td></td></tr>
<tr><td>Ship lock</td><td></td><td>Low water period 8~3month20%</td><td></td></tr>
<tr><td colspan="2">8． Construction area</td><td>Mu</td><td>4184/1545</td><td></td></tr>
<tr><td colspan="2">9． Construction</td><td></td><td></td><td></td></tr>
<tr><td colspan="2">Preparation</td><td>Month</td><td>6/6</td><td>straight-line duration is 4 months</td></tr>
<tr><td colspan="2">Construction period of main project</td><td>Month</td><td>25/23</td><td></td></tr>
<tr><td colspan="2">Completion period</td><td>Month</td><td>2/2</td><td></td></tr>
<tr><td colspan="2">Total duration</td><td>Month</td><td>29/29</td><td></td></tr>
<tr><td colspan="2">八、Economic index</td><td></td><td></td><td></td></tr>
<tr><td colspan="2">Total investment</td><td>x10^{8}yuan</td><td>39.99</td><td></td></tr>
</table>

2.4.4 Reservoir operation mode

Bazizui navigation-power junction project is focused on navigation, and takes into account the comprehensive utilization of power. The design of reservoir operation mode should be based on the main task. The reservoir should be kept at a higher water level as much as possible, so that the hydraulic resources can be fully utilized to obtain the maximum comprehensive benefits, on the condition that meets navigation requirement and reduces flooding. The station is runoff power plant, not assuming the mission of flood control, so it has no regulating effect on flood. As it is often influenced by backwater effect of water level in Poyang Lake, the junction operation is divided into two situations:

1. Without the influence of backwater effect of downstream water level in Poyang Lake:

When the upstream water quantity is less than 690m3/s(Hushanzui 300, Mopiling 390), the reservoir operates at normal water level of 18.0m. All water should be used to generate power, except that meeting navigation water consumption. When the upstream water quantity is between 690$m^3/s \leq Q <$ 1100m^3/s (Hushanzui 450, Mopiling 650), partly open water release gate and the discharge capacity should be the result of natural water flow minus unit and lock flow. The reservoir still operates at normal water level of 18.0m. When the upstream water quantity is more than 1100m3/s, power generation will stop and all the sluices are opened gradually to open drain until the restoration of natural river conditions. When the quantity is greater than or equal to 11200m3/s, navigation lock will stop.

2. Influenced by backwater effect of downstream water level in Poyang Lake:

When the upstream water quantity is less than 1100m^3/s and downstream water level is less than 16.5 m, the reservoir still operates at normal water level of 18.0m and power generation and navigation is kept normal, the excess water is discharged by sluice. When downstream water level is between 16.5m≤H<18.0m, water level of the reservoir is18.0m, and navigation is kept normal, but power generation stops. The excess water is discharged by sluice. When downstream water level is ≥18.0m, all the sluices are opened gradually to open drain until the restoration of natural river conditions.

Based on the above working situations, when upstream water quantity≥1100m3/s or when downstream water level height≥18.0m, the reservoir should totally drain until the restoration of natural river situation. When upstream water quantity≥11200m3/s, navigation should stop.

After flooding, when upstream water quantity <1100m^3/s and downstream water level H<18.0m, the reservoir should store water.

2.5 Project composition

Bazizui navigation-power junction project is composed of main junction project, resettlement project and environmental protection project. The composition of each project is detailed in table 2.4-1. The project does not include waterway dredging project in reservoir area or under the dam. The dredging project is included in waterway regulation project from Jiepai to Shuanggang. The evaluation does not include the influence of dredging on environment. Dredging should be entrusted to the relevant qualification units to assess environmental impact.

Table 2.4-1 Bazizui Navigation-power Junction Project Composition

<table>
<tr><th colspan="3" rowspan="2">Project item</th><th rowspan="2">Project composition</th><th colspan="2">Possible environment effect</th></tr>
<tr><th>Construction period</th><th>Operation period</th></tr>
<tr><td rowspan="12">Main junction project</td><td rowspan="7">Permanent</td><td>Water retaining structure</td><td>Mo PI Ling left bank dam, Mo PI Ling gate dam, Connecting dam between two junctions, Hushanzui gate dam, and Hushanzui right bank dam</td><td rowspan="4">Disturbance of landform, vegetation destruction, soil erosion, noise and air pollution</td><td rowspan="4">Economic benefit and social benefit by navigation and power generation; Dam barrier,
Water environment change in reservoir area and downstream of dam,
Land use change</td></tr>
<tr><td>Water discharge structure</td><td>20-hole release gate in Mopiling、12-hole release gate in Hushanzui</td></tr>
<tr><td>Power plant</td><td>Run-of-river power plant in Mopiling and Run-of-river power plant in Hushanzui, both include Main building, installation room and auxiliary power house</td></tr>
<tr><td>Navigation structure</td><td>The Mo PI Ling lock, tiger mouth locks, including the upstream approach channel, downstream approach channel, lock body</td></tr>
<tr><td>Owner base</td><td>Junction management center</td><td></td><td>Producing domestic sewage and waste</td></tr>
<tr><td>Permanent approach road</td><td>Permanent road 8.5km</td><td>Disturbance of landform, vegetation destruction, soil erosion, noise and air pollution</td><td>Improve local traffic conditions</td></tr>
<tr><td>Protection engineering</td><td>Reinforcement dikes of 32.19km, Dangerous sections treatment of 10km，newly-built 1watergate, and rebuilt 1watergate
Newly built and rebuilt 9 pumping stations and 652 mu padding farmland</td><td>Influence of constructive and domestic sewage</td><td>Alleviate waterlogging, improve the environment</td></tr>
<tr><td rowspan="5">Temporary project</td><td>Auxiliary plant</td><td>Concrete production system, aggregate processing system; all kinds of construction plant</td><td rowspan="2">Disturbance landform, destroy vegetation, produce soil and water loss, noise, air pollution and waste water;

Conducive to local employment and social and economic development</td><td rowspan="2"></td></tr>
<tr><td>warehouse</td><td>All kinds of building materials warehouse</td></tr>
<tr><td>Construction management &living camp</td><td>Living facilities& Office zone</td><td>domestic sewage and waste</td><td></td></tr>
<tr><td>Material yard and slag yard</td><td>Right bankI_1 borrow pit 、Left bankI_2 borrow pit、sand-gravel material、landhill in Bazizui junction</td><td rowspan="2">Disturbance of landform, vegetation destruction, soil erosion, noise and air pollution 、 land</td><td rowspan="2"></td></tr>
<tr><td>Field traffic</td><td>Temporary road 30km</td></tr>
</table>

<table>
<tr><th rowspan="2" colspan="2">Project item</th><th rowspan="2">Project composition</th><th colspan="2">Possible environment effect</th></tr>
<tr><th>Construction period</th><th>Operation period</th></tr>
<tr><td></td><td></td><td></td><td>utilization way changed</td><td></td></tr>
<tr><td rowspan="4">reservoir inundation and resettlement engineering</td><td>reservoir inundation</td><td>Normal water level18m，Storage capacity below normal water level $1.36*10^8m^3$，Total area of reservoir inundation $2027.19hm^2$</td><td rowspan="2"></td><td rowspan="2">Change the downstream reservoir and site hydrology;
Reservoir inundation caused loss of vegetation, the change of land use pattern</td></tr>
<tr><td>Construction land occupation</td><td>Land occupied by the hub engineering is $533.31hm^2$，including permanent land occupation of $155.02hm^2$，and temporary land occupation of $378.29km^2$；land occupied by the protection engineering is $150.33hm^2$，including permanent land occupation of $31.17hm^2$，and temporary land occupation of $119.16hm^2$</td></tr>
<tr><td>Resettlement</td><td>No house relocation. In the planning level year, the production resettlement population are 85 persons.The relocation population is not involved</td><td></td><td></td></tr>
<tr><td>Relocation and Rehabilitation Project</td><td>Rehabilitation of waterways, docks, transmission lines, communication lines, hydrological station, culverts and water gates</td><td>Disturbance of landform, vegetation destruction, soil erosion</td><td></td></tr>
<tr><td rowspan="3">Enviroment protection project</td><td>Fish pass structure</td><td>Mo PI Ling fishway and Hushanzui fishway, using diaphragm type fishway</td><td></td><td>Reduce the impact of engineering construction on fish</td></tr>
<tr><td>Environmental Protection Countermeasures</td><td>Production and living wastewater treatment project,
Pollution prevention and ecological restoration project in construction area,
Fish conservation project,
Conservation and protection project of rare plants,
Soil and water conservation project, etc</td><td>improve the impact of the above activities on the environment</td><td>improve the impact of the above activities on the environment</td></tr>
<tr><td>environmental management and monitoring</td><td>establishing environmental management agencies to do environmental management of project construction and operation, to monitor the construction and operation of water, gas, sound, ecology, soil and water conservation</td><td>improve the local environment</td><td>improve the local environment</td></tr>
</table>

2.6 Layout of hydroproject and main structures

Bazizui navigation-power junction project is mainly composed of flood discharge structures, power plant buildings, navigation structures, fish crossing structures, and water retaining structure. The recommended scheme of the layout from the bank to the right is in the order as follow: Mopiling left bank dam (front length 215m),Mopiling (front lock 43.4m),Mopiling dam section of reservoir gate(front length 19m),Mopiling 20 hole sluice gate (front length 342m),Mopiling riverbed plant (front length 75.94m), Mopiling fishway (front length 8m), connecting fill dams between the two junction (front length 408M), Hushanzui lock (front length 43.4m),Hushanzui dam section of reservoir gate(front length 19m), Hushanzui 12-hole sluice gate (front length 206M), Hushanzui riverbed plant (front length 70.51m), Hushanzui fishway (front length 8m), and Hushanzui right bank fill dam(52m). the total crest length is 1510m. A road throughout the whole junction on the crest is planned. The lane 7m wide the upstream side of the sidewalk is 1.0m wide. The general arrangement plan of the dam site is shown in figure 5.

2.6.1 Water retaining structure

(1) earth dam section

The earth dam is connected with the left bank and the right bank of the Xin River in the hub, and the earth dam connects the two hubs of Hushanzui and Diaopiling. The left bank earth dam is located on the left side of the Tiepiling Ridge Lock and is located at a base elevation of 8.0m in the riverbed and a part of the base elevation of 18.0m in the first terrace. The right bank earth dam is located on the right side of the Hushanzui hub workshop, About 10.5m, located in the first terrace part of the basic elevation of about 17.5m; connection between the two hubs located in the middle of the island dam, the basic elevation of about 20.0m. The top left earth dam is 215m long and the right earth dam top is 52m long. The middle earth dam crest length is 408m. The crest elevation is 27.0m, the crest width is 8.0m and the maximum dam height is 20.0m. The earth dam is a homogeneous earth dam. The crest of the dam is a concrete pavement. The slope ratios of the upper and lower reaches of the dam are both 1: 2.5. Prefabricated slope protection is adopted for the upper and lower reaches of 24.5m. Soding slope protection is adopted for 24.5m or more. The basis of vertical cut-off method, the selection of concrete cutoff wall, wall thickness 0.6m.

The left and right banks of the Pivot embankment are formed by embankments of both banks of the embankment as reservoirs. The embankments of the two embankments also serve as the dam abutments. This design intends to reinforce the upper reaches of the left bank and the right bank earth dam joint 200m and the range of 100m downstream in accordance with the once-in-50-year design standards and use it as the main building of this project.

In principle, in keeping with the status quo embankment, embankment heightening thickening of the embankment as much as possible to make use of the original embankment section earthwork, taking full use of wide and stable beach, less occupation of arable land, to meet the principle of smooth waterway reinforcement. This section embankment with external cutting filling, widening the embankment to the inside. Filling soil selection of impermeable soil better performance, layer by layer compaction, old and new soil combination of surface must first loose soil, while removing surface weeds and other objects. The embankment elevation 27.0m, width 8.0m, concrete pavement, before and after the slope ratio of 1: 2.5, the front slope of concrete prefabricated block slope protection, the back slope of the turf slope protection. After increasing the thickness of the thick training section with 2% longitudinal slope connected with the original embankment smooth, thick training thick section of the back side of the water set up slope drainage and ditch drainage ditch.

Vertical embankment seepage control measures are to use 0.22m-thick water jetting concrete cutoff wall, and the closure of earth dam abutment cut-off wall.

(2) Gatehouse dam section

Between the ship lock and the sluice gate, a gatehouse is provided for storing the floodgate, and the foundation is located on a weakly weathered rock base. The dam crest elevation is 27.0m and the leading edge is 19m long. The upstream cantilevered corbels 3m on the crest are the traffic roads on the crest. The dam crest has a total width of 26m and a gatehouse in the downstream dam with a size of 14m × 3.3m × 8.5m (Length × width × height).

2.6.2 Drainage structure

The drainage buildings of Diaopiling on Dongdahe and Hushanzui on Xidahe are respectively composed of 20 holes and 12 holes sluice, sluice Ridge and Hushan mouth sluice structure of the same type. Sluices are arranged in the main channel, and can be combined with the role of drift and red sand, the base is located in the weathered weathered rock, open WES practical weir type, weir crest elevation 11.0m, gate width of 14m. The sluice gate chamber adopts mid-span divisions. The thickness of the sluice gate is 3.0 m, the thickness of the pier is 2.5 m, and the leading edge of the sluice gate is 342 m long. Gate chamber along the flow of 23m long. The lock chamber is provided with an upstream access door slot, a work access slot and a downstream access door. The working access door is a roof-type flat steel gate which is opened and closed by a fixed winch. The upper and lower access doors are exposed flat sliding steel gates, The upstream access door is opened and closed by the two-way door at the top of the dam, and the downstream access door is opened and closed by a mobile electric hoist hanging on the downstream side of the opening and closing machine room. Gate chamber, the downstream are equipped with alveolus, alveolar deep 3.0m. Sluice floor to be partitioned concrete, the surface 0.5m thick with C30 concrete, 2.0m elevation C15 buried concrete. Discharge sluice downstream 15m long concrete shield, thickness 1.0m, followed by a 1: 5 gentle slope and the original ground phase.

According to the layout of the gate structure, the pier flow along the length of 23m, the pier elevation of 27.0m, the pier at the elevation of 21.0m to the upstream of 1: 1 cantilevered 3m, used to support the crest of the upstream side of the road bridge, the downstream for the door track, the track center distance 4.0m, door machine girder arranged downstream of the cable trench. Arranged in the work of the door slot rack, used to support Hoist work platform. Dams at the top of the two gate holes were laid pedestrian traffic bridge, so that the aesthetics of the dam top unity.

2.6.3 Power plant

Bazizui power station is composed of Hushanzui power station on the Dongdahe and Diaopiling power station on the Xidahe, both are river-type bulb tubular turbine plant.

(1) Hushanzui power station on the Dongdahe

Located on the right bank of Dongdahe River, the leading edge has a total length of 70.51m, of which 41.51m long and 29.0m long. The installation room is located on the right side of the mainframe. 2 sets of tubular bulbs, with a total installed capacity of 5.6MW. The lower part of the mainframe has a width of 62.75m along the water flow, the installation elevation of the unit is 8.30m, the elevation of the operating floor of the mainframe is 22.50m and the height of the installation site is 24.70m.

Deputy plant by the host room between the deputy plant and the installation of downstream auxiliary plant components. The main transformer and switchgear are arranged on the downstream side of the installation room.

The factory ground level is 24.50m, the transportation of electromechanical equipment adopts horizontal approach to the factory, and the mechanical and electrical equipment is directly transported into the installation room through the crest of road. Dam top road is located in the upper reaches of the plant, the elevation of 27.0m, and right bank earth dam crest road connection.

(2) Diaopiling power station on the Xidahe

Located on the right bank of the West River, the leading edge of the total length of 75.94m, of which 43.94m long between the host, installation length 32.0m, installation between the host on the right. 2 sets of tubular bulbs, with a total installed capacity of 7.0MW. The lower part of the mainframe has a width of 67.09m along the water flow direction, the installation elevation of the unit is 7.80m, the elevation of the operating floor of the mainframe is 22.50m, and the installation site elevation is 24.70m.

Deputy plant by the host room between the deputy plant and the installation of downstream auxiliary plant components. The main transformer and switchgear are arranged on the downstream side of the installation room.

The factory ground level is 24.50m, the transportation of electromechanical equipment adopts horizontal approach to the factory, and the mechanical and electrical equipment is directly transported into the installation room through the crest of road. Dam top road is located in the upper reaches of the plant, the elevation of 27.0m, and right bank earth dam crest road connection.

2.6.4 Navigation structures

The navigation buildings of Bazizui navigation-power junction is composed of Hushanzui ship lock and Diaopiling ship lock.

Hushanzui ship lock: The ship lock is arranged on the beach ground of the left bank. Considering the navigation of 1000t class ships, the axis is perpendicular to the dam axis perpendicularly to the left side of the spillway. The gate is located at the dam axis and is an integral part of the dam retaining structure. Ship lock into the ship, the way out of the curve into the gate, straight out of the gate gate way. The ship lock is composed of the upper and lower sluice heads and sluice chambers, the upper and lower guide ways, the upstream and downstream far-conditioning stations and anchorages. The effective size of the lock is 180 × 23 × 3.5m (length × width × threshold depth). Navigation tune section length 162m, as y = x / 6 of the line. Mooring length 240m, arranged by the ship pier on the shore. The total length of the straight line section of the lock is 1040m. The width of the approach channel at the upper and lower reaches is 55m, which meets the requirements for the design of ship mooring and entering / exiting. The upstream approach channel passes through a circular arc with a turning radius of 600m, and a corner of 11 ° connects with the main channel. The downstream approach passage passes through a large circular arc with a turning radius of 1500m, and the angle of convergence is 60 ° with the main waterway. The top of the bridge traffic bridge from the upper reaches of the first span, connecting the crest and the right bank traffic.

Diaopiling ship lock: Ship lock is designed to pass 1000t-class ship, the axis perpendicular to the axis of the dam orthogonal, close to the left side of the sluice layout, the first gate located at the dam axis, as part of the hub retaining structures. Ship lock into the ship, the way out of the curve into the gate, straight out of the gate gate way. The ship lock is composed of the upper and lower sluice heads and sluice chambers, the upper and lower guide ways, the upstream and downstream far-conditioning stations and anchorages. The effective size of the lock is 180 × 23 × 3.5m (length × width × threshold depth). Navigation tune section length 162m, as y = x / 6 of the line. Mooring length 240m, arranged by the ship pier on the shore. The total length of the straight line section of the lock is 1040m. The width of the approach channel at the upper and lower reaches is 55m, which meets the requirements for the design of ship mooring and entering / exiting. Upstream and downstream lead-in waterways can be directly connected with the main waterway. The dam top traffic bridge spans the upper reaches of the upper gate and connects the dam crest to the left bank.

2.6.5 Fish crossing structure

The two main fish imports of the project are arranged on the right side of the tailrace of the power plant and connected to the fish gathering system arranged on the tailrace platform of the power station. The upstream water enters into the water replenishment system through a special replenishment channel, and then enters the fish collection system through the replenishment hole on the partition wall between the replenishment system and the fish collection system to induce dripping fish. Set fish system on the 4 different levels of fish into the hole for fish to enter. The fish swimming in the fishing system and the fish swimming in from the fish main entrance go through the meeting pool and enter the fish tracks. The fish tank goes along the right bank of the tailrace drainage wall downstream to turn 90 ° to the tail of the retaining wall. The vertical dam axis passes through the earth dam. The exit of the Hushanzui and the Diaopiling is respectively arranged at the earth dam and the connecting section At 350m and 430m upstream of the junction, the total length is 775m and 850m, respectively. This area is far away from the inlet runner of the power station and has a small flow rate, which makes it easier for fish to go back upstream.

Protection targets are mainly the main stream of migratory fish and rivers and lakes migratory fish, mainly to "four major domestic fishes" and red eyes trout, guan, gan, bian and other economic fishes, the main fish season for March each year - August. Select the recommended cross-sectional fish-shaped fish tank, the fishing season fishing outlet design level is 18.0m, fish import design water level is 14.64m for Diaopiling (unit fully open) ~ 13.85m (open a machine), Hushanzui For the 14.91m (unit fully open) ~ 13.82m (open a machine), the design of the fish tank through the fish hole design flow rate of 0.7m / s ~ 1.2m / s, the total length of the fishway 850m (Hushan mouth), the slope of 1/60, fishway width of 3m, fish pond length of 3.6m, design depth of 2m, at the corner are set up rest pool, fish import elevation 11.8m, export elevation 16.0m, fish import and export Inspection gates are set up, in the earth dam located at floodgate.

2.6.6 Hub management center

It is to be built at the upstream side of the fill dam on the island between the east river and the west river. Then the ground elevation and the crest elevation keep the same height. The buildings are balanced laid out. The center can be accessed to by the road or the right and the left banks.

The management area covers an area of 200 mu, mainly including comprehensive office building, fishery proliferation station, expert building, laboratory building, employee dormitory, canteen and guard, etc. The fishery multiplication station includes broodstock pond, seedling pond, breeding workshop and hatching pond.

2.6.7 Reservoir area protection project

The protection of the reservoir area includes the protection of the dikes on both sides of the main stream and the protection of the tributary Pearl River (Qiling river). At present, dikes are built on both sides of trunk stream. The involved dikes are Daxi and Duanjiahu on the right bank, and Zinian, Zhoujianong, Yangbu,Pingshang, Hegang, Shixiang, Zhuqiao and Tuanhu farmland on the left bank. Sketch map of general layout of the protective engineering treatment measures is showed in figure 13.

2.6.7.1 design standards of flood control

At present, floods in the embankments of the reservoir area's protection areas are all at the flood level of 10 years and the building levels are all at level 5. The project classification and flood criteria for the newly constructed (rebuilt) power station are shown in Table 2.6-1.

Table 2.6-1 Project level and flood control standards of new (reconstruction) power station in reservoir area and protection zone

Number	Name of electric drainage and irrigation station	Level of electric drainage and irrigation station	Level of main buildings	Flood restoration period (year)
1	Zoufangcun station	III	3	30
2	Duanjiahucun station	IV	4	20
3	Loubucun station	III	3	30
4	Jujiacun station	IV	4	20
5	Xiabucun statioin	IV	4	20
6	Chengjiacun station	IV	4	20
7	Nanyuancun station	IV	4	20
8	Xiashancun station	IV	4	20
9	Qianjincun station	IV	4	20

(2) drainage design standards

County drainage standards is once-in-ten-year and the standard height below submerged main flooding not flooding the main building elevation; other protected area drainage standards using 5-year once on the 3rd day of heavy rains to the depths of crop flooding, drainage in the protected area, the design flood standard adopts the standard of drainage drainage period corresponding to the protection area.

2.6.7.2 reinforcement measures of reservoir protection project

The area affected by the submerged dams in the project area is basically between the dam site and the upper reaches of Huangjinbu Bridge. At present, the reservoir areas are all existing embankments, water retaining standards and dikes under the "flood control standards" The same standards, the basic were conducted reinforcement, so this project is no longer dike elevation review. Because most of the existing embankments are built on the sand foundation of the binary structure, the embankment seepage prevention treatment is not carried out, and the ground behind the embankment is lower than the normal water storage level or slightly higher than the normal water storage level, so there is a problem of immersion. Therefore, The embankments affected by the seepage control shall be treated with anti-seepage treatment and relief wells and cutoff ditches shall be set up after the embankment; the riprap and slope protection shall be carried out for the dangerous dangerous sections; the existing partial drainage gates can not be met due to the elevation of the reservoir area after the dam construction Self-draining requirements, combined with inadequate drainage capacity of some of the existing drainage pump stations, will result in a new (heavy) construction of drainage gates, pumping stations and drainage channels in order to solve the problem of waterlogging in the protected areas. The specific engineering measures are shown in Table 2.6- 2. The overall reinforcement measures for the reservoir area protection project are as follows:

1) The total length of the protective embankment in the reservoir area (upstream to Golden Port Bridge) is about 52km long. The seepage prevention treatment is to add a seepage prevention wall and a post-embankment relief tunnel. The embankment of the interception ditch is 32.19km and the length of dangerous danger section is 10km.

2) 1 new sluice and 11 rebuilt sluice, including 5 on the left bank and 7 on the right bank.

3) 9 new power stations will be built in the protected areas in the reservoir area. 5 of which are on the left bank and 4 on the right bank, with a drainage area of 55.9km2.

4) Reconstruction of a dock, converted over the river road 1.

5) lift Taiwan area 652 acres.

Table2.6-2 The impacts of reservoir area drainage and project measures

Number	The name of protected area	Location	Left/right bank	Water-collected （km^2）	Designed drainage flow （m^3/s）	Solutions		
1	Daxixu	Zoufang village	Left	13.128	13.76	Newly-built electric drainage and irrigation station	Build drainage pumping station	
2	Loubuxu	Duanjiahu village	Left	1.130	1.18	Newly-built electric drainage and irrigation station	Build drainage pumping station	
3	Duanjiahuxu	Loubu village	Left	16.727	17.53	Newly-built electric drainage and irrigation station	Build drainage pumping station	
4	Jinbuxu	Qianjin village	Left	2.342	2.45	Newly-built electric drainage and irrigation station	Build drainage pumping station	

Number	The name of protected area	Location	Left/right bank	Water-collected （km²）	Designed drainage flow （m³/s）	Solutions		
5	Jinbuxu	Xiabu village	Left	3.009	3.15	Newly-built electric drainage and irrigation station	Build drainage pumping station	
6	Zinianxu	Chengjia village	Right	5.936	6.22	Newly-built electric drainage and irrigation station	Build drainage pumping station	
7			Right	7.760	8.13	Newly-built electric drainage and irrigation station	Build drainage pumping station	
8		Xiashan village	Right	2.189	2.29	Newly-built electric drainage and irrigation station	Build drainage pumping station	
9	Shixiangxu	Qianjin village	Right	3.682	3.86	Newly-built electric drainage and irrigation station	Build drainage pumping station	
10	Daxixu	Yuye village	Left			Build drainage pumping station		
11	Daxixu	Lijialong	Left			Build drainage pumping station		
12	Pingshangxu	Tifangqidian	Right		12.94	Build drainage pumping station	Partly-elevated	Build self-draining sluice
13	Jinbuxu	Loubu village	Left			Sluice transformation		
14	Jinbuxu	Xiabu village	Left			Sluice transformation		
15	Jinbuxu	Zhangshan village	Left			Sluice transformation		
16	Qingshanxu	Shixi	Left			Sluice transformation		
17	Jiangfangxu		Left			Sluice transformation		
18	Yangbuxu	Hebu village	Right			Sluice transformation	Partly-elevated	
19	Zhuqiaoxu	Laowudaijia	Right			Sluice transformation	Partly-elevated	
20	Zhuqiaoxu	Hujiazhou village	Right			Sluice transformation		
21	Xinhepingxu	Xiqiaolijia	Right			Sluice transformation		

Number	The name of protected area	Location	Left/right bank	Water-collected （km^2）	Designed drainage flow （m^3/s）	Solutions		
22		Pitouzhangjia	Right			Sluice transformation		
23		Jinjiang town	Right			Sluice transformation		

2.6.7.3 reservoir area protective dike projects

(1) Dike immersion seepage control

The submerged scope of this project is temporarily controlled by the normal 18m water level at the dam plus 1m higher. Vertical dike embankment using water law to make concrete cutoff wall, water wall thickness 0.22m, the wall elevation through the gravel layer to the relative impermeable layer 1m. After the embankment arranged relief wells and cut-off ditch, decompression well spacing temporarily consider 25m, cut-off ditch use of culvert type, ditch elevation according to the anti-submergence requirements of the farmland surface elevation 1m below the control, ditch down at 1/3000 ~ 1/1000, into the vicinity of the drainage gate or pumping station before the pool. The statistics of dike to be treated are shown in Table 2.6-3.

Table 2.6-3 Reservoir area embankments in need of renovation

Number	Embankment	Length of renovated section
1	Daxixu	11.93
2	Duanjiahuxu	0.73
3	Jinbuxu	2.70
4	Zinianxu	5.59
5	Zhoujialongxu	0.51
6	Shawoxu	0.10
7	Zijiangxu	0.39
8	Hegangxu	1.02
9	Shixiangxu	0.11
10	Zhuqiaoxu	7.78
11	Tuanhu farm	1.32
12	Total	32.19

(2) Dangerous section levee treatment

In recent years, there has been a significant increase in sand mining activities in the reservoir area resulting in undercutting of the riverbed. In addition, there is no beach protection in the embankment of some embankments. In particular, the concave banks that bend along the riverways have locally generated collapsing and collapsing bank phenomena. After the project is completed, More emphasis on the embankment bank slope instability, risk insurance section. In the reservoir area, the embankment of embankment with risk insurance section should be about 10km in length. According to these partial risk insurance sections, following the embankment feet, Of the slope to 1: 2 after the use of grind Gabion slope protection, thickness 0.6m, 15cm thick gravel cushion and 15cm thick sand cushion; embankment above the prefabricated hexagonal block slope, precast block thickness 10cm, Side length 30cm, under the 10cm thick sand pebble cushion.

2.6.7.4 Reservoir area drainage projects

The beveling area of Bazizui reservoir area is low-lying and the ground elevation is generally 17m ~ 23m. Most of the arable land is close to the normal water level of 18.8m for the Bazizui Reservoir. After the construction of the Bazizui reservoir and the protection project is completed, the waterlogging loss in some of the protected areas will be lost Conditions, prone to waterlogging, we must create a new power station, since the floodgate, drainage guide to discharge the protected area waterlogging.

There are 9 drainage areas in the Bazizui reservoir area. In the submerged or submerged areas, large areas of the surface of the field can not pass the local lift treatment. Effluent pumping stations (including drainage pumping station) Reconstruction 2), the statistics of the parameters of each new and rebuilt power station are shown in Table 2.6-4.

Table 2.6-4 Newly-built electric drainage and irrigation stations as protection project in the reservoir area

Left/right bank	Number	Name of stations	quantity	flow	Power of each generator(kw)	Total power(kw)	Level of major buildings
Left bank	1	Zoufangcun station	6	13.76	180	1080	3
	2	Duanjiahucun station	2	1.18	55	110	4
	3	Loubucun station	3	17.53	590	1770	3
	4	Jujiacun station	2	2.45	110	220	4
	5	Xiabucun station	2	3.15	165	330	4
Right bank	6	Chengjiacun station	3	6.22	180	540	4
	7	Nanyuancun station	4	8.13	190	760	4
	8	Xiashancun station	2	2.29	135	270	4
	9	Qianjincun station	2	3.86	220	440	4
Total						5520	

2.6.7.5 Land-elevating project in the reservoir areas

In order to minimize the impact of reservoir submergence on the local national economy and ecological environment and to reduce submergence and submergence of land, according to the topographic and geological conditions in the reservoir area, it is proposed that a submerged land outside the embankment and three slightly lower depressions Take lift protection measures, lift the field to 19.0m elevation (normal water level ultra-high 1.0m). Land-lifting project is mainly carried out filling padding, reconstruction of field projects. Firstly, the top tillage layer and water retaining layer in land-lifting areas are peeled off 0.5m and stacked on the stockyard. After the dredging materials in the river bed are lifted, they are backfilled from the stockyard for land leveling and restoration of the corresponding irrigation canal. According to the crops in land-lifting areas, the lifted field is divided into wed fields and drylands. Paddy fields need to be provided with 0.3m clay water retaining layer, while in dry land, the clayey soil retaining layer compaction requirement is 0.90. The amount of each lift field is shown in Table 2.6-5.

Table 2.6-5 The project amount of land-lifting

Number	Name of land-lifting area	Designed height（m）	Land-lifting area（acres）	Excavation of surface soil（m^3）	Sand-filling of bedrock（m^3）	Filling of humus（m^3）	Remark
1	Ynagbuxu	19.0	350	132000	316801	105600	dry lands
2	Hebu	19.0	47	17684	77810	14147	dry lands
3	Piangshangxu	19.0	35	12928	46539	10342	dry lands
4	Zhuqiaoxu	19.0	220	83400	250200	66720	dry lands
Total			652	246012	691350	196809	

2.6.7.6 Sluice projects in the reservoir area

The Bazizui Reservoir Area intends to rebuild 11 sluice gates and 1 sluice gate, including 5 on the left bank and 7 on the right bank. New and Reconstructed Culverts Scale: According to the status of drainage ditches and planning requirements, the new culverts should be designed according to drainage design flow; the reconstructed culvert gates should be checked to meet the drainage design requirements and not less than the original culvert gates size. The basic situation of sluice is shown in Table 2.6-6.

Table 2.6-6 Table of sluices data

Number	Number on the map	Name of the protected area	Location	Neighboring section	Left/ Right bank	Size of the hole (width×height ）(m×m）	Quantity of holes	Height of the bottom (inside)	Height of the bottom (outside)
1	45	Pingshangxu	Starting point	B08	Right	2.8×2.6	2	16.3	14
2	16	Jinbuxu	Loubu village	B12	Left	2×2.5	2	17.38	17.22
3	18	Jinbuxu	Xiaubu village	B15	Left	2×2.5	1	16.65	16.43
4	22	Jinbuxu	Zhngshan village	B27	Left	2.5×3	2		16.6
5	24	Qingshanxu	Shixi	B32	Left	1×1.6	1	17.6	
6	29	Jiangfangxu		B33	Left	2.5×4	2	17.6	17.44
7	42	Ynagbuxu	Hebu village	B07	Right	2.6×2.8	1	15.1	
8	50	Zhuqiaoxu	Laowudaijia	B15	Right	3.0×3.0	1	17.4	17.1
9	51	Zhuqiaoxu	Hujiazhou village	B15	Right	2.0×2.0	1	17.6	17.2
10	55	Xinhepingxu	Xiqiqolijia	B27	Right	2.5×3.5	1	15.18	14.4
11	59		Pitouzhangjia	B35	Right	2×2.5	2	16.7	16.14
12	62		Jinjiang town	B40	Right	2.4×2.0	1	16.89	16.64

2.6.8 Waterway Engineering

According to report, the lowest navigable water level is respectively 15.87m and 15.53m at the upstreams of Hushanzui and Mopiling, and lowest navigable water level are respectively 12m and 10.79m at the downstream. Upstream is cascade hub of Jiepai, and the lowest designed navigable water level is 19m. Downstream is cascade hub of Shuanggang, and the lowest designed navigable water level is 12m.

The dredging engineering will be included in the waterway regulation engineering of the waterway from Jiepai to Shuanggang in Xin River.

2.6.8.1 Waterways in reservoir areas

According to the operation mode of reservoirs, the condition of the lowest navigable water level at the upstream of Hushanzui Hub and the upstream of Diaopiling Hub is 15.87m and 15.53m, respectively. The flow is large and the water depth of the waterway can meet the requirements, During the dry season, the normal water level at the Hushanzui Hub and the Diaopiling Hub is 18m, which is 1m lower than the lowest designed navigable water level of the downstream of the boundary junction. It is planned to renovate the boundary junction and adjust the boundary The design of the lowest navigable water level to the downstream of the brand hub shall be 18m. Therefore, it is necessary to carry out remediation measures such as dredging locally in connection with the water level at the boundary of the sector hub.

Channel dredging section size consistent with the reservoir channel, trenching bottom width: 60m, wide: 2m on both sides, both sides of the slope: 1: 3, trenching depth: design depth of 2.2m. The volume of channel dredging in the reservoir area is about 59.70 × 104m3.

2.6.8.2 downstream connecting waterways

The lowest navigable water level of the downstream of Hushanzui Hub is 12m respectively, which is connected with the lowest navigable water level upstream of the proposed dual-cascade hydropower station in the lower reaches of 12m at the Poyang Lake Pivot hub. The Poyang Lake Pivot is still under research and the characteristic water level is not clear. Therefore, 95% guaranteed water level as the downstream design of the lowest navigable level, that is 13.69m, Poyang Lake hub construction or not, can be connected with the downstream water level. Taking into consideration the water level reduction caused by waterway regulation and dredging in the downstream of Diaopiling Hub, 2.5m reduction of permanent structural bottom elevation of the ship lock shall be considered as a reserve. The water level of Hushanzui Hub and the downstream Shuanggang Pilot shall be connected without reservation of water level descent.

The Bazizui hub dredging project will be included in Xinjiangjiepai-Shuanggang channel renovation project, this report does not evaluate that.

2.7 Reservoir inundation, land occupation and resettlement

2.7.1 Land occupation

The total land occupation is 2710.83hm2, of which permanent occupation is 2213.38hm2 and temporary construction area of 497.45hm2. Among them: cultivated land 359.90hm2, woodland 84.85hm2, grassland 77.30hm2, water and water conservancy facilities land 2188.78hm2. Construction land requisition physical index summary table is shown in Table 2.7-1. The map of land expropriation in pivot area is shown in Figure 11.

The project covers the Yugan County of Shangrao city and Yujiang County of Yingtan city. It covers an area of 2563.60hm2, 147.23hm2 respectively. Most of the land cover is in Yugan County, Yujiang County covers most of the water surface of the reservoir drowned river. Summary of the project area zoning sees Table 2.7-2.

The permanent occupation of the project includes the land occupation of the pivotal project, the protection of the reservoir area (dike project, drainage project), the area of the hub management area, the permanent road occupation, the flooded area of the reservoir. The temporary construction covers the protection area of the reservoir area (backfilling and lifting area), the area occupied by the construction work area, the construction road, the soil yard and the spoil yard, etc.

Table 2.7-1 Summary of physical indicators for construction land requisition

Serial No.	project	Unit	Construction land requisition							
			Construction land requisition			Reservoir inundation area	Protection area		Hub area	
			Total	Permanent land occupation	Temporary land occupation		Protection of permanent land expropriation	Protection of temporary land expropriation	hub of permanent land expropriation	Hub of temporary land expropriation
一	Land area	hm^2	2710.83	2213.38	497.45	2027.19	31.63	118.07	154.57	379.37
1	Cultivated land	hm^2	359.90	75.59	284.31	3.47	13.76	97.69	58.35	186.62
2	forestland	hm^2	84.85	15.86	69.00	0.08	0.06	13.56	15.71	55.44
3	grassland	hm^2	77.30	8.57	68.73	0.00	5.96	2.72	2.61	66.01

Serial No.	project	Unit	Construction land requisition							
			Construction land requisition			Reservoir inundation area	Protection area		Hub area	
			Total	Permanent land occupation	Temporary land occupation		Protection of permanent land expropriation	Protection of temporary land expropriation	hub of permanent land expropriation	Hub of temporary land expropriation
4	Water area and water conservancy facilities land	hm^2	2188.78	2113.38	75.40	2023.63	11.85	4.10	77.90	71.30
二	tomb	piece	330	130	200		30	100	100	100
三	Scattered fruitwood	tree	2500	1200	1300	500	200	500	500	800
四	Specific facility									
1	Waterpass road	point	2	2		2				
2	deck	deck	3	3		3				
3	10kVline	km	1.05		1.05			1.05		
4	Communication line	km	2.23	2.23					2.23	
5	Meigang Hydrometric Station	km	1	1		1				
6	gauging Station		1	1		1				
7	culverts and water gates		20	20		20				

Table 2.7-2 Project occupation zoning summary Unit: hm^2

administrative division	Project subarea		Occupation type				total	property	
			Cultivated land	Forest land	grass land	Water area and water conservancy facilities land		permanent	temporary
Yugan County	Junction engineering zone		38.34	27.58	10.28	55.27	131.47	114.88	16.59
	Junction management zone					14.32	14.32	14.32	
	Protection engineering area	Embankment project area	33.25	13.12		28.71	75.08	22.4	52.68
		Drainage engineering area	10.86	0.22		17.10	28.18	7.34	20.84
		Backfilling and PaddingFarmland area	43.47				43.47		43.47
		Subtotal	87.58	13.34		45.81	146.73	29.74	116.99
	Material yard			7.83	5.47		13.30		13.30
	slag yard		141.25	21.74	51.45	35.15	249.59		249.59
	Construction production and living area		46.36	9.37	7.55	1.03	64.31		64.31
	Traffic road area	Permanent road	12.08	3.41	1.00	9.33	25.82	25.82	
		Temporary road	28.81	1.50	1.55	2.64	34.50		34.50
		Subtotal	40.89	4.91	2.55	11.97	60.32	25.82	34.50
	Reservoir inundation area		3.47	0.08		1880.01	1883.56	1883.56	
	Subtotal		357.89	84.85	77.30	2043.56	2563.60	2068.32	495.28
Yujiang County	Junction engineering area								
	Junction management area								
	Protection engineering area	Embankment project area							
		Drainage engineering area	2.01			1.59	3.60	1.43	2.17
		Backfilling and PaddingF							

		armland area							
		Subtotal	2.01			1.59	3.60	1.43	2.17
	Material yard								
	slag yard								
	Construction production and living area								
	Traffic road area	Permanent road							
		Temporary road							
		Subtotal							
	Reservoir inundation area					143.63	143.63	143.63	
	Subtotal		2.01			145.22	147.23	145.06	2.17
Total	Junction engineering zone		38.34	27.58	10.28	55.27	131.47	114.88	16.59
	Junction management zone					14.32	14.32	14.32	
	Protection engineering area	Embankment project area	33.25	13.12		28.71	75.08	22.40	52.68
		Drainage engineering area	12.87	0.22		18.69	31.78	8.77	23.01
		Backfilling and Padding Farmland area	43.47				43.47		43.47
		Subtotal	89.59	13.34		47.40	150.33	31.17	119.16
	Material yard			7.83	5.47		13.30		13.30
	slag yard		141.25	21.74	51.45	35.15	249.59		249.59
	Construction production and living area		46.36	9.37	7.55	1.03	64.31		64.31
	Traffic road area	Permanent road	12.08	3.41	1.00	9.33	25.82	25.82	
		Temporary road	28.81	1.50	1.55	2.64	34.50		34.50
		Subtotal	40.89	4.91	2.55	11.97	60.32	25.82	34.50
	Reservoir inundation area		3.47	0.08		2023.64	2027.19	2027.19	
	Total		359.90	84.85	77.30	2188.78	2710.83	2213.38	497.45

2.7.2 Reservoir inundation and resettlement

2.7.2.1 Submergence range

Submergence end of the project is located at the point of Baita river flooding into Xin river, and the submergence length is 37km. Reservoir inundation ranges from Daxi country, Hongjiazui country, Baimaqiao country, Yangbu country, Shanshan country, Huangjinbu country, Meigang country and part nation-owned land in Zhenjiang country, Yujiang county as well as part village collective cultivated land in Huangjinbu country, Yugan county.

This project doesn’t involve house relocation and therefore no relocation zone is set up. 1132.82 mu cultivated land will be occupied, among which 875.28mu is state owned land, and 206.43mu is occupied by protection engineering. Therefore, the promoter is not responsible for the production resettlement of the occupied land of (875.28+206.43) mu. The promoter is responsible only for the production resettlement of the 86 persons whose land belongs to the remaining 52.11mu in Zhuqiao village, Huangjinbu county. (the 52.11mu is occupied due to reservoir inundation)The scope of the project land is shown in figure 12.

2.7.2.2 Reservoir submergence index

Total area of submerged land in reservoir inundated area is 2027.19hm^2, among which, cultivated land is 3.47hm^2, forestland is 0.08hm^2, Water area and water conservancy facilities land is 2023.64hm^2, the number of scattered fruit trees is 2500, tombs are 300. There are 2 water-pass roads, 3 decks, 1 hydrological station(Meigang hydrological station) , 1 gauging station(Daxi gauging station) and 20 culverts and water gates . 10KV lines are 1.05km, and communication lines are 2.23km.

2.7.2.3 Production resettlement

The project covers 1136.82 mu of cultivated land. Because the cultivated land occupied by the project is state-owned, it does not count the population of production resettlement. Protection engineering does not count the population of production resettlement. The production resettlement needs to be accounted is the cultivated land of 52.11 mu in Zhuqiao village, Huangjinbu country. After calculation, the planned annual production resettlement population is 86 people.

2.7.2.4 Professional engineering reconstruction planning

The professional engineering influenced by the project are 2 waterpass roads, 3 decks, 1.05km 10kV lines, 2.23km communication lines, 1 Meigang hydrological station, 1 Daxi gauging station) and 20 culverts and water gates. Height cushion treatment will be taken at 2 water passing roads and 3 decks, the elevation is planned to be 19m. 10kV lines is planned to be added to 1.26km. communication lines is planned to be added to 2.68km. Rebuild Meigang hydrological station and Daxi gauging station at their places to restore their function.Culverts and water gates are included in the design of reservoir protection engineering. It plans to build 1 gate, and rebuild 11 gates. 9 pumping stations will be built and rebuilt, 5 on the lift bank and 4 on the right bank.

2.7.5 Reservoir bottom cleaning

(1) Cleaning range

It is divided into two parts: general cleaning and special cleaning. There is no special cleaning part in this project. Combined with the characteristics of operation mode of reservoir, the general cleaning range is determined:

① Forest logging, floating debris clean-up should be carried out under the normal water lever in the reservoir area.

② Buildings should be cleaned up below the resident migration line to 3m below the dead water level.

③ Sanitary cleaning and disinfection should be carried out in the reservoir area below the residents' migration line (excluding affected areas).

(2) Requirements and methods of cleaning

①Sanitation and epidemic prevention should be carried out by the professional team under the guidance of the health and Epidemic Prevention Department

②Fill and compaction with soil or building residue in the surface of the cleaning site. After disinfection of feces, inspection reports will be provided by the County Center for Disease Control and Prevention.

③Health inspection and approval should be provided by health and epidemic prevention departments above the county level

④ The woodland, sparse woodland, shrub forest and garden field should be cut down below the flooded line at the normal water level. After cutting, the residual roots should not be higher than 0.3m. The useful materials should be transported out of the storehouse and forbidden to be burned.

⑤ Young trees with higher economic value should be transplanted to the outside of the reservoir.

⑥ The garden and other fruit trees above the normal water level may not be cleaned for the bank stability.

(3) Cleaning quantity of reservoir bottom

In reservoir bottom cleaning, 330 tombs and scattered trees of 2500 will be involved.

2.8 Construction management plan

2.8.1 Overall plan of construction

According to the characteristics of the construction layout and construction diversion, combined with the topography and geological conditions of the dam site area, there is no bridge for cross-strait communication and the use of cofferdams and temporary piers to communicate the two sides of the strait. On the other hand, All arranged in the river heart island. Central island current elevation of 19.0m ~ 21.0m, the status of the ground surface to meet the flood season flood control requirements, but does not meet the requirements of flood season, the need to increase to 10 years once the design flood above the proposed fill height of 24.5m.

Temporary projects are arranged concrete mixing system, concrete precasting plant, steel processing plant, temporary storage of metal structures, mechanical repair plant, construction of substations, water supply system, construction and living area, site laboratory. According to the site geological survey, the project gravel materials are self-mining, need to arrange gravel aggregate screening system. The general construction layout of the project is shown in Figure 8.

The construction temporary project covers a total area of about 621500m2, which meets the construction area requirements. The layout parameters of construction auxiliary enterprises, warehouses and living facilities are shown in Table 2.8-1.

Table 2.8-1 Table of construction-assisted corporations, warehouses and living facilities

Number	Content	Unit	Land area	Building area	Remark
1	Sand and gravel yard	m^2	250000		
2	Concrete warehouse	m^2	10000	8000	
3	Sand-processing system	m^2	35000	2000	
4	Washed materials yard	m^2	20000	2000	
5	Concrete mixing factory	m^2	5000	1000	
6	Concrete prefabrication plant	m^2	2000		
7	Steel processing plant	m^2	10000	2000	
8	Wood processing plant	m^2	6000	1000	
9	mechanical and electrical assembly field	m^2	10000	2000	
10	Construction machinery parking lot	m^2	15000	3000	
11	Construction machinery repair shop	m^2	5000	1000	
12	Water supply station, pool	m^2	3400		
13	Substation	m^2	500	200	
14	Warehouses	m^2	50000	20000	
15	Office and living area	m^2	200000	45000	
	Total		621500	87200	

2.9 Earthwork balance, material yard and slag yard planning

2.9.1 Earthwork balance

Table 2.9-1 Earthwork balance in engineering area Unit: 10*^{4}m^3

Serial number	area	excavation			backfill			in		out		Lend out		discard	
		earthwork	topsoil	subtotal	earthwork	topsoil	subtotal	quantity	resource	quantity	whereabouts	quantity	resource	Waste slag	whereabouts

(1)	Junction engineering area	1447.44	0.54	1447.98	452.38	0.54	452.92			295.07	(2) (3) (6)	57.82	borrow pit,35.12 ; purchase 22.70	757.81	Slag field
(2)	Junction management area		1.35	1.35	5.87	1.35	7.22	3.55	(1)			2.32	purchase		
(3)	Protection engineering area	94.13	34.15	128.28	192.57	34.15	226.72	0.72	(1)			97.72	Borrow pit8.90 、sand-gravel material 88.82		
(4)	Material yard		2.99	2.99		2.99	2.99								
(5)	slag yard		32.50	32.50		32.50	32.50								
(6)	Construction production and living area		5.39	5.39	290.80	5.39	296.19	290.80	(1)						
(7)	Traffic road area	12.32	2.22	14.54	12.32	2.22	14.54								
Total		1553.89	79.14	1633.03	953.94	79.14	1033.08	295.07		295.07		157.86		757.81	Slag field

Notes:

1. Topsoil stripping is accounted into excavation, and will be backfilled.

2. Each row is calculated according to "excavation + transfer + borrow = backfill + transfer + waste"

Table 2.9-2Comprehensive use of topsoil in engineering area

Serial No.	area	Topsoil stripping					Topsoil backfill		
		Stripped topsoil area hm^2	Needed stripping area hm^2	Stripped topsoil thickness m	Stripping amount10*4 m^3	Stacking position	Covering soil area hm^2	Covering soil thicknessm	Covering soil amount 10*4 m^3

1	Junction engineering area		76.20	1.35	0.40	0.54	Low lying area	1.80	0.30	0.54
2	Junction management area		7.16	5.40	0.25	1.35		4.50	0.30	1.35
3	Protection engineering area	Embankment engineering	46.37	16.40	0.45	7.38	Along the embankment area	24.60	0.30	7.38
		Drainage project	22.43	4.80	0.45	2.16	Low lying area	7.20	0.30	2.16
		Padding farmland project	43.47	43.47	0.50	24.61	Occupied area	43.47	0.50	24.61
		subtotal	112.27	64.67		34.15		75.27		34.15
4	Material yard	1#	8.30	6.23	0.30	1.87	Low lying area of mining platform	6.23	0.30	1.87
		2#	5.00	3.75	0.30	1.13		3.75	0.30	1.13
		subtotal	13.30	9.98		2.99		9.98	0.30	2.99
5	Slag yard		231.57	72.23	0.45	32.50	Slag yard tail	108.34	0.30	32.50
6	Construction production and living area		63.28	10.77	0.50	5.39	Low lying area	17.95	0.30	5.39
7	Traffic road area	Permanent road	16.49	1.28	0.40	0.51	Along road	1.70	0.30	0.51
		Temporary road	31.86	3.10	0.55	1.71		5.69	0.30	1.71
		subtotal	48.35	4.38		2.22		7.39	0.30	2.22
Total			552.13	168.78		79.14		225.23		79.14

2.9.2 Material yard planning

Two borrow pits and 1 sand-gravel material yard. Stone material will be purchased, and no stone material yard is planned. The location of Earth and stone is shown in Figure15. Bazizui navigation-power junction earth-stone field distribution is shown in figure 8.

2.9.3 Slag field planning

A slag of 757.81*104m2 will be produced. One slag filed is planned, named Bazizui slag junction slag filed, and it covers an area of 249.59hm2.

The dumping site is located at about 100m downstream of the dam site. Geomorphic units mainly belong to river erosion accumulation type, and the terrain is flat. The elevation is between 18m-20m. Around the site is original embankment, and the crest elevation is 20m-22m. Because of disrepair, embankment has been incomplete, and the current slag is mainly farmland, forest and grassland.

Table 2.9-4 Slag field property

NAME	Type	area （hm^2）	capacity （$10^{*4}m^3$）	amount		Slag elevation	Max heap height	Rank
				loose （$10000m^3$）	solid （$10000m^3$）			
Bzizui slag field	Flatland	249.59	889.82	863.90	757.81	18m ～ 24m	6m	2

2.10 Construction period and estimation of total investment

2.10.1 Construction period

Total construction period is 54 months, preparation period is 4 months. Construction period of main engineering is 48 months(the completion of from first-stage diversion channel excavation to key cofferdam demolition of foundation ditch). The completion period of the project is 2 months.

2.10.2 Total investment estimation

Total investment is $39.99*10^8$. The project capital in cash is 2 billion 400 million yuan. 900 million yuan is applied from the Yangtze River and other inland high grade waterway construction funds and the Ministry of transport inland waterway construction funds. Project unit has 1 billion 500 million yuan, and 1 billion 599 million yuan is loan from banks.

3. Environment status

3.1 Environmental situation of River Basin

The Xinjiang basin is located in the northeast of Jiangxi Province, west coast of Poyang Lake, north of the Huaiyu Mountains and Rao River basin, south bordering Fujian with the Wuyi Mountains and east of adjacent to Zhejiang province with hills. Xinjiang originated in Yujing Mountain of the Huaiyu Mountains on the border of Zhejiang and Jiangxi in Yushan county. It is called Yushan River above of Shangrao city and called Xinjiang after the abouchement of Fengxi River. The trunk stream winds down from east to west, across the northeast of Jiangxi Province, divided into two branches near Daxidu in Yugan county and pours into Poyang Lake at Zhuhu Mountain and in Rui Hong respectively. The area of the Xinjiang River Basin is 16890km2, with an area of 15871km2 in Jiangxi Province, which accounts for about 9.5% of the total area of the province, and the total length of the main stream is 328km.

The shape of the whole basin is an irregular rectangle, the length of the East and the west is about 190km, the width of the north and the south is about 90km, and the shape coefficient of the basin is 0.147. The valley is high in the southeast, low in the northwest, and surrounded by mountains on both sides of the north and south. In the south is the Wuyi Mountains which extends along the border of Fujian and Jiangxi, from northeast to southwest, stretches more than 500 kilometers, the elevation of 1000m to 1500m and the peak of Huanggang altitude 2158m, is the first peak in East china; The attitude of the Huaiyu Mountains in the north is about 1000m and the attitude of the main peak called Yujing Mountain is 1816m. The upper reaches of the coast are mainly in middle and low mountains and the terrain is undulating; The middle reaches is the Xinjiang basin, the terrain decreases from the three edges of the north, east and south to the middle, and inclines westward. There is a lower flat mountain body composed of red rock strata and the red layer geomorphic develops; The lower reaches is the Poyang Lake alluvial plain. The mountain area accounts for 40%, the hills account for 35%, and the plain is only 25%.

The main stream of the Xinjiang is divided into three sections in the upper, middle and lower reaches of Shangrao and Yingtan city. The upper reaches of the river is 115 km long, the fall is 702m, and the average gradient is 6.10 per thousand. The middle reaches of the river is 144 km long, the fall is 38m, the average gradient is 0.263 per thousand and the width of the river is 200~300m. The lower reaches of the river is 69 km long, the fall is 10m, the average gradient is 0.145 per thousand and the width of the river is 400~500m.

The Xinjiang Basin is located in the subtropical monsoon climate zone. The whole basin is distinct, the climate is mild, the light is abundant and the rainfall is abundant. Influenced by the monsoon from the Bay of Bengal in the Indian Ocean and the East China Sea and the South China Sea in the Pacific Ocean, the rainfall gradually increases from April. In May and June, the cold and warm gas flow are brought to the south of the Yangtze River, and the rainfall increases dramatically. In July and August, controlled by subtropical high, except typhoon rain, the rainfall is scarce. In spring and winter, affected by dry cold air mass from Siberia and Mongolia plateau, the rainfall is also scarce. The rainfall distribution on the surface is more in the east than in the west and more in mountain area than on both sides of trunk stream river valley and in the downstream area. There are two rainy areas in the basin, one is Yu Mountain, Qian Mountain and Huaiyu Mountain area in the north of Guixi, generally the average rainfall is more than 1800mm years, the center area is slightly more than 1900mm. The other one is the Wuyi Mountains area in the south of Xinjiang basin and on the border of Jiangxi and Fujian, the distribution of annual rainfall increases obviously with elevation increase. The area starts from Jinxi in the west and passes Shangqing, Tieluping and the southern area of Ganxi, the annual rainfall is greater than 1800mm, central district of 2000mm, appeared in the Huanggang Mountain area which is the main peak of the Wuyi Mountains. During the year, the rainfall is not evenly distributed, which accounts for 54.3% of annual rainfall from April to June and only 15.8% from July to August. Therefore, it often occurs that rain is more prone to waterlogging in the first half of the year and the rain is less prone to drought in the second half of the year.

According to the statistics of main stations, the average annual rainfall of stations is 1820.5mm, the maximum annual rainfall of single station is 2833.9mm (Yiyang station 1954) and the minimum annual rainfall of single station is 923.7mm (Guangfeng station 1971). The annual average temperature of the basin is 17.9 degree, the highest in July and August, the lowest in December or January. The extreme maximum temperature is 43.3 degree (Yushan Station August 10, 1953). The extreme minimum temperature is -15.1 degree (YuJiang Station December 29, 1991). The average relative humidity is 79.2% for many years and the minimum relative humidity is 4%. The average annual evaporation is 1384.7mm. The largest monthly evaporation is 363.6mm (Guixi Station July 1961). The smallest monthly evaporation is 18.2mm (YuJiang Station January 1998). The average frost-free season is 263d. The average sunshine hours for years is 1706h. The average wind speed is 2.1m/s, the maximum wind speed is 22.7 m/s (Yiyang station July 13, 1976) and the corresponding wind direction is WSW.

The water system of the Xinjiang River Basin is developed, the rivers are numerous, the main stream is 328 km long, and more than 20 branches of the tributaries are accepted along the way, and the tributaries mostly flow in the north and the south. There are 16 first grade tributaries with a basin area above 200km2 and there are three more than 1000km2, respectively, Fengxi River, Qianshan River and Baita River. The southern tributaries are mostly originated in the northern foot of Wuyishan, lofty mountains and steep hills are in the upstream and valleys are deep and there are abundant water resources. The northern tributaries are mostly originated in the southern foot of Huai Yushan.

The hydraulic resources of the Xinjiang River Basin are abundant, and the standing stock of water energy in the whole basin is 859.1MW; There are 413 hydropower stations that can be developed by technology. The installed capacity is 766.08MW, which accounts for 11.19% of the total installed capacity of the province, and the annual electricity output is 2 billion 659 million kW. H, accounting for 12.56% of the total annual electricity output of the province. The installed capacity of the main stream is 161.1MW, and the annual electricity output is 602 million 300 thousand kW. H. The installed capacity accounts for 21% of the total basin, and the electricity output accounts for 22.65%. Xinjiang River has many tributaries and there are 16 tributaries with a basin area above 200km2. Many canyons are in the upstream of the tributaries, the river slope is steep, the fall is large, there are many dam sites and the development and use of water is in good condition.

The land resources in the Xinjiang River Basin are mainly mountainous and hilly, 40% in the mountain area, 35% in the hills and 25% in the plain. The earth of basin is mostly sandstone weathered red soil, brown soil, gray brown soil, purple sandy loam and alluvial soil.

According to the national soil erosion zoning, Xinjiang River Basin is located in the red soil hilly area of the south. The main soil erosion is hydraulic erosion, and there are wind erosion and gravity erosion in some areas. According to the results of the third soil erosion remote sensing survey in Jiangxi, the total area of water and soil erosion in the Xinjiang River Basin is 4198.87km2, which accounts for 27% of the total land area. Among them, the area of hydraulic erosion is 4185.73.73km2 (including 482 places of slope collapse, slope collapse area 4.53km2; slope land area 462.33km2), which accounts for 99.7% of the total area of soil erosion. The area of wind erosion is 13.14km2, which accounts for 0.3% of the total area of soil erosion. In the hydraulic erosion of Xinjiang River Basin, the area of slight loss is 1171.82 km2, accounting for 27.9%; The medium loss area is 1353.46 km2, accounting for 32.2%; The area of strong loss is 1353.46 km2, accounting for 31.5%; The area of extremely strong loss is 288.80 km2, accounting for 6.9%; The area of severe loss is 63.61 km2, accounting for 1.5%. In the wind erosion of the Xinjiang River Basin, the medium loss area is 2.32 km2, accounting for 17.7%; The area of strong loss is 8.66 km2, accounting for 65.9%; The area of extremely strong loss is 2.16 km2, accounting for 16.4%.

3.2 Environmental status of engineering area

3.2.1 Topographic features

The Xinjiang River is originated in the Huanyu-Wuyi mountain range, inflows this area from Yingtan in the southeast, pours into Poyang Lake to the northwest and the main tributary is the Baita river.

The Xinjiang River Basin is a subtropical temperate monsoon climate zone. The region has abundant precipitation, mild climate and ample light. The Xinjiang River Basin is high in the southeast and low in the northwest. And from south to north, the terrain gradually reduced (the highest peak is the Jialing Mountain in the east with the attitude of 419.8m), in the northwest is Poyang Lake plain, the terrain is flat and open, the average height is not more than 50m except asmall number of denudation hillock and the mountains are scattered. The geomorphic units are tectonic denudation middle and low mountains, low mountains and hills, denudation hilly hillock terrain and river erosion and accumulation landforms (Xinjiang alluvial plain), and give first place to alluvial plains, followed by gradual erosion hills. The attitude of low mountain and hilly area is about 80m ~ 150m, the vegetation is flourishing and the soil and water conservation is good.

The river valley is flat and open where the Bazizui navigation project is located in, a long and narrow alluvial plain forms on both sides of the bank. The riverbed is tens of meters to hundreds of meters wide, and the floodplain is spread throughout the river. The Xinjiang alluvial plain is consists of the first terrace (second terrace in some places), the first terrace has a discontinuous distribution on the left and right bank, two sides are asymmetric, the left bank is wide and right bank is narrow, the terrace ground elevation is 17m ~ 26m and the width of terrace face is about 300m ~ 2000m. In addition, the project area has the highway trunk roads on both sides of the Xinjiang River (G206 National Road and S208 provincial road on the right bank, the county road and the town road on the left bank), and the land and water traffic is convenient.

The Dongdahe dam is located in alluvial plain in middle and lower reaches of Xinjiang, the main geomorphic units is fluvial erosion and accumulation type, there is low monadnock distribution about 2km in the northeast on the right bank. The East River of the Xinjiang flows in northwest direction through the dam area, the river is straight and the section of the river valley is a wide and symmetrical U shaped valley. The width of the river bed is about 150m to 300m, and the topography of the river bed is relatively gentle on the whole, and the height of the river bed is generally 11.19m to 12.2m. On the left bank is the bottomland between the East River and the West River of Xinjiang, about 500m in width, gradually broadening towards the downstream and the elevation of the bottomland is 19.1 ~ 20.5m. On the right bank is flat and open first terrace. The elevation of the terrace is usually between 18m and 24m. There are rural and farmland distribution on the terrace. Flood levees which have more than 20 years of flood control standard are built on the bank and the elevation of the crest is 24.3m ~ 25.3m.

The Xidahe dam is located in alluvial plain in middle and lower reaches of Xinjiang, the main geomorphic units is fluvial erosion and accumulation type, there is low monadnock distribution about 1km in the northwest on the left bank. The West River of the Xinjiang flows in northwest direction through the dam area, the river is straight and the section of the river valley is a wide and symmetrical U shaped valley. The width of the river bed is about 500m to 700m, and the topography of the river bed is relatively gentle on the whole, and the height of the river bed is generally 7.66m to 8.28m. On the right bank is the bottomland between the East River and the West River of Xinjiang, about 500m in width, gradually broadening towards the downstream and the elevation of the bottomland is 19.1 ~ 20.5m. On the left bank is flat and open first terrace. The elevation of the terrace is usually between 18m and 24m. There are rural and farmland distribution on the terrace. Flood levees which have more than 20 years of flood control standard are built on the left bank and the elevation of the crest is 25.22m.

3.2.2 Geology

(1) Stratigraphic lithology

The exposed strata in the Bazizui Navigation reservoir area are: Lower Proterozoic Banxi Group, Devonian System, Carbonic, dyas, Three Diego - Jurassic System, Jurassic System, Tertiary system, Quaternary System and magmatite rock of Stage of Yanshan (see table 3.2-1).

The Lower Proterozoic Banxi group is widely distributed, continuous distributed in the area of the northeastern, central and southwestern. The metamorphic rocks of the Former Devonian System are exposed in the Dongxiang Huxing Mountain and the Waizeng area. Carbonic is mostly distributed in the Guanmao Mountain as an ribbon and the dyas is often seen in the western and northern lakeside areas. The Mesozoic erathem is widely distributed, Three Diego - Jurassic System sedimentary rocks are scattered in the northern lakeside and there is also small area in the east. The Jurassic System volcanic rocks are more concentrated and are developed in the south of Dongxiang. In the Cenozoic, Tertiary system occupys the southeastern and southwestern depression basins, while the lakeside and the valley plain are covered with extensive Quaternary System.

(2) Geological structure

The project area is located in the Yangtze Huaiditai (first grade structure unit), Jiangnan Tailong (second grade structure unit), Ping (Xiang) Le (Ping) Taixian (third grade structure unit) structure units.

In the history of regional geological development, the region has experienced many strong tectonic movements, such as Lvliang, Caledonian, Hercynian, Indo, Yanshan, Himalayan and so on, it causes the crustal deformation in this area to be intense and complex, forming various forms of folds and faults with different properties and different combination rules, and is accompanied by multi stage magmatic intrusion and volcanic eruption. The north-south squeezing action is main in the early period and it makes the Proterozoic strata in this area have extensive regional metamorphism, forming continuous linear fold structure with the axial direction bordering on east-west , and faults that nearly parallel to the axial of the folds, and accompanied by magmatic activity and migmatization, constitute the basic form of the basement structure in the area. Since the Neopaleozoic, the east-west squeezing action has transformed to the east-west twist action in the region. Except the succession in state direction of tectonic basins formed in Neopaleozoic, strong plastic folds are replaced by widespread brittle faults in deformation characteristics, The folds formed in this period are also characterized by open and soothing anticline uplift and syncline basin and red rift basin in late Yanshan, accompanied by multi stage magmatic intrusion and volcanic eruption, and gives first place to low-angle dip and open folds. Xinjiang basin is a gentle syncline structure. Its axis is composed of Cretaceous strata. Its long axis direction is slightly north east, which is basically consistent with the main structural line direction of the region.

Table 3.2-1 The stratigraphic and lithology of Bazizui Navigation reservoir area

	System	Series		Group	Segment	Code	Thickness（m）	Lithology	Distribution position
Cenozoic	Quaternary					Q	84	loose cover layer of flood alluvial and residual slope	Xinjiang Valley and Poyang Lake Basin
	Lower Tertiary			Xinyu	upper	Exn2	317	the brick red thick layer of feldspar and sandstone, mainly composed of fine grains and secondary grains, local is siltstone and shale, the lower part often contains gravel, with calcareous sandstone on	Hilly area in the southwest of Xingyun Village~ Jiepai station on the left bank and hilly area in the north of Jiepai Village on the right bank

	System	Series		Group	Segment	Code	Thickness（m）	Lithology	Distribution position
								the top, cross bedding develops	
					lower	Exn1	317	fuchsia conglomerate, gravel, gravel sandstone, siltstone and mudstone	The Poyang basin in the northwest of Jinxian - Fenggang
Mesozoic	Jurassic	upper		Yanling		J3y	296	fuchsia granular sandstone, siltstone and shale, conglomerate is usually at the bottom, rhyolite and tuff gravel are easy to be seen, most of them are thick layered	Jinjiang - Huangjinbu area
		middle		Linshan		J2ln(?)	338	yellow and white, gray and white conglomerate, gravelly sandstone and grit, with a small amount of siltstone and medium fine grained	East of the eastern Jinjiang town

	System	Series		Group	Segment	Code	Thickness（m）	Lithology	Distribution position
								sandstone and sandy shale	
		lower		Anyuan		T33—J1an	＞74	consist of ash~black sandstone and shale with coal rake	Yugan Mopiling intermittently exposed. Laowuli in the east of the town of Jinjiang
	Triassic	upper							
		lower		Daye		T1d	＞180	lark sandy shale, blue-gray and dark grey thin compact cryptocrystalline limestone	Western Quantian
Upper Paleozoic	Permian	upper	Changxingian Stage			P2c	336	pale, cinerous and purple red thick crystalline limestone and siliceous limestone, celadon shale and limestone	Mogangshan in the southwest and Xiegan, Fujialong and Mopiling in the northeast
			Longtan Stage		Wangpanli	P2l4	100	hoar fine sandstone, siltstone and shale interbedding, interclip coal seam	Quantian、Mogangshan、Zhonglingqiao、Fenggang in the west and north

	System	Series		Group	Segment	Code	Thickness（m）	Lithology	Distribution position
					Shizishan	P2l3	30	thin siltstone or sandy shale sandwiched between french gray quartz fine sandstone	
					Laoshan	P2l2	258	Grey and black siltstone, sandy shale interbedded black batt, coal rake and aluminous shale. Relatively stable marl (or calcareous sandstone) in shale and fine sandstone intercalated layers.	
					Guanshan	P2l1	200	Grey~black fine sandstone and sandy shale, clay shale and coal beds, hoar grained quartz sandstone	
		lower	Maokouan Stage			P1m	268	Dense hoar limestone, and gray to dark gray	scattered from Zhonglingqiao to Xianyaling

	System	Series		Group	Segment	Code	Thickness（m）	Lithology	Distribution position
								limestone, interbedded with calcite dolomite and calcite limestone.	
	Carbonic	upper		Chuanshan		C3c	＞20	hoar thick layer of grayish limestone with a local flesh red, not very obvious bedding, with small calcite veins.	Luopan of Yugan county, Shuidong、Chixiqiao and Gutang of Jinxian county
		middle		Huanglong		C2h	55	thick layer of light gray and dark gray dolomite interbedded breccia, section output is dust. Little intercalation of limestone	Jiuting in Yujiang、Yuyi in Dongxiang、Zhanyu、Hongling in Linchuan
			Datang Stage		upper	C1d	96	composition of grey, gray white, fuchsia shale, sandy shale, quartz sandstone and siltstone	North of Jinjiang

	System	Series		Group	Segment	Code	Thickness（m）	Lithology	Distribution position
					middle		14～237	Composition of light gray, black quartz sandstone, sandy shale, shale and carbonaceous shale, coal layer 1 ~ 5 clips	
					lower		1.25～255.3	Composition of yellow thick quartz sandstone and quartz conglomerate, rudaceous sandstone	
				Huashanling		C1h	182	The interbeds of fuchsia conglomerate, quartz sandstone, siltstone and sandy shale	
Lower Paleozoic -Upper Proterozoic	Pre Devonian					AnD	1338	Composition of different degree of migmatization schist and gneiss and some streaky migmatite, intercalationof	Wufu——Xianhe Mountain、Shuangtang——Waihui and Huxing Mountain

	System	Series		Group		Segment	Code	Thickness（m）	Lithology	Distribution position
									several layers of amphibolite	
Lower Proterozoic				Banxi	upper		Ptbn3	1279	In the middle and upper is main in yellow gray, grayish phyllite with sandy phyllite, phyllitic siltstone and phyllitic sandstone. chiltern increase at the bottom, often as thick layer of phyllitic sandstone, with thick black carbonaceous phyllite.	Wannian - Jinjiang area. often form The slots of the syncline
					middle		Ptbn2	3400	The lithology is sandwiched between phyllite, sandy phyllite, phyllitic siltstone and phyllitic sandstone, schist produced because of	

	System	Series	Group	Segment	Code	Thickness（m）	Lithology	Distribution position
							tectonic movements	
			lower		Ptbn1	215	Purple gray, fuchsia phyllite, interbedded sandy phyllite and phyllitic siltstone locally with phyllitic sandstone	in the south of Dongxiang - Jinxian line and Zhushan-Taosha area,extending from east to west, often constitute the core of anticline

After all the tectonic movement, regional structural features are NE structure, NEE to EW, NW to NNW three types, and NEE structure mainly, followed by NE structure. Representative faults from south to north are Dengjiabu fault, Linchuan-Jinjiang fault and Yugan-Fengcheng fault zone, these faults control the regional tectonic development pattern, the project area is between Linchuan - Jinjiang fault and Yugan-Fengcheng fault belt.

The earthquake activity in the engineering area is poor and the magnitude is low. The project area is in a III seismic zone of Shangrao-Xiushui seismic sub zone of seismic zone in the middle and lower reaches of the Yangtze River. According to historical records, historical earthquakes in 1613 years from 319 BC to 1932 occurred 47 earthquakes, most earthquakes no more than 6, of which only in the year 455 Yugan earthquake, with a intensity of VI - VII(damage earthquake), is a destructive earthquake. According to the new Chinese seismic motion zoning map (GB18306-2015), the peak ground acceleration of the engineering area is 0.05g, the characteristic period of ground motion response spectrum is 0.35s, corresponding to the basic intensity of earthquake is 6 degrees, and the regional faults are not active, so the regional stability is good.

(3) Hydrogeology

The main types of groundwater are bedrock fissure groundwater and loose medium pore groundwater and structural confined water locally. The hydrochemical type is generally low mineralized and calcium bicarbonated type water.

Bedrock fissure groundwater: mainly occurs in the fracture zone and fracture, which is recharged by atmospheric rainfall and excreted on the surface in the form of spring water in the valley or slope zone.

Loose medium pore groundwater: mainly buried in the lower gravel layer of Xinjiang and its tributaries alluvial platform. The water level is equal to the river level, and it mainly receives atmospheric precipitation and drains to Xinjiang.

The pore aquifers at the East River dam site are distributed in the river bed and in the alluvial deposits on both sides of the river. The water content and water level of the dam vary with the season. The bedrock fissure groundwater is located in the bedrock of the two banks and in the riverbed. According to the stable groundwater level observed in the borehole, the buried depth of the left bank of the dam site is 0.90M, and the corresponding elevation is 18.97m. The buried depth of the right bank of the dam site is 2.60M, and the corresponding elevation is 19.18m. The river bed drilling is the river water level, and the amplitude of water level elevation is large because of the flood period, which is 18.49m to 19.40m.

The pore aquifers at the West River dam site are distributed in the river bed and in the alluvial deposits on both sides of the river. The water content and water level of the dam vary with the season. The bedrock fissure groundwater is located in the bedrock of the two banks and in the riverbed. According to the stable groundwater level observed in the borehole, the buried depth of the left bank of the dam site is 6.20M(affected by dam body height), and the corresponding elevation is 19.02m. The buried depth of the right bank of the dam site is 0.5M, and the corresponding elevation is 19.24m. The river bed drilling is the river water level, and the amplitude of water level elevation is large because of the flood period, which is 18.70m to 19.46m.

The analysis of surface water and groundwater quality near the site of the dam is shown in table 3.2-2 and 3.2-3. According to the results of the simple analysis of water quality, the groundwater of the Hushanzui dam site is weak corrosiveness to the concrete with heavy carbonate, and the environmental water is weak corrosiveness to the steel; The surface water has medium corrosiveness to the concrete with heavy carbonate, and the environmental water is weak corrosiveness to the steel structure. The other indexes are not corrosiveness to concrete, and have no corrosion to concrete iron of the reinforced concrete structure.

Table 3.2-2 Analysis results of groundwater quality near the East River dam site

Analysis projectBZ±		**ρBZ±**	**C(1/ZBZ±)**	**X(1/ZBZ±)**				
		mg/L	**mmol/L**	**mmol/L %**	Project		Analysis results	Unit
cation	K^+	1.70	0.043	3.551	pH		7.00	
	Na^+	9.20	0.400	33.031	Alkalinity	Total alkalinity	0.778	mmol/L
	Ca^{2+}	11.91	0.594	49.050		Phenolphthalein alkalinity	0.000	mmol/L
	Mg^{2+}	2.10	0.173	14.286		Methyl orange alkalinity	0.778	mmol/L
	Fe^{3+}					Total alkalinity	38.94	mg/L
	Fe^{2+}				Hardness	Total hardness	38.38	mg/L
	$NH4^+$	0.02	0.001	0.083		Temporary hardness	38.38	mg/L
	Combination	24.93	1.211	100.001		Permanent hardness	0.00	mg/L
anion	Cl^-	5.26	0.148	12.161		Negative hardness	0.55	mg/L
	SO_4^{2-}	14.00	0.291	23.911	CO_2	Free CO2	14.05	mg/L
	HCO_3^-	47.45	0.778	63.928		Erosive CO2	5.13	mg/L
	CO_3^{2-}	0.00	0.000	0.000		Chemical oxygen consumption		mg/L
	OH^-	0.00	0.000	0.000		Soluble SiO2		mg/L
	NO_2^-					Dissolving solid		mg/L
	NO_3^-					Total salinity	91.64	mg/L
	HPO_4^-							
	F^-							
	Combination	66.71	1.217	100.000				

Table 3.2-3 Analysis results of groundwater quality near the West River dam site

Analysis projectBZ±		**ρBZ±**	**C(1/ZBZ±)**	**X(1/ZBZ±)**				
		mg/L	**mmol/L**	**mmol/L %**	Project		Analysis results	Unit
cation	K^+	1.60	0.041	3.800	pH		7.65	
	Na^+	7.10	0.309	28.638	Alkalinity	Total alkalinity	0.894	mmol/L
	Ca^{2+}	11.53	0.575	53.290		Phenolphthalein alkalinity	0.000	mmol/L
	Mg^{2+}	1.86	0.153	14.180		Methyl orange alkalinity	0.894	mmol/L
	Fe^{3+}					Total alkalinity	44.74	mg/L
	Fe^{2+}				Hardness	Total hardness	36.43	mg/L
	NH_4^+	0.02	0.001	0.093		Temporary hardness	36.43	mg/L
	Combination	22.11	1.079	100.001		Permanent hardness	0.00	mg/L
anion	Cl^-	5.26	0.148	13.653		Negative hardness	8.31	mg/L
	SO_4^{2-}	2.00	0.042	3.875	CO_2	Free CO2	8.03	mg/L
	HCO_3^-	54.57	0.894	82.472		Erosive CO2	4.28	mg/L
	CO_3^{2-}	0.00	0.000	0.000		Chemical oxygen consumption		mg/L
	OH^-	0.00	0.000	0.000		Soluble SiO2		mg/L
	NO_2^-					Dissolving solid		mg/L
	NO_3^-					Total salinity	83.94	mg/L
	HPO_4^-							
	F^-							
	Combination	61.83	1.084	100.000				

The regional geological map of Bazizui Navigation project is shown in Figure 22.

3.2.3 Meteorology

The project belongs to subtropical monsoon climate zone, mild climate, abundant rainfall, adequate light, four distinctive seasons, long frost free period. According to the meteorological statistics in Yugan County, the average annual temperature in Yugan county is 17.8, the extreme maximum temperature is 40, and the extreme minimum temperature is -14.3; The annual average precipitation is 1586.4mm, the average annual water surface evaporation is 1557.7mm, and the annual average relative humidity is 81%; The annual average frost free period is 256 days and the annual average sunshine hours is 1872 hours; The average annual wind speed is 3.5m/s.

3.2.4 Hydrologic and sediment

The water collecting area of the Bazizui Navigation dam site is 15942km2, and the Meigang hydrologic station is located 27.2km upstream of the dam site on the Xinjiang main stream. The Meigang station controls the water collecting area of 15535km2 with only a 2.6% gap with that of Bazizui Navigation. Because the water collecting area of Bazizui dam site is close to that of Meigang station and there are no large tributaries in the interval, the runoff of Bazizui dam site can be calculated by the runoff of Meijiang hydrological station according to the area ratio method.

It is calculated that the average annual flow rate of the recommended dam sites of Bazizui Navigation is 578m3/s. According to the split ratio of the East River and the West River proposed by the research report (see table below), the annual mean runoff of the East River is 225m3/s, and the annual average runoff of the West River is 353m3/s. The annual average runoff of the recommended dam sites is 18 billion 228 million m3. The design value of different frequency flow at recommended dam sites is shown in the table below.

Table 3.2-4 The split ratio of the East River and the West River of Bazizui at different flow grades

Flow Grade（m^3/s）	Split ratio of the East River**Keast**	Split ratio of the West River**Kwest**
QBazizui>1200	0.36	0.64
300<QBazizui≤1200	0.39	0.61
200<QBazizui≤300	0.44	0.56
100<QBazizui≤200	0.53	0.47
60<QBazizui≤100	0.64	0.36
QBazizui≤60	0.72	0.28

Table 3.2-5 The calculation results of annual flow frequency of the Bazizui dam sites

Dam site section	Mean value **（m3/s）**	**Frequency at all levels（%）design values（m^3/s）**							
		5	**10**	**20**	**50**	**75**	**80**	**90**	**95**

Bazizui	578	976	864	742	545	421	395	334	291
Hushanzui	225	381	337	289	213	164	154	130	128
Mopiling	353	595	527	453	332	257	241	204	163

The flood of the Xinjiang Basin is mainly caused by the rainstorm. The cold and warm gas flow is kept in the middle and lower reaches of the Yangtze River in 4~6 months, forming a large range of precipitation. This period is the most precipitation season in this basin, which often produces heavy rainstorm and causes flood disaster. There is also a flood due to the typhoon effect in 7~10 months. The shape of the flood process line in the Xinjiang Basin is usually sharp and thin, a flood process is about 1 ~ 3d in the upper reaches, 3 to 5d in the middle and lower reaches, and a long period of 5 ~ 7d below the megang hydrologic station. If the Poyang Lake flood backwater, flood duration is longer. From November to March the next year, controlled by the cold high pressure in Siberia, the rainfall in the whole basin is low, and the probability of large flood is low. Asthe water collecting area of the recommended Bazizui dam sites is only 2.6% larger than the control area of the Meigang hydrologic station, the design flood at Bazizui dam sites directly quoted Shuanggang hydrological station data, getting that the design peak flow of fifty years is 15600m3/s and the check peak flow of three hundred years is 20300m3/s at Bazizui dam sites. The design peak flow is get in accordance with the high water flow ratio (0.36, 0.64) of the East River and the West river of Xinjiang.

Table 3.2-6 Design flood results for the Bazizui dam sites

Dam site section	Frequency at all levels（%）design value（m3/s）									
	0.1	0.2	0.33	0.5	1	2	3.33	5	10	20
Bazizui	23400	21600	20300	19200	17500	15600	14200	13100	11200	9160
Hushanzui	8420	7780	7310	6910	6300	5620	5110	4720	4030	3300
Mopiling	15000	13800	13000	12300	11200	9980	9090	8380	7170	5860

There is no measured sediment data at the dam sites of the Bazizui Navigation, and the amount of sediment in the upstream can be calculated by the area ratio according to the measured sediment data of Meigang station. The sediment of Hushanzui dam site and Mopiling dam site is determined according to the corresponding flow distribution ratio.

It is calculated that the suspended sediment transport rate of the Bazizui dam site is 65.0kg/s, and the average suspended sediment transport amount is 2 million 49 thousand T for many years. The average annual runoff of Hushanzui and Mopiling of Xinjiang are respectively 225m3/s and 352m3/s, distributing the amount of sediment in the upstream of Bazizui dam sites according to the proportion, the suspended sediment transport rate of Hushanzui dam site and Mopiling dam site are respectively 25.3kg/s and 39.7kg/s and the average suspended sediment transport amount are respectively 798 thousand T and 1 million 251 thousand T.

Referring to the adjacent area project and the "Xinjiang River Basin comprehensive planning report", the sediment thrust ratio of the river section is 0.15, then the bed load average sediment transport of Bazizui dam site is 307 thousand T. The bed load average sediment transport Hushanzui dam site and Mopiling dam site are respectively 120 thousand T and 188 thousand T.

The total amount of sediment is the sum of suspended sediment transport and bed load sediment transport, therefore, the average annual sediment transport of Bazizui dam site is 2 million 356 thousand T. The average annual sediment transport of Hushanzui dam site and Mopiling dam site are respectively 917 thousand T and 1 million 439 thousand T.

3.2.5 Soil

The zonal soil in the project area is red soil. With the lower terrace of the valley as the starting point, the soil rises gradually with the terrain, and the soil in turn are alluvial soil or plain paddy soil(low valley plain)-red earth, red soil, purple soil and paddy soil(low and middle hills)-montane red soil and paddy soil(middle, high hills and low mountains).

The main soil types in the project area are red soil and red paddy soil. Red soil is distributed in a ring in low mountains on the edge of the basin and some middle and high hills (above 200m), its lower limit is connected to a variety of low altitude hilly red soil or some lithologic soil, the upper limit (altitude is more than 700m) is mountain yellow soil, the thickness of the terrace topsoil is about 30 ~ 80cm and he thickness of the hilly soil layer is about 30 ~ 50cm.

3.3Investigation of source of pollution

(1) Industrial pollution source

According to the survey of major industrial pollution sources in the mainstream ofXinjiang River Bazizui Navigation-power junction reservoir area (from Bazizui dam to the spot 37km away from the upstream backwater end), the existing industrial enterprises in Bazizui Navigation-power junction reservoir area are 29, concentrated in the industrial park in Huangjinbu town, Yugan County. According to the statistics, the main pollutants COD of industrial wastewater in the reservoir section in 2015 is 279.2084t/a emissions, the NH_3-N emissions is 31.3256t/a, see table 3.2-32.

The centralized sewage treatment plant in the reservoir area is Yugan Industrial Park Sewage

Treatment Plant. The scale has been built for a period of 10 thousand t/d, and the long-term treatment scale is 20 thousand t/d. The sewage outfall is located in Huangjinbu section of Xinjiang river (right bank of Xinjiang river, dam upstream about 24.6km, as shown in Figure 19), the effluent standard is implemented according to the "urban sewage treatment plant pollutant discharge standard" (GB18918-2002) level of B standard.

Table 3.3-1 Emission of major industrial pollution sources in reservoir area of Bazizui navigation-power junction in 2015

No.	Name of pollution source	COD emission （t/a）	A mmonia nitrogen emission （t/a）	Remarks
1	Jiangxi Hualida Industrial Co. Ltd	29.07	3.57	treat and discharge after entering the sewage treatment plant
2	Shangrao Dingtaifeng Industrial Co. Ltd	16.2	1.531	treat and discharge after entering the sewage treatment plant
3	Jiangxi Huijing Industry and Trade Co., Ltd	5.406	0.21	treat and discharge after entering the sewage treatment plant
4	Yugan Tailai Jewelry Co., Ltd	5.705	0.2793	treat and discharge

No.	Name of pollution source	COD emission（t/a）	A mmonia nitrogen emission（t/a）	Remarks
				after entering the sewage treatment plant
5	Jiangxi Tongxing Jewelry Co., Ltd	1.71	0.21	treat and discharge after entering the sewage treatment plant
6	Jiangxi Sailide crystal Co. Ltd	3.42	0.42	treat and discharge after entering the sewage treatment plant
7	Jiangxi Jinsha Jewellery Co. Ltd	9.2274	0.4004	treat and discharge after entering the sewage treatment plant
8	Jiangxi Qiancai Crystal Co. Ltd	6.7828	0.2814	treat and discharge after entering the sewage

No.	Name of pollution source	COD emission（t/a）	A mmonia nitrogen emission（t/a）	Remarks
				treatment plant
9	Yugan Juqi Jewelry Co., Ltd	1.802	0.351	treat and discharge after entering the sewage treatment plant
10	Yugan Kaitong diamond Co. Ltd	1.7412	0.2925	treat and discharge after entering the sewage treatment plant
11	Jiangxi Hefeng Electronic Machinery Co., Ltd.	15.624	0.84	treat and discharge after entering the sewage treatment plant
12	Yugan Tianli new building materials Co., Ltd.	3	0.21	treat and discharge after entering the sewage treatment plant
13	Jiangxi Yicai fly ash Development Co., Ltd.	12.312	0.42	treat and

No.	Name of pollution source	COD emission（t/a）	A mmonia nitrogen emission（t/a）	Remarks
				discharge after entering the sewage treatment plant
14	Jiangxi Yongyao Machinery Co. Ltd	3.604	0.14	treat and discharge after entering the sewage treatment plant
15	Yugan heroman Alwayseal Technology Ltd	7.2684	0.2754	treat and discharge after entering the sewage treatment plant
16	Jiangxi Hongfei Power Supply Technology Co., Ltd	6.9	0.595	treat and discharge after entering the sewage treatment plant
17	Jiangxi Copper Group (Yugan) Malleable Co., Ltd.	1.7416	0.351	treat and discharge after entering

No.	Name of pollution source	COD emission（t/a）	A mmonia nitrogen emission（t/a）	Remarks
				the sewage treatment plant
18	Jiangxi Yuanpu Amperex Technology Limited	6.9	0.585	treat and discharge after entering the sewage treatment plant
19	Jiangxi Gold Glass Fiber Co., Ltd	8.859	0.2985	treat and discharge after entering the sewage treatment plant
20	Yugan Dongtai new building materials Co. Ltd.	36	5.22	treat and discharge after entering the sewage treatment plant
21	Yugan Jingye metal manufacturing Co., Ltd.	8	1	treat and discharge after entering the sewage treatment plant

No.	Name of pollution source	COD emission（t/a）	A mmonia nitrogen emission（t/a）	Remarks
22	Yugan County Jintai nonferrous Pioneer Metals Corporation	10.5	1.575	treat and discharge after entering the sewage treatment plant
23	Jiangxi Penghui tech food industry Co., Ltd	8	2.5	treat and discharge after entering the sewage treatment plant
24	Yugan Jinshi New Material Technology Ltd	13.218	0.65	treat and discharge after entering the sewage treatment plant
25	Jiangxi Heying Pharmaceutical Co., Ltd	5.85	0.252	treat and discharge after entering the sewage treatment plant
26	Guodian Huangjinbu Power Generation Co., Ltd	0	0	Self disposal to achieve

No.	Name of pollution source	COD emission （t/a）	A mmonia nitrogen emission （t/a）	Remarks
				zero emission
27	Jiangxi Lvtian Biochemical Co. Ltd	33.8	6.54	treat and discharge after entering the sewage treatment plant
28	Yugan Shenghe Copper Co., Ltd	16.506	2.1996	treat and discharge after entering the sewage treatment plant
29	Jiangxi Huangjinbu Wannianqing Cement Co., Ltd	0.061	0.1285	treat and discharge after entering the sewage treatment plant
Total		279.2084	31.3256	treat and discharge after entering the sewage treatment plant

(2)Pollution sources of urban residents

At present, the municipal sewage in Yugan County is through the unified collection of municipal pipe network and enters into the sewage treatment plant of Yugan county to be treated and it reaches the discharge standard after treatment. Yugan, county sewage treatment scale is of 20 thousand t/d postprocessing, long-term design scale is of 40 thousand t/d, and sewage outfall location is near Maoxi village, Huhui river. Sewage by Huhui River flow into Poyang Lake, is not discharged into the reservoir area. Therefore, there are no sources of pollution of urban residents.

(3) Surface pollution source

Two aspects of the pollution sources of surface pollution are agricultural pollution sources and rural residents' living pollution sources. They were statistically analyzed.

——agricultural pollution sources

According to the statistics of pollution sources in 2015, the emissions of agricultural pollutants in Yugan County in 2014 were COD 3321.60t, ammonia nitrogen 282.41t, total nitrogen 1555.16t and total phosphorus 181.13t. According to the statistics of Yugan County in 2014, the area of 6 villages and towns in the reservoir area accounts for about 23.6% of the total arable land in Yugan county. Therefore, the agricultural pollution source of the Bazizui reservoir area is COD 783.90t, ammonia nitrogen 66.65t, total nitrogen 367.02t, and total phosphorus 42.75t.

——rural residents' living pollution sources

Surface pollution source mainly involves 6 towns and counties. They are Huangjinbu, Meigang county, Yangbu town, Xiashan couty, Daxi Town and Bamaqiao coutny.

According to the field survey and visiting the local water conservancy and environmental protection departments, most surface pollution of Huangjinbu Town, Meigang county, Yangbu town, Xiashan couty flows into storage tributary backwater area and purified then flows into the reservoir, Part of Daxi and Bamaqiao surface pollution is discharged into the following section in xinjiang.。 surface source pollution load of the 6 towns and counties are of the total load ratio was:, Huangjinbu 90%, Meigang 80%, Xia shan 60%, Yangbu 70%, Daxi 50% and Baimaqiao 20%.

The main source of rural residents' living pollution is the living sewage of the rural population in the region. The per capita production coefficient of domestic sewage pollutants was COD 55g per person·d, ammonia nitrogen 7.32g per person·d, total nitrogen 9.34 g/ person·d, total phosphorus 0.65 g per person·d. It is calculated that the pollution of rural residents in the reservoir area is COD 3215.56t/a, ammonia nitrogen 427.96 t/a, total nitrogen 546.06 t/a and total phosphorus 38 t/a.

Table 3.3-2 Inventory of rural living pollution sources in BazizuiReservoir Area

No.	Area	Population (person)	emission (t)				Scheduled Receipt (t)			
			COD	ammonia nitrogen	Total nitrogen	total phosphorus	COD	ammonia nitrogen	Total nitrogen	total phosphorus
1	Huangjinbu town	76423	1534.19	204.19	260.53	18.13	1380.77	183.77	234.48	16.32
2	Meigang county	53698	1077.99	143.47	183.06	12.74	862.39	114.78	146.45	10.19
3	Yangbu town	32692	656.29	87.35	111.45	7.76	393.78	52.41	66.87	4.65
4	Xiashan county	5589	112.20	14.93	19.05	1.33	78.54	10.45	13.34	0.93
5	Daxi county	33819	678.92	90.36	115.29	8.02	339.46	45.18	57.65	4.01
6	Baimaqiao county	40006	803.12	106.89	136.38	9.49	160.62	21.38	27.28	1.90
Sum		242227	4862.71	647.18	825.78	57.47	3215.56	427.96	546.06	38.00

To sum up, the total amount of COD, NH3-N, TN and TP f the source pollution entering Bazizui reservoir area is 3999.46t, 494.61t, 913.08t, and 80.75t, respectively.

After calculation, the load summary of Bazizui reservoir area in 2014 is summarized in table 3.3-3.

Table 3.3-3 Load summary of Bazizui reservoir area in 2014

Type	pollutant discharge level (t)			
	COD	NH_3-N	TN	TP
Industrial pollution source	279.21	31.33	—	—
Agricultural pollution sources	783.90	66.65	367.02	42.75

Rural residents' living pollution sources	3215.56	427.96	546.06	38.00
Total	4278.67	525.94	913.08	80.75

(4) Relationship between the location of the water intake and the outlet of the engineering and drinking water source. See 3.3-4。

Table 3.3-4 The location of the source of pollution and the intake of the drinking water source

No.	Protection target	Position
1	Daxi County Shenling tap water plant water intake	Left bank of Xinjiang river, 4.2km upstream
2	Yang Bu County Caiyuan tap water plant water intake.	Right bank of Xinjiang river, 8.9km upstream，
3	Sewage disposal port of Yugan Industrial Park in Huangjinbu	Right bank of Xinjiang river, 24.6km upstream，
4	Water intake of Huangjinbu Power Plant (industrial water)	Right bank of Xinjiang river, 25km upstream，
5	Huangjinbu Industrial Park Waterworks Water intake	Right bank of Xinjiang river, 25km upstream，
6	Meigang Zhongnian Waterworks Water intake	Left bank of Xinjiang river, 24.5km upstream
7	Hongjiazui tap water plant water intake	Right bank of West river, Xinjiang river，downstream 4km from West river dam
8	Baimaqiao Gaoyuan tap water plant water intake	Right bank of East river, Xinjiang river，downstream 7.5km from East river dam
9	Yugan Zhangjiagang tap water plant water intake	Left bank of East river, Xinjiang river，downstream 8.7km from East river dam
10	Yugan Lusigang-Shuanggang tap water plant water intake	Left bank of East river, Xinjiang river，downstream 21.5km from East river dam

3.4 Investigation and evaluation of surface water environment situation

3.4.1 Functional zoning of water environment

According to "Jiangxi Province surface water (environment) function zoning", Xinjiang River Bazizui navigation-power junction project involvs Xinjiang Yujiang reserve, Xinjiang Yugan reserve, drinking water source area of Yugan, East river in XinJiang river, Yugan to Poyang reservations of East river in Xinjiang river, Yugan reservation in West river in Xinjiang and reservation area of the Baita River. The Yujiang reservation area of Xinjiang, is from the junction of Yujiang County in Yingtan to the junction of Yujiang County of Yingtan City, is 23.5km in length, and the water quality target is class III. Xinjiang Yugan reservation area is located at the junction of Yugan in Lujia, Pingshang, Yujiang County, to the fork of the East river and West River on the upper reaches of Xinjiang River in Yugan county. The length is 32.0km, and the water quality target is class III. Yugan drinking water source area of East river of Xinjiang River is from the fork of East river and West river, to the 0.2km of the water intake in the water plant of Yugan county. The length is 10.5km, and the water quality target is class II to III. Yugan to Poyang reservations of East river in Xinjiang river is from the 0.2km of the water intake in the water plant of Yugan county to estuary of East river in Caijiawan in Poyang county entering Le'an river. The length is 34.5km, and the water quality target is class III. Yugan reservation in West river in Xinjiang is located in Yugan County, Zhou fan, from the fork of the East and the West River to the Poyang Lake River in Poyang Town, Sanjiang, and the length is 55.0km, and the target level of water quality is class III. The reservation area of the Baita River in Yujiang is from the Xiangshui bridge of Yujiang county to the Baita River in Yujiang County, with the length of 19.0km and the grade III of the water quality target. The reservation area of the Baita River in Yujiang is from the Xiangshuiqiao of Yujiang county to the Baita River in Yujiang County, with the length of 19.0km and the grade III of the water quality target. The functional zoning of water and water environment in the water and upper and lower reaches of the Xinjiang Bazizui navigation-power project is detailed in table 3.4-1 and figure 19. The drawing chart of the drinking water source protection area of the Zhangjiagang water intake of Yugan County water works is shown in Figure 20.

Table 3.4-1 The water environment function zoning of the area and the upper and lower reaches of the Xinjiang river involved in Bazizui navigation-power project in Jiangx

No.	River lake reservoir	District or City	Town	Water function zone	Water environment function zone	Water quality target	Starting position	termination	Length（km）	Provincial boundary	City boundary	Control section	Water environment functional area coding
1	Xinjiang River	Yingtan	Guixi,Yujiang	Xinjiang river Yujia	Landscape entertainment	III	border of Yujiang and Yingtan	Border of Pishang Lujia and	23.5	No	No	Jinjiang town	360600FJ060407

				ng reserve	water area			Yugan					
2	Xinjiang River	Shangrao	Yugan	Xinjiang river Yugan reserve	Landscape entertainment water area	III	border of Pingshalujia, Yujiang and Yugan,Yujiang	fork of East river and West river in Zhoufanshang, Yugan	32.0	No	No	Daxidu Water level station	361100FJ060418
3	East river of Xinjiang River	Shangrao	Yugan	Yugan drinking water source area in East river of Xinjiang river	drinking water source protection area	II～III	The fork of the East and West River of Xinjiang, Zhoufanshang, Yugan County,	0.2km under the water intake of Yugan Waterworks	10.5	No	No	Yugan Water works	361100FJ060419
4	East river of Xinjiang River	Shangrao	Yugan,Poyang	Yugan-Poyang reserve of East river of Xinji	Landscape entertainment water area	III	0.2km under the water intake of Yugan Waterworks	East river entrance to Le’an river, Caijiawan, Poyang county	34.5	No	No	Zhuhu farm	361100FJ060420

				ang river									
5	West river of Xinjiang River	Shangrao	Yugan	Yugan reserve of East river of Xinjiang river	Landscape entertainment water area	III	The fork of the East and West River of Xinjiang, Zhoufanshang, Yugan County	Poyang County, Ruihong town, Sanjiang entrance to Poyang Lake	55.0	No	No	Ruihong town	361100FJ060421
6	Baita river of Xinjiang river	Yingtan	Yujiang	Baita river Yujiang reserve	Landscape entertainment water area	III	Xiangshuiqiao, Yujiang	the Baita river entrance to Xinjiang river	19.0	No	No	Pashi Water level station	360600FJ360506

3.4.2Surface water quality monitor research

(1)Time and section layout

Jiangxi Province Environmental Protection Science Research Institute Engineering Research Center carried out surface water quality monitor research for the proposed project water section.

Investigation of the present situation of surface water environment set up 12 water quality monitoring sections. For details, see table 3.4-3

Table 3.4-3 Water environment monitoring section layout

Name	Section position	aim
SW1	1km upstream at the end of reservoir	Xinjiang River background value
SW2	1km upstream at the entrance of Baita river to Xinjiang river	Baita River background value
SW3	Baita River confluence section（2.5km downstream at the Baita estuary）	Tributary confluence
SW4	Water intate of waterworks in Huangjinbu industrial park in Yugan county	Affected section

Name	Section position	aim
SW5	sewage outlet of Huangjinbu industrial park in Yugan county（Shangxing village, Huangjinbu town）	Pollution source section
SW6	1km upstream at the entrance of Zhuqiao river to Xinjiang river	Zhuqiao River background value
SW7	km downstream of confluence of Zhuqiao river	Tributary confluence
SW8	Water intate of waterworks in Yangbu	Affected section
SW9	Water intate of waterworks in Daxi	Affected section
SW10	900m upstream of dam site（fork of West river and East river of Xinjiang）	Affected section
SW11	km downstream of East river dam site of Xinjiang river	Affected section
SW12	1km downstream of West river dam site of Xinjiang river	Affected section

(2)Index monitored

A total of 12 indexes of pH,SS,COD,BOD_5,dissolved oxygen,NH_3-N,total nitrogen, total phosphorus, permanganate index, Volatile phenol, petroleum and six valent chromium.

(3) Analysis method

See Table 3.4-4。

Table 3.4-4 Monitoring analysis method for water quality and instrument used

Index monitored	**Monitoring** analysis method	name and model of the instrument used
PH value	Glass electrode method （GB 6920-86）	UB-7 pH meter
SS	gravimetric method （GB 11901－89）	BS124S electronic balance
dissolved oxygen	iodometry （GB 7489-87）	
BOD_5	Dilution inoculation（HJ 505-2009）	
permanganate index	Acid（GB11892-89）	—
Petroleum	Infrared spectrophotometry（HJ 637-2012）	Oil480 infrared spectrometric oil meter
total phosphorus	antimony spectrophotometric method（GB11893-89）	VIS-7220N visible spectrophotometer
ammonia nitrogen	Nessler reagent（HJ535-2009）	VIS-7220N visible spectrophotometer
Volatile phenol	EPA Method# 420.2	FLOWSOLUTONL continuous flow injection analyzer
Fecal coliform	Multiple-tube fermentation（HJ/T 347-2007）	GRP-9270 water insulated constant temperature incubator
Six valent chromium	Diphenylcarbazide spectrophotometry（GB 7467-87）	VIS-7220N visible spectrophotometer
chloride	Ion chromatography（Monitoring and analysis method for water and wastewater(Fourth edtion)）	ICS-90 ion chromatograph

(4)Monitoring frequency

The research period was 2 day straight, one sampling is made each day.

(5)Result

The results are shown in Table 3.4-5。

3.4.3Surface water environment evaluation

(1)Method and standard

The standard index method was used to evaluate the current situation of water environment. The calculation method is as follows:

Pollution degree of factors aggravated with the increase of measured concentration, the formula is as follows: $S_{i,j} = \dfrac{C_{i,j}}{C_{si}}$

In the formula: $S_{i,j}$ ——The standard index of evaluation factor j of section i;

$C_{i,j}$ ——Monitoring concentration of evaluation factor j in section i， mg/L;

C_{si} ——Evaluation criteria of evaluation factor j， mg/L。

The standard index of the pH value is calculated by the next formula：

$$S_{pH,j} = \frac{7.0 - pH_j}{7.0 - pH_{sd}} \qquad pH_j \le 7.0$$

$$S_{pH,j} = \frac{pH_j - 7.0}{pH_{su} - 7.0} \qquad pH_j > 7.0$$

In the formula: $S_{pH,j}$ ——The pH standard index of section j;

pH_j ——PH measured value of section J;

pH_{su} , pH_{sd} ——The upper and lower limits of the pH evaluation criteria, respectively.

For water dissolved oxygen in water, the formula for calculating the standard index is as follows：

$$S_{i,DO}=\frac{\left|DO_f-DO_i\right|}{DO_f-DO_s}$$ DOi≥DOs

$$S_{i,DO}=10-9\frac{DO_i}{DO_s}$$ DOi＜DOs

$$DO_f=468/(31.6+T)$$

In the formula： $S_{i,DO}$——Standard index of dissolved oxygen in section I, mg/L;

DOi ——Concentration of dissolved oxygen in section i，mg/L;

DOf ——Concentration of saturation dissolved oxygen at situ temperature，mg/L；

DOs ——Evaluation standard value of dissolved oxygen，mg/L.

According to different monitoring sections, the evaluation criteria were grade II and III in the surface water environmental quality standard (GB3838-2002), respectively.（The lower reaches of the SW11 section are the water intake in Zhangjiagang, Yugan County, and Grade II is carried out; the rest are all carry out Grade III).

(2)Evaluation results of water environment status

Compared with the standard value of the surface water environmental quality standard (GB3838-2002), the water quality is evaluated by the single factor evaluation method. The evaluation value and results of water quality monitoring section of the reservoir area and the construction area are shown in table 3.4-5, table 3.4-6. From the monitoring results, the situation of surface water environment in the project in general meet water quality standards of class II and class III. The water quality meets the requirements of the water environment function area specified by the local government.

Table 3.4-6 Evaluation results of surface water quality present status（Standard index）

Index	Monitoring time	Evaluation results											
		SW1	SW2	SW3	SW4	SW5	SW6	SW7	SW8	SW9	SW10	SW11	SW12
PH	3.7	0.04	0.01	0.015	0.005	0.035	0.025	0.015	0.03	0.02	0.01	0.015	0.02
	3.8	0.055	0.025	0.02	0.01	0.03	0.02	0.005	0.02	0.01	0.01	0.025	0.015
SS	3.7	0.33	0.30	0.37	0.47	0.50	0.33	0.33	0.47	0.57	0.33	0.52	0.33
	3.8	0.33	0.33	0.30	0.47	0.47	0.37	0.30	0.53	0.53	0.37	0.48	0.37
Chemical oxygen demand	3.7	0.484	0.53	0.57	0.55	0.615	0.575	0.645	0.63	0.615	0.66	0.91	0.665
	3.8	0.482	0.54	0.58	0.545	0.625	0.57	0.655	0.625	0.62	0.665	0.9	0.66
Biochemical oxygen demand	3.7	0.65	0.68	0.70	0.72	0.79	0.71	0.69	0.70	0.68	0.70	0.88	0.68
	3.8	0.64	0.67	0.68	0.73	0.80	0.71	0.67	0.69	0.66	0.68	0.89	0.65
dissolved oxygen	3.7	0.120	0.064	0.256	0.140	0.304	0.216	0.260	0.176	0.168	0.284	0.387	0.192
	3.8	0.160	0.168	0.148	0.172	0.248	0.276	0.156	0.104	0.148	0.260	0.233	0.212
ammonia nitrogen	3.7	0.088	0.056	0.061	0.137	0.171	0.066	0.097	0.174	0.156	0.088	0.148	0.097
	3.8	0.079	0.061	0.064	0.129	0.169	0.068	0.089	0.176	0.149	0.084	0.176	0.094
Total nitrogen	3.7	0.201	0.197	0.218	0.345	0.566	0.194	0.243	0.496	0.486	0.334	0.45	0.219
	3.8	0.206	0.201	0.213	0.351	0.571	0.188	0.239	0.494	0.490	0.329	0.474	0.223
Total phosphorus	3.7	0.22	0.26	0.325	0.39	0.48	0.25	0.31	0.41	0.375	0.3	0.74	0.34
	3.8	0.23	0.27	0.315	0.375	0.495	0.26	0.32	0.42	0.385	0.31	0.72	0.35
permanganate index	3.7	0.307	0.345	0.368	0.363	0.463	0.357	0.402	0.387	0.380	0.390	0.608	0.387
	3.8	0.310	0.343	0.373	0.365	0.462	0.360	0.405	0.390	0.378	0.393	0.613	0.388
Volatile phenol	3.7	—	—	—	—	—	—	—	—	—	—	—	—
	3.8	—	—	—	—	—	—	—	—	—	—	—	—
Petroleum	3.7	0.2	0.4	0.2	0.6	0.4	0.4	0.4	0.4	0.6	0.8	0.6	0.4
	3.8	0.2	0.2	0.4	0.4	0.6	0.2	0.4	0.2	0.4	0.6	0.4	0.4
Six valent chromium	3.7	0.06	0.02	0.04	0.14	0.16	0.04	0.06	0.08	0.06	0.06	0.02	0.02
	3.8	0.04	0.02	0.04	0.12	0.16	0.06	0.04	0.12	0.06	0.04	0.02	0.02

SS refers to *the Standards For The Quality Of Surface Water Resources* (SL63-94).

3.4.4Brief summary of Survey of the current situation of surface water environment

According to the monitoring results of Jiangxi Province Environmental Protection Science Research

Institute of Engineering Technology Research Center in March 2017, 12 indexes of 12 water quality monitoring sections all reach ClassIIor Class III water quality standards. They are pH,SS,COD,BOD5,dissolved oxygen, NH3-N, total nitrogen, total phosphorus, permanganate index, volatile phenol, petroleum, six valent chromium.

3.5 Ambient Air Quality Research and Evaluation

3.5.1 Ambient Air Quality Research

(1)Monitoring sites and factors

2 monitoring site was selected (as shown in Pic 16 and Table3.5-1)

Monitoring factors are TSP, PM10, NO2 and SO2.

Table 3.5-1 Monitoring sites for Air quality research

No. of Monitoring sites	Location of monitoring sites	position
A1	Waixiong village	On the right bank of dam site
A2	Zhoufanshang village	On the left bank of dam site

(2)Monitoring time and frequency

Jiangxi Province Environmental Protection Science Research Institute Engineering Research Center carried out the air quality reseach during Mar 6-12, 2017 for 7 days straight. TSP, PM10 was monitored for at least 12 hours per day; NO2,SO2 was monitored for at least 18 hours per day, air quality was monitored for at least 45 minutes per hour.

(3)Monitoring and analysis method

See table 3.5-2。

Table 3.5-2 Analysis method and Monitoring instrument

Detection objects	Monitoring **method**	**detection limit** (**mg/m^3**)
Total suspended particulate matter	The gravimetric method for the determination of total suspended particulate matter in ambient air (GB/T 15432-1995)	0.001
Nitrogen dioxide	Determination of nitrogen oxides in ambient air Acid naphthalene diammonium spectrophotometric method (HJ 479-2009)	0.015
Inhalable particulate matter	The gravimetric method for the determination of ambient air PM10 and PM2.5 (HJ 618-2011)	0.01
sulfur dioxide	The determination of sulfur dioxide in ambient air Aldehyde absorption - pararosaniline spectrophotometric method (HJ 482-2009)	0.007

(4) Results of environment air quality

Monitor Site	Date	NO_2		SO_2		PM_{10} AVG/day	TSP AVG/day
		AVG/hour	AVG/day	AVG/hour	AVG/day		
Waixiong Village (Right bank of the dam)	2017.3.6	0.019 ~ 0.042	0.031	0.030 ~ 0.060	0.046	0.046	0.113
	2017.3.7	0.019 ~ 0.044	0.031	0.032 ~ 0.058	0.047	0.041	0.105
	2017.3.8	0.019 ~ 0.044	0.03	0.031 ~ 0.057	0.046	0.044	0.116
	2017.3.9	0.021 ~ 0.042	0.032	0.030 ~ 0.055	0.045	0.042	0.111
	2017.3.10	0.019 ~ 0.043	0.03	0.031 ~ 0.058	0.046	0.045	0.116
	2017.3.11	0.019 ~ 0.041	0.032	0.030 ~ 0.059	0.044	0.039	0.104
	2017.3.12	0.021 ~ 0.045	0.031	0.029 ~ 0.060	0.046	0.047	0.107
Zhoufanshang (Left bank of the dam)	2017.3.6	0.018 ~ 0.041	0.031	0.026 ~ 0.055	0.046	0.042	0.117
	2017.3.7	0.021 ~ 0.043	0.032	0.027 ~ 0.055	0.044	0.037	0.102
	2017.3.8	0.019 ~ 0.041	0.031	0.023 ~ 0.059	0.047	0.045	0.118
	2017.3.9	0.018 ~ 0.043	0.031	0.026 ~ 0.057	0.045	0.040	0.116
	2017.3.10	0.019 ~ 0.043	0.031	0.027 ~ 0.059	0.046	0.046	0.114
	2017.3.11	0.018 ~ 0.043	0.031	0.029 ~ 0.060	0.046	0.038	0.108
	2017.3.12	0.019 ~ 0.042	0.032	0.030 ~ 0.057	0.048	0.044	0.113

3.5.2 Evaluation of Environmental Air Quality status

(1)Evaluation standard

Environmental air quality complies with secondary standard of the Environmental Air Quality Standard (GB3095-2012). The specific standard value is shown in table1.5-2。

(2)Evaluation method

Maximum concentration rate and exceeding standard rate are adopted to evaluate environmental air quality in engineering area.

The formula of Maximum ground concentration ratio is as follows:

$$P_i = \frac{C_{i\max}}{C_{oi}} \times 100\%$$

In the formula：Pi ——Maximum ground concentration ratio of the pollution factor i，100%；

Cimax ——The maximum value of the current monitoring value of the pollution factor i，mg/m3；

Coi ——Atmospheric environmental quality standard value of pollution factor i，mg/m3。

The calculation formula of over-limit ratioηis as follows：

$$\eta = \frac{\text{Excessive number}}{\text{Total detection number}} \times 100\%$$

(3) Evaluation results

See table 3.5-4。

Table 3.5-3 Air Quality Research Results Unit：mg/m^3

Monitor Site	Date	NO_2		SO_2		PM_{10} AVG/day	TSP AVG/day
		AVG/hour	AVG/day	AVG/hour	AVG/day		
Waixiong Village (Right bank of the dam)	2017.3.6	0.019 ~ 0.042	0.031	0.030 ~ 0.060	0.046	0.046	0.113
	2017.3.7	0.019 ~ 0.044	0.031	0.032 ~ 0.058	0.047	0.041	0.105
	2017.3.8	0.019 ~ 0.044	0.03	0.031 ~ 0.057	0.046	0.044	0.116
	2017.3.9	0.021 ~ 0.042	0.032	0.030 ~ 0.055	0.045	0.042	0.111
	2017.3.10	0.019 ~ 0.043	0.03	0.031 ~ 0.058	0.046	0.045	0.116
	2017.3.11	0.019 ~ 0.041	0.032	0.030 ~ 0.059	0.044	0.039	0.104
	2017.3.12	0.021 ~ 0.045	0.031	0.029 ~ 0.060	0.046	0.047	0.107
Zhoufanshang (Left bank of the dam)	2017.3.6	0.018 ~ 0.041	0.031	0.026 ~ 0.055	0.046	0.042	0.117
	2017.3.7	0.021 ~ 0.043	0.032	0.027 ~ 0.055	0.044	0.037	0.102
	2017.3.8	0.019 ~ 0.041	0.031	0.023 ~ 0.059	0.047	0.045	0.118
	2017.3.9	0.018 ~ 0.043	0.031	0.026 ~ 0.057	0.045	0.040	0.116
	2017.3.10	0.019 ~ 0.043	0.031	0.027 ~ 0.059	0.046	0.046	0.114

	2017.3.11	0.018 ~ 0.043	0.031	0.029 ~ 0.060	0.046	0.038	0.108
	2017.3.12	0.019 ~ 0.042	0.032	0.030 ~ 0.057	0.048	0.044	0.113

Table 3.5-4 Ambient air status assessment results

Monitoring point	Evaluation items		Measurement range (mg/m3)	The maximum concentration of the standard rate (%)	Exceeding rate (%)
1#Zhangjiacun（Right bank of dam）	NO2	Average hourly range	0.019 ~ 0.045	22.5	0
		Daily average range	0.03 ~ 0.032	40	0
	SO2	Average hourly range	0.029 ~ 0.060	12	0
		Daily average range	0.044 ~ 0.046	30.7	0
	PM10	Daily average range	0.039 ~ 0.047	31.3	0
	TSP	Daily average range	0.104 ~ 0.116	38.7	0
2#Liujiacun（Left bank of dam）	NO2	Average hourly range	0.018 ~ 0.043	21.5	0
		Daily average range	0.031 ~ 0.032	40	0
	SO2	Average hourly range	0.023 ~ 0.060	12	0
		Daily average range	0.044 ~ 0.048	12	0
	PM10	Daily average range	0.037 ~ 0.046	10.7	0
	TSP	Daily average range	0.102 ~ 0.118	39.3	0

As can be seen from the evaluation results, the monitoring results of all the evaluation factors at each measuring point have not exceeded the standards, and both meet the requirements of the second-level standard of Ambient Air Quality Standard (GB3095-2012).

3.6 Acoustic environment survey and evaluation

3.6.1 Acoustic environment survey

(1) Measuring point layout

In order to evaluate the impact of the construction of Baizuizi Hydropower Project on the acoustic environment of the evaluation area, on March 11, 2017， the Engineering Technology Research Center of Jiangxi Provincial Academy of Environmental Protection Science and Technology set up five monitoring sites including the Waixiong Village, Zhoufanshang, S208 roadside in the evaluation area monitoring sites, Sanbei Mountain Lujia, Loubu village for the monitoring of acoustic environment, the monitoring points shown in Table 3.6-1 and Figure 16.

Table 3.6-1 noise monitoring point layout list

Name	Monitoring point location

N1	Waixiong Village（Right bank of dam）
N2	Zhoufanshang（Left bank of dam）
N3	S208 roadside in the evaluation area monitoring sites（South of Mazuibei bridge）
N4	Sanbei Mountain Lujia（East River temporary pavement construction）
N5	Loubu village（Power station）

3.6.2 Acoustic Environment Status Evaluation

In contrast with the "Acoustic Environment Quality Standard" (GB3096-2008), the ambient sound levels at daytime and at night of monitoring points such as Waixiong village, Zhoufanshang, Sanbei Mountain Lujia, Loubu Village outside the evaluation area all met Grade 1 standard; S208 is Grade II highway, daytime and nighttime equivalent sound level of noise all meet category 4a of "Acoustic Environmental Quality Standard" (GB3096-2008). Therefore, the quality of the sound environment in the evaluation area is better.

(2) measuring time, frequency and methods

Engineering Technology Research Center of Jiangxi Province Environmental Protection Science Research Institute of in March 2017 monitored continuously a day,and each time of every day and night.

The monitoring methods are carried out in accordance with the relevant provisions of the sound environmental quality standard (GB3096-2008)

(3) measuring results

The monitoring results of the acoustic environment in the evaluation area are shown in table 3.6-2.

Table 3.6-2 Noise Monitor Results **Unit：dB（A）**

Monitoring Site	Time	Period	
		Day（dB）	Night（dB）
N1	3.11	53.6	42.5
N2	3.11	51.9	41.3
N3	3.11	52.4	42.0
N4	3.11	54.0	43.1
N5	3.11	53.3	42.7

3.7 Investigation and Evaluation on Current Status of Terrestrial Ecological Environment

The project is located in the alluvial plain of Xinjiang River and the valley is open, narrow alluvial plain formed on both sides of the river, the bed width is of tens to hundreds of meters, while there is floodplain around. The topography is mainly composed of alluvial plain topography, followed by low erosion denuded hills. The elevation in the hilly area is about 80m ~ 150m above sea level. There are many villages in evaluation areas which are densely populated with long history of human activities. The natural vegetation in the assessment area is dominated by man-made Pinus massoniana, Masson pine shrub, shrub grassland and marshy grassland. The artificial vegetation mainly includes farmland, dry land and artificial wetland pine forest.

In order to obtain the ecological status of terrestrial ecosystems affected by the Bazizui navigation and hydropower project, the evaluation unit conducted a comprehensive survey on the terrestrial ecology of the affected areas. The investigation contents include terrestrial plants and vegetation, terrestrial animals, rare animals and plants and old trees and famous trees. The survey method is a combination of path investigation and typical cross-sectional quadrats survey. The investigation scope is that the normal water level subsidence line extends 3km to the periphery and 5km to the dam site in Baisezui Navigation-Pivotal Reservoir.

Terrestrial animals and plants mainly use the method of route investigation, and record the species of plants and animals along the way, and observe the habitats. The rare and endangered plants and ancient and famous protected plants of the country are measured by GPS, and their numbers and growth conditions are estimated. The typical sample plots were selected to investigate the vegetation types, community appearance, community structure and composition, as well as the height, abundance and phenophase of each species. The area of quadrats was set as follows: the quadrats of the tree community were 100-400 m^2 ($10 \times 10m^2$～$20 \times 20m^2$), the shrubs were 25 m^2 ($5 \times 5m^2$), and the herbaceous quadrats were 1～4 m^2 ($1 \times 1\ m^2 \sim 2 \times 2\ m^2$).

3.7.1 Ecosystem type

According to the analysis of land use along the line, combined with the investigation of plant and animal distribution and biomass, the ecological system of terrestrial ecological environment in the assessment area can be divided into natural forest ecosystem, grassland ecosystem, semi-natural farmland ecology systems, wetland ecosystems and man-made urban / rural ecosystems. Because the broad-leaved forests in the evaluation area are mainly bamboo forest and musklin, which are different from the coniferous forest with masson pine as the dominant species, the forest ecosystem is divided into coniferous forest-based ecosystem and broad forest-based forest ecosystem. According to the interpretation data of remote sensing, the area of each ecosystem in the assessment area is shown in Table 3.7-1. The scope of the terrestrial ecological evaluation area and the satellite remote sensing image of the Bazizui navigation and hydropower project are shown in FIG. 4, and the current situation of the land utilization is shown in FIG. 21.

Table 3.7-1 Evaluation area of each ecosystem

Ecosystem type	Coniferous forest-based woodland ecosystem	Broad-leaved forest-based woodland ecosystem	Grassland ecosystem	Farmland ecosystem	Wetland ecosystems	Town / village ecosystems
Area（hm^2）	4766.37	2243	971.59	15572.92	3104.12	944.91
Percentage (%)	17.26	8.12	3.52	56.38	11.24	3.42

1. coniferous forest-based ecosystems

According to the interpretation of remote sensing images combined with the site survey， the ecosystems dominated by coniferous forests in the assessment area have a certain distribution area, accounting for 17.26% of the total ecosystem area in the assessment area. Ecosystem is mainly composed of pinus massoniana and mixed coniferous and broad-leaved forests. They are mainly distributed in the hills on the left bank of the Xinyang River near the dam site and the low hills on the right bank of the Xinyang River in Yangbu Town. The rest are mostly distributed in blocks with a relatively small area. The vegetational form is dominated by coniferous forest. There are also a few coniferous and broad-leaved mixed forests. However, the main species is Pinaceae, which has a higher canopy density and rich community species diversity, and the human disturbance in these areas is relatively small, whch is a good refuge for all kinds of animals. It is also a major activity site for evaluating wildlife in the area, such as arboreal amphibians, shrub-like reptiles, birds such as land birds and small mammals.

2、Forest ecosystems dominated by broad-leaved forests

The broad-leaved forest-dominated forest ecosystem in the assessment area has a larger area. In the vicinity of the assessment area and the village of Jiangxinzhoushuang is more widely distributed. The vegetation in the ecosystem is mainly composed of Phyllostachys pubescens forest, camphor tree forest and musklin. The broad-leaved forest-based forest ecosystems are mainly distributed in Huangbu Town, Jiang Jia, Tang Jiazhou and other areas at the tail of the Weishui water. The species of undergrowth is rich, with high coverage and good ecological environment quality. It is one of the main activities of wildlife in the assessment area. Among them, the active animals are reptiles with songbirds, climbing birds and parachutes A small amount of mainly mammals.

3. grassland ecosystem

The bushwood and shrubs in the assessment area are smaller in area, distributed in the forest margin, farmland and village, and are integrated in the corresponding ecosystems. The bushwood and shrubs with large area are mainly distributed in riparian zone and barren hills, vitex shrubs, sparrow shrubs, raspberry thickets, mare grass, grass and other grass are representive vegetation. It is a major activity site for all kinds of shrubs and climbers, and is also the main foraging place for some songbirds.

4、Wetland ecosystems

The main types of wetlands along the banks of the river are the tidal flats and their riverbank marshes and the river basin water bodies in the areas along the banks of the Xinjiang River. The vegetation type is dominated by the grass covered by aquatic vascular plants and habitats for various amphibians and reptiles, important habitat for wading birds.

5、Farmland ecosystems and urban / rural ecosystems

In the farmland ecosystems, there are a wide range of ecosystem types in the evaluation area. This type of structure is relatively simple and its vegetation type is simple with serious human interference. There are many animals that live with humans, such as sparrows, magpies, and various rodents.

3.7.2Vagetation

（1）Evaluation area vegetation system

The evaluation area of this project is located in the alluvial plain of the Xinjiang River in the middle and lower reaches of the Xinjiang River. According to the vegetation zonation in Jiangxi Province, the vegetation types in the assessment area belong to the subregion IV→IVA in the subtropical evergreen broad-leaved forest → IVAii (moist) evergreen broad-leaved forest in the subtropical evergreen broad-leaved forest zone → northern subtropical evergreen broad-leaved forest in the IVAiia subregion → IVAiia-4 Hunan and Jiangxi hilly hills of evergreen chinquapin，evergreen chinquapin and Schima superba in cultivated vegetation area → IVAiib-4 (10) Fuhe river, The middle reaches of the Xinjiang River of evergreen chinquapin，evergreen chinquapin and Schima superba. Due to the historical disturbance of the vegetation in the watershed with the long history of traffic and agricultural production activities, the evergreen broad-leaved forest in the assessed area is now lost, leaving only a small amount of camphor trees as feng-shui woods. Vegetation in the appraisal area is now dominated by farmland, grass shrubs, coniferous forests and economic forests, leaving a small amount of zonal broad-leaved forests as local feng shui forests.

According to the division of vegetation types in China and Jiangxi by Wu Zhengyi et al., the natural vegetation system in the evaluation area of the project has 3 vegetation type groups, 7 vegetation types and 19 groups (Table 3.7-2).

Table3.7-2Evaluation area vegetation classification system

<table>
<tr><th>Vegetation type group</th><th>Vegetation type</th><th>Group system</th><th>Group Latin name</th></tr>
<tr><td rowspan="2">Coniferous forest</td><td>I.Warm evergreen coniferous forest</td><td>Pinus massoniana</td><td>Form. Pinus massoniana</td></tr>
<tr><td>II.Mixed coniferous and broad-leaved forest</td><td>Cinnamomum camphora + Pinus massoniana</td><td>Form. Cinnamomum camphora + Pinus massoniana</td></tr>
<tr><td rowspan="7">Broadleaf forest</td><td rowspan="2">III.Evergreen broad-leaved forest</td><td>Cinnamomum camphora</td><td>Form. Cinnamomum camphora</td></tr>
<tr><td>Schima superba</td><td>Form. Schima superba</td></tr>
<tr><td rowspan="3">IV.Deciduous broad-leaved forest</td><td>Pterocarya stenoptera</td><td>Form. Pterocarya stenoptera</td></tr>
<tr><td>Quercus chenii</td><td>Form. Quercus chenii</td></tr>
<tr><td>Melia azedarach</td><td>Form. Melia azedarach</td></tr>
<tr><td rowspan="2">V.bamboo forest</td><td>Phyllostachys edulis</td><td>Form. Phyllostachys edulis</td></tr>
<tr><td>Phyllostachys praecox</td><td>Form. Phyllostachys praecox</td></tr>
<tr><td rowspan="10">Bushwood and Shrubs</td><td rowspan="3">VI.bushwood</td><td>Vitex negundo var. Cannabifolia</td><td>Form. Vitex negundo var. Cannabifolia</td></tr>
<tr><td>Sageretia thea</td><td>Form. Sageretia thea</td></tr>
<tr><td>Form. Rubus alceaefolius</td><td>Form. Rubus alceaefolius</td></tr>
<tr><td rowspan="7">VII.Shrubs</td><td>Rumex japonicus</td><td>Form. Rumex japonicus</td></tr>
<tr><td>Imperata cylindrical var. major</td><td>Form. Imperata cylindrical var. major</td></tr>
<tr><td>Cynodon dactylon</td><td>Form. Cynodon dactylon</td></tr>
<tr><td>Eremochloa ophiuroides</td><td>Form. Eremochloa ophiuroides</td></tr>
<tr><td>Xanthium sibiricum</td><td>Form. Xanthium sibiricum</td></tr>
<tr><td>Carex sp.</td><td>Form. Carex sp.</td></tr>
<tr><td>Polygonum hydropiper</td><td>Form.Polygonum hydropiper</td></tr>
<tr><td rowspan="3">Plantation</td><td>Economic timber</td><td>Pinus elliottii</td><td>Form. Pinus elliottii</td></tr>
<tr><td rowspan="2">Economic fruit trees</td><td>Citrus unshiu</td><td>Form. Citrus unshiu</td></tr>
<tr><td>Prunus salicina</td><td>Form. Prunus salicina</td></tr>
<tr><td>Agricultural vegetation</td><td>Artificial community</td><td colspan="2">Rice, rape, vegetables and more</td></tr>
</table>

（2）Characteristics of Main Vegetation Types and Their Distribution

I. Warm zone evergreen coniferous forest

1. Pinus massoniana

Pinus massoniana forest is one of the most widely distributed coniferous forests in the evaluation area. It is mainly distributed in the hills on the left bank of the Xinjiang River near the dam site and the low hills on the right bank of the Xinjiang River in Yangbu Town. The canopy of the community is neat and the appearance is emerald green. There are a few deciduous broad-leaved tree species and shrubs in the general forest. The fauna structure is simple and the species composition is relatively simple.

Canopy density of tree layer is about 0.7 with average height of 7m. The dominant species are Pinus massoniana, with a height of 5 ~ 9m, a diameter of 3 ~ 6cm and a coverage of 65%. The main companion species were Liquidambar formosana and Quercus fabri. The shrub layer coverage was 35% 1.1m high, and the dominant species is Lindera glauca, about 1 ~ 2m high with 40% coverage. The main associated species are Vitex negundo var. Cannabifolia, Rosa multiflora, Rubus coreanus, Glochidion puberum, Eurya loquaiana, Rubus corchorifolius, Zanthoxylum armatum, Lespedeza formosa and so on. The herb layer coverage is 35% while the average height is 1m. The dominant species is Miscanthus floridulus, with a height of about 0.5-1.5 m and a cover of 25%. The major companion species were Dendranthema indicum, Artemisia argyi, Geranium wilfordii, Imperata cylindrica, Setaria viridis, Senecio scandens, and the like.

2. Cinnamomum camphora + Pinus massoniana

II. Broadleaf forest

The main vegetation types of broad-leaved forest in evaluation area are the evergreen broad-leaved forest, deciduous broad-leaved forest and bamboo forest. Evergreen broad-leaved forest camphor trees, musklin, deciduous broad-leaved forests are mainly Populus, Quercus liaotungensis, while bamboo forest is mainly forest of Phyllostachys edulis.

3. Cinnamomum camphora

Cinnamomum camphora is the representive of the evergreen broad-leaved forest remnat in the assessment area with a smaller distribution area and it is mainly distributed around the villages in assessment area, Jiangxinzhou beach, such as Yujia of Xiaozhou, Yaojia of Meigangxiang, Jiangfang village and Tangjia of Huangjinbu.

Cinnamomum camphora trees density of 0.6-0.8 with the average height of 6m-10m, and the dominant species is camphor tree (cinnamomum camphora), associated species is calycium (celtis sinensis); shrub layer coverage is 45% while average height is 2.5m, the dominant species are hydrangea strigosa, rhododendron simsii and glochidion puberum. Herbaceous layer covers 25% and the layer average height is 1m. The dominant species are arundinella anomala with height of 0.8m - 1.2m, cover 20%, the main associated species are lophatherum gracile, polygonum capitatum, erigeron annuus, dendranthema indicum.

4. Schima superba

Schima superba in the evaluation area near the foothills are visible natural regeneration of the formation of a small area of massive distribution. Most of the soil in the forest is yellowish-brown soil in the mountainous area. The fauna of the forest is bright green and the canopy is relatively neat. The species coverage in the fauna is high but its composition is simple.

The canopy density of arbor layer was 0.7 or more. The dominant species was Schima superba, with a height of 5 ~ 7.5 m, a diameter of 6 ~ 10 cm and a canopy density of 0.7. The major companion species were Liquidambar formosana, Quercus acutissima) and so on. The coverage of shrub layer is 20% and the average height is 1m. The dominant species is Rosa multiflora, about 1 ~ 1.5m in height and 15% in coverage. The main companion species are Serissa foetida, Rubus coreanus, Coriaria nepalensis and so on. Herbaceous layer coverage was 20% and layer average height was 1.5m. The dominant species was Miscanthus floridulus, with a height of about 1 ~ 2m and a coverage of 15% Cyrtomium fortune, Achyranthes bidentata.

5. Pterocarya stenoptera

Pterocarya stenoptera fit deep fertile and moist soil, whose growth is more appropriate in warm temperate and subtropical climate. Born in streams along the riverbanks, wet slopes of the forest. The field survey of Pterocarya stenoptera is mainly located in the Xinjiang River, such as Meigang Township, Daxi Township Fanjiabu and other places.

The canopy density was 0.5 and the average height was about 10 m. The dominant species was Pterocarya stenoptera, with a height of about 8-15 m, a diameter of 10-18 cm, a coverage of 40%, the main companion species Populus canadensis, Ailanthus altissima, Salix matsudana, etc.; shrub layer coverage 30%, average height 1.5m, dominant species Rosa multiflora, about 1-1.5m high, coverage 25%, mainly associated There are Elaeagnus pungens, Alangium platanifolium and so on. Herbaceous layer covers 50% and the layer is 1m high. The dominant species is Hemarthria altissima, about 0.1-0.3m high, 40%, the main associated species are Cynodon dactylon, Commelina communis, Oxalis corniculata and so on.

6.Quercus chenii

The leaf area of Quercus variabilis was smaller in the evaluation area, mainly distributed in Shangxing village, Huangjinbu town. The canopy density of tree layer is 0.55, the average height is 4-5 m, and the dominant species is Quercus variabilis, Celtis sinensis, Acer oblongum and so on. The coverage of shrub layer is 40%. The dominant species is Loropetalum chinense, about 1 ~ 2 m in height and 35% in coverage. The main companion species are Lindera glauca, Lespedeza formosa, Castanea seguinii, Rosa multiflora, Grewia biloba, Vitex negundo var. Cannabifolia, etc.; herb layer coverage is 35% and layer average height is 0.3m, dominant species of Deyeuxia arundinacea with a height of 0.2-0.4 m and a cover of 25%. The main concomitant species are Bidens pilosa, Imperata cylindrica, Oxalis corniculata and Senecio scanden.

7.Melia azedarach

8.Phyllostachys heterocycla cv. Pubescens）

Phyllostachys heterocycla in the evaluation area near the village is distributed in piece, and the community appearance is emerald green, canopy is neat, under the forest soil is yellowish brown, plant species composition is relatively simple.

The canopy density was 0.7 and the average height was 7 m. The dominant species was Phyllostachys heterocycla cv. Pubescens, 6-8 m tall, 4-10 cm in diameter, 65% coverage, and the main companion species was Cunninghamia lanceolate； The coverage of shrub layer was 20% and the average height of layer was 1.5m. The dominant species was Vitex negundo var. Cannabifolia, 1 ~ 2m in height and 15% coverage. The main species was Nandina domestica, (Rosa cymosa). The herb layer coverage was 15% and the layer average was 0.1m. The dominant species was Oplismenus undulatifolius, about 0.1m in height and 25% in coverage. The major companion species was Sonchus oleraceus), Xanthium sibiricum (Erigeron annuus) and so on.

9.Phyllostachys praecox

III. Shrubs

Shrubs include all types of vegetation that are dominated by shrubs. Community height generally below 5m, coverage is greater than 30% -40%. The difference between it and the forest is not only different in height, but more importantly, the shrubs are mostly clustered shrub life style. There are mainly shrub types in the evaluation area: shrubs of Vitex negundo, shrubs of Grifola frondosa, shrubs of Rubus przewalskii and so on.

10. Rosa cymosa

Rosa cymos are widely distributed in the evaluation area. The population of shrub layer in this group is 50% -65%, and the average height is 2m. The dominant species is Vitex japonica, 1.5 ~ 2.5m in height and 35% in coverage. The main concomitant species are Daphne genkwa, Glochidion puberum, Rosa laevigata and Rosa multiflora. The herb layer coverage was 55% and the average layer height was 0.5m. The dominant species was Imperata cylindrica, with a height of 0.2-0.6m and a coverage of 50% , The main companion species are Dendranthema indicum, Kalimeris indica, Oxalis corniculata, Torilis scabra, Daucus carota and so on.

11. Sageretia thea

Scirpus thea is edge of the forest in the evaluation area. There is distribution of wasteland, smaller area.

The coverage of shrub layer was about 70%, and the average height of layer was 2m. The dominant species was Capuchin, with the major associated species being Glochidion puberum, Lindera glauca, Cudrania tricuspidata etc.; The dominant species is Imperata cylindrica. The major companion species are Artemisia japonica, Kalimeris indica, Viola philippica, Setaria viridis and so on.

12. Rubus alceaefolius

IV. scrub-grassland

Shrubs refers to the perennial or midsummer herbaceous plants as the main constitutive species, but in which scattered among the few shrubs plant communities. Such communities in the Central Asia subtropics are mainly because forests, shrubs were repeatedly deforested, burning, resulting in soil erosion, soil is increasingly poor, the habitat tends to become a secondary type of drought. The evaluation area of shrub type are: Caragana, white grass grass, dog bud root community, centipede community, Xanthium community, Carex community, Polygonum hydropiper community.

13. Rumex japonicus

In the appraisal area Rumex japonicus distributes in the shoal beach, structure and species composition is relatively simple. Herbaceous layer coverage is more than 80%, and layer average height is 0.3m. The dominant species are Allium macrostemon, Kummerowia striata, Cirsium setosum, Potentilla chinensis， Potentilla discolor (Potentilla discolor) and so on.

14. Imperata cylindrica

Imperatare in the evaluation area is widely distributed on the roadside, the peak, the wasteland and the floodplain. The community herbaceous layer coverage is 65%, layer 0.5m, the dominant species is Imperata cylindrica, the main companion species are Erigeron annuus, Taraxacum mongolicum, Leonurus artemisia, Origanum vulgare, Mazus japonicus, Oxalis corniculata, Solanum nigrum, Plantago asiatica and the like.

15. Cynodon dactylon

16. Eremochloa ophiuroides

17. Xanthium sibiricum

18. Carex sp.

Carex community is one of the major communities in floodplain in the evaluation area. The heritages of this group are 70% -90% of the vegetation cover with a height of 0.4m. The dominant species are Carex genus, such as Carex sp., Less associated species, mainly Commelina diffusa, Ixeris polycephala and so on.

19. Polygonum hydropiper

Artificial vegetation

Economic forest

There is more economic timber in the evaluation area. Economic forest mainly wetland pine and fruit trees.

Agricultural vegetation

Within the scope of the evaluation, the main food crops are rice and beans (soybeans), potato (sweet potato) and so on. The cash crops mainly include rape and peanuts.

（3）Vegetation distribution in evaluation area

The distribution characteristics of plant communities in the evaluation area: The main vegetation of river floodplains and dike banks on both sides of the Xinjiang River are mainly shrub grasslands and wetland swamp vegetation, such as Bermudagrass community, Centipede grass community, Carex community, Polygonum orientale community. Protestion forest on the bank is mainly Pterocarya stenoptera and so on; In the Xinjiang River Xinzhou， addition to the hub project of Bazizui Xindu Village has a certain area of farmland distribution, there is mainly mokolin, camphor trees, Pterocarya stenoptera and other broad-leaved forest, mostly under wet forest Marsh vegetation. The main landform of the lower terraces of plain areas of the Xinjiang River is mainly mosaic of farmland and village buildings. The main forestland types in this area are mainly artificial forests, such as Phyllostachys pubescens, economic fruit trees and sporadic Neem deciduous broad-leaved forests. In addition, there is also a small amount of Camphor tree feng-shui forest, a lot of other natural vegetation points, field terraces, wasteland mainly brushwood and shrubs and grasslands distribution; the high terrace and the Hilly area of the river are mainly distributed Pinus massoniana forest, Pinus elliottii, Jing shrubs, sparrow shrubs and other distribution, Pinus massoniana distribution area is of the most extensive.

（4）The distribution of ecological public forest

Ecological public welfare forests refer to the forest with important ecological status and fragile ecological conditions, which play an important role in ecological security of the land, biodiversity conservation and sustainable economic and social development, and provide public welfare and social products or services as the main purpose of utilization. Protection forests and special purpose forests delineated by relevant national regulations and standards.

According to the relevant provisions of the Measures for the Administration of Ecological Public Welfare Forest in Jiangxi Province (2009), the construction unit before construction shall go through formalities with the competent forestry authorities for the formalities of requisition and requisition of forest land and apply for the logging permit. For the non-public welfare forest land that has been reduced due to occupation or requisition, according to the principle of "taking up one and supplementing one", the county-level people's government will make up for it within its own administrative area.

3.7.3 Terrestrial plant

（1）Flora

According to the taxonomic identification of plant specimens collected in the evaluation area of Baizui navigation terminal and the compilation of the floristic data system accumulated over the years, the classification of pteridophytes was based on Qinrenchang classification system (1978), the gymnosperms were classified according to Zheng Wanjun classification system (1978). According to the Hutchinson Plant Taxonomy (1934), the angiosperm family obtained a total of 718 vascular plants belonging to 421 genera and 128 families (including taxonomic classification, the same below), including 12 families of ferns 18 genera and 32 species; 116 families, 403 genera and 686 species of seed plants (including 3 species of 3 families, 2 families of gymnosperms, and 683 species of angiostars, 4 families of 114 families), the number of vascular plants, The number of total number of wild vascular plants, total genus and total number of species 47.9%, 28.5% and 15.9%. (See Table 3.7-3 for details).

Table3.7-3 Evaluation area vascular plant statistics

Item	Ferns			Seed plants						Vascular plants		
				Gymnosperm			Angiosperms					
	Family	Genera	Species	Family	Genera	Species	Family	Genera	Species	Family	Category	Species
Evaluation area	12	18	32	2	3	3	114	400	683	128	421	718
Jiangxi Province	49	114	401	8	22	31	210	1340	4088	267	1476	4520
Accounting for the proportion of Jiangxi Province（%）	24.5	15.8	8.0	25.0	13.6	9.7	54.3	29.9	16.7	47.9	28.5	15.9

（2）Floristic analysis of flora composition

There are altogether 718 vascular plants belonging to 421 genra in 128 families in the evaluation area, among which there are 668 species belonging to 377 genera and 98 families, of which, there are 32 species belonging to 12 genera and 18 genera in wild ferns, 3 genra 3 species, wild angiosperms 84 families 356 genera 633 species. The species of wild vascular plant families in the evaluation area accounted for 76.56%, 89.55% and 93.04% of the vascular plant families in the evaluation area respectively, and the wild vascular plants accounted for a large proportion in the evaluation area. The statistics of wild and cultivated vascular plants in the assessment area are shown in Table 3.7-4.

Table 3.7-4 Quantitative statistics of wild and cultivated vascular plants in evaluation area

Item	Ferns			Gymnosperm			Angiosperms						Vascular plants		
							Dicotyledons			Monocotyledons					
	Family	Genera	Species	Family	Category	Species	Family	Genra	Species	Family	Genra	Species	Family	Genra	Species
Natural distribution	**12**	**18**	**32**	**2**	**3**	**3**	**74**	**278**	**514**	**10**	**78**	**119**	**98**	**377**	**668**

（3）Statistics and Analysis of the Geographical Elements of Flora

Plant area refers to a plant taxa——distribution of the region of families, genera or species, it is due to the occurrence of plant species history of the long-term adaptation to the environment, and the result of many natural factors on them. Although all the taxonomic units of a plant have the distribution type, from the plant geography point of view, Bieke can reflect more systematically the phylogeny, evolutionary differentiation and geographical features of plants, and better reflect the species' Kinship. Because taxonomic belong to the same genus often contain the same origin and similar evolutionary trend, the taxonomic characteristics are relatively stable, occupy a relatively stable distribution area, at the same time in its evolutionary process, with the geographical environment Changes occurance, but there are more obvious regional differences. Therefore, the genus is often used in the study of flora as a marker or basis for the division of flora. Belonging to the distribution of a certain area is distributed in the surface area. The statistical analysis of the geographical components of the genera of wild vascular plants is of great significance.

Ferns in Wild Vascular Plants of Evaluation Area According to the distribution type of ferns in China (2004) by Lu Shugang in Chinese Flora (Volume 1), the seed plants are classified according to Wu Zhengyu's genus Distribution type system (1993), divided 377 genera of wild vascular plants in the evaluation area into 14 distribution types (see 3.7-5).

Table 3.7-5 The type of distribution area of wild vascular plants in the evaluation area

Numbering	Distribution type	total	The percentage of non-world distributions%
1	World distribution	32	——
2	Pan-tropical distribution	67	19.42
3	Discontinuous distribution of tropical and tropical america	12	3.48
4	Old world tropical distribution	22	6.38
5	Tropical Asia to tropical oceans	18	5.22
6	Tropical Asia to tropical Africa	10	2.90
7	Tropical Asia Distribution	44	12.75
8	North temperate distribution	62	17.97
9	East Asia and North America intermittent distribution	28	8.12
10	Old world temperate distribution	24	6.96
11	Temperate Asian distribution	5	1.45
12	Mediterranean, West Asia to Central Asia distribution	4	1.16
13	Central Asia distribution	0	0.00
14	East Asia distribution	48	13.91
15	China's unique distribution	1	0.29
Total (except for the world)		345	100.00

The distribution types of 377 wild vascular plants belonging to the evaluation area are summarized in four broad categories: world distribution, tropical distribution (categories 2-7), temperate zone (categories 8-14) and endemic to China. The statistics of the above table shows that the tropical and temperate distributions belong to 173 genera and 171 genera respectively, accounting for 50.14% and 49.57% of the total non-world distribution of wild vascular plants in the assessment area respectively. Among the tropical distributions, the distribution is the most in the tropic zone, followed by the tropics in the Asian and the tropical regions in the old world, and the other tropical species in the tropics are relatively small; in the temperate zone, the distribution of the north temperate zone is the highest Followed by East Asia.

A、Description of distribution of genus

i. World distribution of genus

Types of world distribution include genera that are distributed around the world on almost every continent but do not have a special distribution center or contain one or more distribution centers worldwide. There are 32 species of wild vascular plants of this type in the evaluation area, including Selaginella, Lysimachia, Salvia, Oxalis, Amaranthus, Cyperus, Polygonum, Erigeron, and the like.

ii. Tropical distribution of genus

There are 173 genera in the tropical distribution of wild vascular plants in the evaluation area, accounting for 50.14% of the total non-world distribution of wild vascular plants in the assessment area. There are mainly 6 distributional types.

(1) Pan-tropic distribution: Pan-tropic distributions include those generally distributed in the tropical regions of the east and west hemispheres and one or more distribution centers in the tropical regions of the world, but others in some tropical regions. The distribution of the type of wild vascular plants in this area a total of 67 genera, accounting for 19.42% of the total, belonging to this distribution type are Imperata, Ludwigia (Ludwigia), Zanthoxylum (Zanthoxylum), cloud Caesalpinia, Cassia, Conyza, Glochidion and the like.

(2) Discontinuous distribution of tropical Asia and tropical Americas: This distribution type includes tropical genera intermittently distributed in warm areas of the Americas and Asia. The wild vascular plants of this distribution type are 12 genera in this area, accounting for 3.48% of the total, including wood Litsea, Celosia, Sabia, Eurya, and the like.

③ Old World Tropical Distribution: There are 22 genera in this area, accounting for 6.38% of the total, including Stephania, Pittosporum, Mallotus, Albizzia, Capillipedium, Cynodon, and the like.

(4) Tropical Asia to Tropical Oceania: Wild vascular plants of this distribution type are 18 genera in this region, accounting for 5.22% of the total, including Lagerstroemia, Daphne, Helicia, Ailanthus, wild, Lophatherum, and the like.

(5) Distribution of tropical Asia to tropical Africa: The species of wild vascular plants in this area are altogether 10 genera, accounting for 2.90% of the total, including Cyrtomium, Hedera, Adina, Arthraxon, Miscanthus, and the like.

⑥Tropical Asia Distribution: There are 44 genera in this area, accounting for 12.75% of the total, including Lindera, Duchesnea, Cyclobalanopsis, Broussonetia, Paederia, Sabia and the like.

iii. Temperate distribution of genus

There are 171 genera in temperate zone of the wild vascular plants in the assessment area, accounting for 49.57% of the total non-world distribution of wild vascular plants in the assessment area. There are 6 distributional patterns.

(1) North Temperate Distribution: There are 62 genera belonging to this distribution within the evaluation area, accounting for 17.97% of the total, including Corydalis, Populus, Salix, Arundinella, Lonicera, Viburnum and the like.

② East Asia and North America intermittent distribution: This distribution type refers to the distribution in East Asia and North America in temperate and subtropical regions. There are 28 genera in this evaluation area, accounting for 8.12% of the total. Including Castanopsis, Ampelopsis, Acorus, Lithocarpus, Gleditsia, Lespedeza, and the like.

③ old world temperate distribution: the old world temperate distribution is widely distributed in Europe, Asia, medium-high latitudes of temperate and temperate genus. There are 24 genera in the project evaluation area, accounting for 6.96% of the total, including Cnidium, Carpesium, Leonurus, Chrysanthemum, Dendranthema, Lapsana, Ajuga, and the like.

④ temperate Asian distribution: only 5 genera in this area, accounting for 1.45% of the total genera. Pseudostellaria, Kalimeris, Trigonotis and others.

⑤ Mediterranean, West Asia to Central Asia Distribution: There are only 4 genera in this area, accounting for 1.16% of the total genera. There are Akebia (Akebia), Genus Erodi (Erodium) and so on.

⑥ Distribution in East Asia: East Asia refers to some genera going eastward from the Himalayas to Japan. Within the survey area, there are 48 genera belonging to the East Asian distribution type, accounting for 13.91% of the total. Including Rhaphiolepis, Liriope, Ophiopogon, Belamcanda, Vernicia, Pogonatherum, and the like.

iv. Genus endemic to China

A total of 1 genera, accounting for 0.29% of the total genera, is the genus Nyssa.

B、flora characteristics

Based on the statistical analysis of the wild vascular plants in the evaluation area, the nature and characteristics of the flora of the wild vascular plants in the evaluation area are summarized as follows: the flora is significantly transitional. According to the distribution statistics of subordinate species, in 377 genera, the genus of tropical and temperate genera are respectively 173 genera and 171 genera, accounting for 50.14% and 49.57% of the total non-world genera of wild vascular plants in the assessment area respectively. The flora in the evaluation area is in a transition zone between temperate zone and tropical zone, with obvious transitional.

（2）Old trees

According to the Regulations for the Protection of Ancient and Famous Trees in Jiangxi Province published by Jiangxi Province in 2005, old trees refer to trees aged more than 100 years, of which Class I trees are over 500 years old and over 300 years old over 500 years. The following is II grade old trees, tree aged more than 100 years for 300 years of grade III for the ancient trees. There are 3 ancient trees in the appraisal area, of which the camphor species is camphor tree, distributed in Fanjiabu, Dabo Township and Yangbu Town Fishery Village. See Table 3.7-6 for details.

Table 3.7-6 Old tress in Assessment area of Bazizui hydropower project

Serial number	name	Quantity	position	Positional relationship	level	Growth Status	**photo**
1	Cinnamomum camphora	1Strain	Daxi Township Fan Jiabu N:28°34′53.35″， E: 116°43′54.57″	Located in the embankment，Will not be overwhelmed	Old tree III level	Tree height 8m, DBH 75cm, unlisted	
2		2Strain	Yangbu town Yuye village N: 28°34′46.83″， E: 116°43′54.27″	Located above the dike normal wate	Old tree III level	Tree height 9m, breast diameter 65cm, unlisted	

3				r level, Will not be overwhelmed	Old tree III level	Tree height 10m, diameter 70cm, unlisted	

（3）Protected plants

There are mainly 1 camphor tree (national II-level protected plant) distributed in the evaluation area of Bazizui Navigation and Hydropower Project. The camphor tree is widely distributed in the evaluation area. In addition to the above-mentioned ancient trees with camphor tree age over 100 years, Hill camphor trees, a larger number.

There are 5 species of key protected wild plants in Jiangxi Province, including 5 species of Tongtong, Chongyangmu, Dalbergia, Fructus Giganteum and Aconitum palustris. They are more common in assessment area.What are located in the proposed hub normal water level above will not be submerged. The distribution and quantity of key protected wild plants at the national and provincial levels in the assessment area are shown in Table 3.7-7.

Table 3.7-7 Rare and Protected Plants and Their Distribution in Baizakui Navigation and Hydropower Junction Evaluation

name	scientific name	Resources	Protection level	Remarks
Camphor tree	Cinnamomum camphora（L.) Presl	+++	II	Wide distribution
Adinandra millettii	Cleyera japonica Thunb.	+++	III	Widely distributed in the surrounding hills post
Bischofia polycarpa*	Bischofia javanica Bl.	+	III	Planting
Dalbergia hupeana	Dalbergia hupeana Hance	++	III	Occasional hills around the occasion
Ilex cornuta	Ilex cornuta Lindl.	+++	III	Occasional hills around the occasion
Acer palmatum	Acer palmatum Thunb.	+	III	Planting

Note: * for cultivated species; level of protection, "II" for the protection level of *List of National Key Protected Wild Plants,* and "2 and 3" for the *Protection List of Key Protected Wild Plants of Jiangxi Province*.

3.7.4 Terrestrial animals

On the basis of field survey and interview, consult related literature and documents, and draw a comprehensive conclusion on the current situation of animal resources in the project evaluation area. At present, there are 48 species of terrestrial vertebrates distributed in the evaluation area. For details, see Table 3.7-8.

Table 3.7-8 Number of terrestrial vertebrates in assessment area

Class	Order	Family	Species
Amphibia	1	3	4
Reptile	2	6	9
Bird	10	21	29
Mamalia	3	3	6
Total	16	33	48

(1) Species diversity

1) Amphibians

The amphibians in the assessment area share 1 order, 3 families and 4 species, of which there are 2 species of amphibians protected at the provincial level, which are Bufo gargarizans and black spot frogs.

2) reptiles

There are 2 orders, 6 families and 9 species of reptiles in the evaluation area, among which there are 3 species of reptiles protected at the provincial level, namely turtles, black-headed snakes, and osprey.

3) Birds

A total of 29 species of birds in the assessment area belong to 10 orders and 21 families. There are 6 species of provincial protected birds in Jiangxi Province, of which there are 3 species of waterfowl, including mallard, spot billed duck and red-necked duck; there are 1 species of wading birds, ie, egrets; 2 species of forest birds, .

4) mammals

There are 6 species of 3 orders, 3 families and 6 species of mammals in the evaluation area. Among them, there are 1 species of key protected mammals in Jiangxi Province, namely, the yellow weasel.

（2）Terrestrial Vertebrate Fauna and Its Characteristics

1) Amphibians

① fauna composition

Among the four amphibians distributed in the evaluation area, there are no ancient north boundary species, two species are distributed in the Oriental Ocean, accounting for 50% of all amphibian species, and two species are widely distributed, accounting for 50% of all amphibian species.

② ecological type

According to the ecological habits of amphibians, the amphibians within the evaluation range are divided into the following two ecotypes.

According to the ecological habits of amphibians, the amphibians in the evaluation range are divided into two types of ecotypes:

Still water (active foraging in still water or slow flow): Giraffe, frog, and black frog. Living in ponds, reservoirs and paddy fields and other hydrostatic water, and human activities are more closely related.

Terrestrial type (activity feeding on land): Bufo bufo gargarizans. The activities on land not far from the water source are closely related to human activities.

2）reptiles

① fauna composition

Among the nine reptiles distributed in the evaluation area, there are no ancient boundary species in the world, four species in the east, accounting for 44.4% of the total number of reptiles, and five species widely distributed, accounting for 55.6% of the total number of reptiles.

② ecological type

According to the ecological habits of reptiles, the evaluation range of reptiles is divided into the following types of ecological type.

Residential type (nesting, breeding, activity reptiles in residential buildings): including more warts. They are mainly in the evaluation area of residential activities.

Scrub type (often activities in the shrub, curb in the curb): Including the skinks, viper. They are mainly active in the woods and scrubs within the scope of evaluation and have a close relationship with human activities.

Aquatic (reptiles that live and feed in the water) include turtles and turtles. They are mainly active in the body of water within the scope of evaluation.

Lin-style waterfront (reptiles in the streams of the forest activities): red dot Kam snake, red chain snake, black snake. They are mainly valley activities with streams within the assessment area.

（3）birds

① Fauna composition

A total of 29 species of birds within the evaluation range, belonging to 10 orders and 21 families. Among them, there are 11 species belonging to the Oriental world, accounting for 37.9%; 12 species belonging to the broad world, accounting for 41.4%; and 6 species belonging to the North Paleozoic, accounting for 20.7%.

② Residence status

Among the 29 species of birds in the evaluation area, 13 were resident birds, accounting for 44.8%; 11 were summer migrants, accounting for 37.9%; and 5 were winter migrants, accounting for 17.3%. Wetland birds with more activities in the assessment area mainly include egrets, grey herons, Chinese pond heron, night heron, cattle egret, black pomfret, lxobrychus cinnamomeus.

③ ecological type

According to living habits, 29 species of birds can be divided into the following five types of ecology:

Wading birds (mouth, neck and feet are longer, toes are also long, suitable for wading, swimming, long-billed into the water or ground floor feeding): Including all species of Ardeidae and Yangko, a total of 10 Species. They are mainly distributed in lakes and rivers in the evaluation range.

Play birds (with flattened or pointed beaks, webbed toes with toes, walking and swimming backwards, swimming, diving and food in the water. Not good at walking on land but flying fast and living on the water) : Including all species of Laridae and Duck family, a total of 7 species. Activities within the water body within the evaluation range have a close relationship with human beings.

Landscaped (solid body, hard mouth, strong and powerful feet, suitable for digging soil and more for activity on the ground): Including 1 species of bead turtle dove. Within the scope of the evaluation, they are mainly distributed in woodland or other areas with human activities.

Bird climbing (the structure of the mouth, foot and tail are special, good at climbing the tree): a common kingfisher; they are mainly distributed in the evaluation area of various forest, some also in the activities of the forest edge village .

Songbirds (Ming Ming and particularly well-developed muscle, the general shape of small, body posture quick, lively and dexterous, good at tweets and singing, and clever nesting): birds of prey all birds are songbird, a total of 10 species. They are widely distributed within the evaluation area.

4) mammals

① fauna composition

There are 3 orders, 3 families and 6 species of mammals in the evaluation area. Among them, there are two species of Toyo, accounting for 33.3%, two species of ancient North species accounting for 33.3% and two species being widely distributed, accounting for 33.3%.

② ecological type

According to the ecological habits of mammals, the ecotypes of mammals within the scope of evaluation are semi-subsurface life forms. Semi-underground life type (mainly in the ground activities for food, habitat, avoid the enemy in the cave, some also find food underground): including Mus musculus, Rattus flavipectus, Rattus norvegicus, yellow weasel. They are mainly distributed in the woods and fields within the scope of the evaluation, in which Mus musculus, Rattus flavipectus, Rattus norvegicus, Apodemus agrarius and human beings are closely related.

(3) Focus on the protection of wild animals

There are no national key protected wild animals in land evaluation of terrestrial vertebrate. Fifteen species of provincial protected animals in Jiangxi Province are: Bufo bufo gargarizans, black spot frogs, turtles, black-headed snakes, sparrows, red dotted snake, Chinese water snake, black-browed snake, white egret, mallard Mouth beak, red-eared duck, swallow, golden waist swallow and yellow ferret. The key protected wild animals in the assessment area are shown in Table 3.7-9.

Table 3.7-9 Important protected animals in assessment area

name	Latin name	Residency, fauna	Quantity	Protection level
1.Bufo gargarizans	*Bufo gargarizans*	Wide variety	++	provincial
2.Rana nigromaculata	*Rana nigromaculata*	Wide variety	++	provincial
3.Chinemys reevesii	*Chinemys reevesii*	Wide variety	+	provincial

4.Zoacys dhumnades	*Zoacys dhumnades*	Wide variety	+	provincial
5.Deinagkistrodon acutus	*Deinagkistrodon acutus*	Oriental species	+	provincial
6.Elaphe rufodorsata	*Elaphe rufodorsata*	Oriental species	+	provincial
7.Enhydris chinensis	*Enhydris chinensis*	Oriental species	+	provincial
8.Elaphe taeniura	*Elaphe taeniura*	Oriental species	+	provincial
9.Egretta garzetta	*Egretta garzetta*	Staying bird, Oriental species	++	provincial
10.Anas platyrhynchos	*Anas platyrhynchos*	Winter migratory birds, broad species	++	provincial
11.A.poecilorhyncha	*A.poecilorhyncha*	Staying birds, broad species	+	provincial
12.Anas penelope	*Anas penelope*	Winter migratory birds, ancient North species	+	provincial
13.Hirundo rustica	*Hirundo rustica*	Summer migrant birds, broad species	++	provincial
14.H.daurica	*H.daurica*	Summer migrant birds, broad species	++	provincial
15.Mustela sibirica	*Mustela sibirica*	Wide variety	+	provincial

3.7.5 Landscape ecology

(1) Landscape ecological system

The status quo of land utilization in Bazizui Navigation Junction Ecological Impact Assessment Area is mainly analyzed by remote sensing image interpretation combined with statistical data of the evaluation area. Using ArcGIS, the land in the evaluation area is divided into six categories: paddy field, dry land, woodland, grassland, water area and construction land. The statistical results of land use status in evaluation area are shown in Table 3.2-16. The status quo of land utilization in Bazozui navigation and hydropower hub evaluation zone is shown in Figure 21**.**

Table 3.2-16Status of Land Utilization in Ecology Impact Assessment Zone of Baizuizui Navigation Junction

Land use type	The number of plaques（块）	area（hm^2）	Area ratio（%）
Paddy field	21	14313.83	51.82
dry land	50	1278.89	4.63
woodland	176	7009.37	25.38
Grassland	35	971.59	3.52
Waters	87	3104.12	11.24
Construction land	90	944.91	3.42
total	459	27622.71	100.00

Landscape ecological quality analysis

The project evaluation area is located in the alluvial plain of the Xinjiang River in the middle and lower reaches of the Xinjiang River. The natural vegetation is dominated by secondary evergreen broad-leaved forest, coniferous forest and massoniana sparse forest. The plain is dominated by farmland ecosystem. The human activity in the area is strong, and the ecological environment shows obvious secondary characteristics. Artificial vegetation occupies an absolute superiority. Judging from the structure of land use in the assessment area, the paddy fields are dominated by area, followed by the woodland; the land with the largest number of patches is woodland. Adopting the landscape ecological analysis method to analyze the dominance value (Do) of each landscape in the evaluation area, the calculation method is as follows:

Dominance value(Do)= {(Rd+Rf)/2 + Lp}/2

Density Rd＝Number of inserts I / total number of inserts×100%

Frequency Rf ＝Number of quadrats / total number of quadrats in which I appears×100%(Taking 1km × 1km as a quadrat, full coverage of the landscape was sampled and examined by Merrington Maxine's "surface-to-surface ratio of t-distribution points")

Landscape ratio(Lp)=Block I area / total sample area×100%

The calculation results of the dominance value (Do) in the evaluation area are shown in Table 3.2-17.

Table 3.2-17 Bazizui navigation and hydropower hub evaluation area of the landscape type of dominance value

Types	R_d(%)	R_f(%)	L_p(%)	D_o(%)
Paddy field	4.58	24.66	51.82	33.22
dry land	10.89	7.82	4.63	6.99
woodland	38.34	32.13	25.38	30.31
Grassland	7.63	5.51	3.52	5.04
Waters	18.95	18.97	11.24	15.10
Construction land	19.61	10.91	3.42	9.34

Table 3.2-17 shows that the dominance value of paddy field in Bazizui navigation and hydropower hub is the highest, which is 33.22%; the second is woodland, the dominance value is 30.31%; the other order is water area, construction land, The dry land and grassland were 15.10%, 9.34%, 6.99% and 5.04% respectively. The dominance of paddy field and dry land was 40.21%, indicating that cultivated land had a control effect on the landscape in this area but its distribution was continuous and concentrated. There are two sides of the river from the artificial transformation of the plain.

3.7.6 Ecological integrity

（1）Evaluation area vegetation natural productivity

Vegetation is the most important and sensitive natural element in the ecological environment, which plays a decisive role in ecosystem change and stability. Biocomponent productivity is usually expressed as net primary productivity of vegetation, which directly reflects the productive capacity of the plant community under natural environmental conditions.

According to the interpretation of the health-care products and the status quo survey, the actual productivity of the vegetation in the evaluation area calculated in the evaluation area is shown in Table 3.7-12. It can be seen from the table that the average net productivity of the vegetation assessment area in the assessment area is 214.36 gC / (m2.a), which is 48gC / m2a lower than the average net productivity of 262.36 gC / m2a in the Yangtze River Basin, indicating that the productivity of vegetation in the assessment area low. It indicates that the evaluation area is strongly influenced by human activities and the relative deficiencies of the natural system's production capacity. The main reason is that the area of artificial vegetation such as crops is the largest in the assessment area. The agricultural vegetation is the main type of vegetation in the assessment area, while the proportion of natural vegetation with higher average net productivity is smaller. As a result, the vegetation productivity in the evaluation area is higher than the average productivity of vegetation in the Yangtze River Basin Slightly lower level

Table 3.7-12 Natural Productivity of Vegetation in Ecological Impact Assessment Zone of Baizaijiao Navigation Junction

Vegetation Types	Representative plants	area（hm^2）	Accounting for the evaluation area(%)	The actual average net productivity（NPP，$gC\ m^{-2}\ a^{-1}$）
Broadleaf forest	Camphor, Schima superba	2243	8.12	818717.4
Coniferous forest	Masson pine, Pinus elliottii	4766.37	17.26	1408272
Shrubs and shrubs	Vitex, capitata, Imperata cylindrica	971.59	3.52	268469.7
Farmland vegetation	Rice, rape, all kinds of vegetables, gardens and so on	15572.92	56.38	3170179
Wetland waters	Freshwater algae and aquatic vascular plants	3104.12	11.24	251433.7

Vegetation Types	Representative plants	area （hm^2）	Accounting for the evaluation area(%)	The actual average net productivity（NPP，$gC\ m^{-2}\ a^{-1}$）
No vegetation area	No vegetation cover	944.91	3.42	0
Evaluate the net average net productivity in the area [gC/（m^2.a）]				214.36

(2) Ecological system stability

Ecosystem stability is the ability of the ecosystem to resist external disturbances and to restore the ecosystem to its original state after disturbance has been removed.

From the analysis of the landscape structure of the evaluation area, paddy field is the landscape type with the highest dominance value in the evaluation area, followed by the woodland and paddy field, accounting for 33.22% of the dominance value. Paddy fields play a decisive role in ecosystem stability in the assessment area. Due to the human-controlled landscape types in paddy fields, the long-term activities of human beings in the woodland in the evaluation area are mainly dominated by secondary forests, with species diversity deteriorating, the net primary productivity of ecosystems declining, and the ability of the system to regain its pre-interference state by itself.

In summary, the ecologically sensitive ecosystem in the evaluation area is the main location, the habitat heterogeneity is low, and the system's impedance stability is low. However, due to the favorable climatic conditions such as rainfall in the evaluation area, the ecosystem natural productivity Strong, strong recovery of the system stability, can withstand a certain degree of human disturbance.

3.8 Investigation and Evaluation of Aquatic Ecological Environment

The current survey of aquatic ecological status is based on the domestic published publications, ecological survey results and historical documents, and combined with the results of the survey of the Xinjiang Aquatic Ecological Survey conducted by the Institute of Water Resources Engineering Ecology Institute of Chinese Academy of Sciences in 2013, Comprehensive survey.

A total of seven aquatic ecological survey sections were set up in Shuanggang, Jiaoanshan, Mapeizui, Zhapipi Ridge, Bazizui, Jizhixia and Jijiaopan in this survey of aquatic ecological status. Phytoplankton, zoobenthos, Aquatic vascular plant, fish, fishery status survey, aquatic ecological survey section see Figure 24.

3.8.1 Aquatic habitat

Xinjiang in Shangrao above for the upstream, Shangrao to Yingtan as the middle reaches, Yingtan following the downstream. The upper reaches of the upper reaches of the coast are dominated by middle and low mountains, and the topography fluctuates greatly. The main tributaries are Jinsha River, Jade River, Rao North River and Fengxi River. The middle reaches belong to the Xinjiang River. The major tributaries are Shixi River, Ponds and other downstream Poyang Lake alluvial plain, the river width 400 ~ 500m, the main tributary of the White River and so on.

The proposed dam site of Baizuijiao Navigation Junction is located about 49km downstream of the Xijiang River downstream boundary hub site. The valley of the Jiepai cascade to the Huangjinbu section is an over-type of mountain-type river to plain-type river, with more low hills distributed across the Taiwan Strait. The lower reaches of the gold port is a plains river, most of the valleys open, wide riverbed hundreds of meters, floodplain around.

Baita River with a larger tributary range, the basin area of 2839km2, the main channel length of 161.0km, the main channel down 1.49 ‰, Baita River flows from the southeast to the northwest through the Wangjiagang into the territory of Jiangxi Province, north flow through the capital Creek County Sanjiangkou, Gaobu, Guixi ear, Shangqing town, fish ponds, Yujiang County Dengjiabu, rake stone, Wangjiadu, along the Qingtiantian Port, landfill water and other major tributaries after the Jinjiang River into the letter The estuary is located at 116 ° 53 'east longitude and 28 ° 23' north latitude.

3.8.2 Phytoplankton

(1) species composition

According to the survey data, there are 4 genera, 27 families and 28 genera (Table 3.8-1) in the phytoplankton survey. Among them, 10 genera of Bacillariophyta, 15 genera of Chlorophyta, 2 genera of Cyanophyta, 1 genus of Chrysophyta . The survey shows that there is a large difference in the stocks of algae in different sections (Table 3.8-3), showing the highest angle section and the lowest section in Shuanggang section. The surveyed sections showed the largest number of diatoms, the second was green algae, and the less were golden algae and cyanobacteria. Cryptophyta, dinoflagellates and euglena were not detected in the surveyed sections of Xinjiang River. The dominant species of phytoplankton in the evaluation area are Melosira, Tabellaria, Ulothrix from Chlorophyta and Dinobryon from Chrysophyta.

Table 3.8-1 The list of phytoplankton in the range of evaluation

					sections

phylum	order	family	genus	Latin name for Genus	Shuanggang	Jiaoshan	Mabeiju	Mopiling	Above Baziju	Jiepaixia	Jiepaishang
Cyanophyta	*Chroococcales*	Microcystaceae	微囊藻	*Microcystis*	+		+	+			
	Osillatoriales	Oscillatoriaceae	颤藻	*Oscillatoria*		+					
chrysophyta	Chromulinales	Dinobryonaceae	锥囊藻	*Dinobryon*	+	+					
Bacillariophyta	Coscinodiscales	Coscinodiscaceae	直链藻	*Melosira*	+	+	+	+	+	+	+
	Araphidiales	Fragilariaceae	平板藻	*Tabellaria*		+		+	+	+	+
			脆杆藻	*Fragilaria*	+	+	+	+	+	+	+
			针杆藻	*Synedra*		+	+	+		+	+
	Biraphidinales	Naviculaceae	肋缝藻	*Frustulia*		+					
			羽纹藻	*Pinnularia*		+	+			+	
			舟形藻	*Navicula*	+	+	+	+	+	+	
		Cymbellaceae	桥弯藻	*Cymbella*					+		+
		Gomphonemaceae	异极藻	*Gomhonema*			+	+			+
	Aulonoraphidinales	Surirellaceae	双菱藻	*Surirella*		+					
chlorophyta	Volvocales	Chlamydomonadaceae	衣藻	*Chlamydomonas*					+		
	Chlorococcale	Chlorococcaceae	多芒藻	*Golenkinia*		+					
		Senedesmaceae	栅藻	*Scenedesmus*					+		
		Hydrodictyaceae	水网藻	*Hydrodictyon*							+
	Ulotrichales	Ulotrichaceae	丝藻	*Ulothrix*	+			+	+	+	+
			双胞藻	*Geminella*		+					
	Chaetophorales	Chaetophoraceae	胶毛藻	*Chaetophora*				+			
			竹枝藻	*Draparnaldia*				+			
	Oedogoniales	Oedogoniaceae	鞘藻	*Oedogonium*							+
			毛鞘藻	*Bulbochaete*					+		
	Cladophorales	Cladophoraceae	刚毛藻	*Cladophora*				+			
	Zygnematales	Zygnemataceae	双星藻	*Zygnema*			+				+
			水绵	*Spirogyra*	+					+	
	Desmidiales	Desmidiaceae	鼓藻	*Cosmarium*		+					
			顶接鼓藻	*Spondylosium*	+				+		

Table 3.8-2 A list of zooplankton in the range of evaluation

roup	family	Latin names for family	species	Latin names for species	Section						
					huanggang	iaoshan	abeiju	opiling	azijiu	iepaishang	iepaixia
rotozoan	砂壳科	Difflugiidae	明亮砂壳虫	Difflugia bucida							
			变异砂壳虫	Difflugia varians Penard							
			双隆咽壳虫	Pontigulasia bigibbosa P.							
			无棘匣壳虫	Centropyxis ecornir							
			旋匣壳虫	Centropyxis aerophila aerophila Deflandre							
			盘壮匣壳虫	Centropyxis discoides (Penard)							
			表壳圆壳虫	Cyclopyxis arcelloides Penard							
otifer	晶囊轮科	Asplanchnidae	前节晶囊轮虫	Asplanchna prcodonta Gosse							
	臂尾轮科	Brachionidae	方块鬼轮虫	Trichotria pocillum (O.F. Müller)							
			角突臂尾轮虫	Brachionua angularis Gosse							
			萼花臂尾轮虫	Brachionua calyciflorus pallas							

roup	family	Latin names for family	species	Latin names for species	Section						
					huanggang	iaoshan	abeiju	opiling	azuju	iepaishang	iepaixia
			矩形龟甲轮虫	Keratella quadrata (Müller)							
			螺形龟甲轮虫	Keratella cochearis (Gosse)							
			针簇多肢轮虫	Polyarthra trigla Ehrengerg							
			唇叶轮虫	Notholca labis Gosse							
	疣毛轮科	Synchaetidae	梳状疣毛轮虫	Synchaeta pectinata Ehrenberg							
	镜轮科	Testudinellidae	迈氏三肢轮虫	Filinia major (Cololitz)							
ladocera	溞科	Daphniidae	蚤状溞	Daphnia pulex							
			僧帽溞	Daphnia cucullata							
			角突网纹溞	Ceriodaphnia cornuta							
			棘爪网纹溞	Ceriodaphnia reticulata							
			角壳网纹溞	Ceriodaphnia cornigera							

roup	family	Latin names for family	species	Latin names for species	Section						
					huanggang	iaoshan	abeiju	opiling	azijiu	iepaishang	iepaixia
	象鼻溞科	Bosminidae	简弧象鼻溞	Bosmina voregoni							
			长额象鼻溞	Bosmina longirostris							
			颈沟基合溞	Bosminopsis deitersi							
	盘肠溞科	Chydoridae	矩形尖额溞	Alona rectangula							
			点滴尖额溞	Alona guttata							
			肋形尖额溞	Alona costata							
			方形尖额溞	Alona quadrangularis							
			吻状异尖额溞	Disparalona rostrata							
			圆形盘肠溞	Chydorus sphaericus							
			直额弯尾溞	Camptocercus rectirostris							
			龟状笔纹溞	Graptoleberis testudinaria							
			三角平直溞	Pleuroxus trigoneuus							
			短腹平直溞	Pleuroxus aduncus							
			光滑平直溞	Pleuroxus laevis							

roup	family	Latin names for family	species	Latin names for species	Section						
					huanggang	iaoshan	abeiju	opiling	azijiu	iepaishang	iepaixia
opepods	胸刺水蚤科	Centropagidae	汤匙华哲水蚤	Sinocalanus dorrii							
	伪镖水蚤科	Pseudodiaptomidae	球状许水蚤	Schmackeria forbesi							
	镖水蚤科	Diaptomidae	锥肢蒙镖水蚤	Mongolodiaptomus birulai							
			右突新镖水蚤	Neodiaptomus schmackeri							
			中华原镖水蚤	Eodiaptoms sinensis							
	剑水蚤科	Cyclopidae	锯缘真剑水蚤	Eucyclops serrulatus							
			剑水蚤	Cyclops sp.							
			近邻剑水蚤	Cyclops vicinus							
			温剑水蚤	Thermocyclops sp.							
			蒙古温剑水蚤	Thermocyclops mongolicus							
			台湾温剑水蚤	Thermocyclops taihokuensis							

Table 3.8-3 The amount of standing phytoplankton (density: 105ind./L; biomass mg/L) in the range of evaluation

Section	amount		proportion of algal phylum in quantity（%）							
	den sity	bio mass	cyano phyta	Crypto phyta	Pyrro ptata	Chryso phyta	xantho phyta	Chrysop hytax	Eugleno phyta	Chloro phyta
Shuang gang	27.16	1.805	50.0	0	0	0	0	50.0	0	0
Jiaoshan	95.09	8.15	0	0	0	61.9	0	38.1	0	0
Mabeiju	40.70	7.35	0	0	0	0	0	100	0	0
Mopiling	49.81	13.76	0	0	0	0	0	100	0	0
Above Baziju	86.03	2.332	0	0	0	0	0	36.8	0	63.3
Jiepaishang	36.22	4.80	0	0	0	0	0	87.5	0	12.5
Jiepaixia	37.10	4.20	0	0	0	0	0	80.1	0	19.9
mean value	35.16	6.05	7.14	0	0	8.84	0	70.4	0	13.7

3.8.3 zooplankton

According to the survey data, 1 family, 4 genera and 8 species of protozoa, 4 families, 8 genera, and 10 species of Rotifer, 3 family, 9 genera, and 19 species of Cladocera, and 4 family and 8 genera of Copepods were detected in the evaluation area.（See table3.8-2）。

Some species of protozoa and rotifer were found in qualitative specimens, but were not detected in the quantitative specimens. The amount of standing protozoa in Jiaoshan section is the highest. The quantitative specimens of protozoa in Baziju, Jiepaishang, and Jiepaixia were not detected. Rotifer density is similar in Shuanggang, Jiaoshan, Jiepaixia and Jiepaishang. Rotifer biomass amount in Shuanggan is the highest. Rotifer quantitative samples were not detected in Mabeiju, Mopiling and Baziju（Table 3.8-4）.

Talbe 3.8-4 The quantity of protozoa and rotifer within the range of evaluation

Group	section	density（ind./L）	biomass（mg/L）
protozoa	Shuanggang	150	0.0075
	Jiaoshan	750	22.52
	Mabeiju	150	0.0561
	Mopiling	150	0.0075
	Baziju	0	0
	Jiepaixia	0	0
	Jiepaishang	0	0
rotifer	Shuanggang	150	0.05
	Jiaoshan	150	0.0041
	Mabeiju	0	0

	Mopiling	0	0
	Baziju	0	0
	Jiepaixia	150	0.0041
	Jiepaishang	150	0.11

There are 19 species of Cladocera in the evaluation area, accounting for 63.3% of the species of planktonic crustaceans found, and 11 species of copepods, accounting for 36.7%. Most of Cladocera are of wide variety and can survive in slow river water.The common Cladocera in the evaluation area is: *Daphnia pulex*, *Daphnia cucullata*,*Bosmina coregoni*, *B. longirostris*, *Bosminopsis deitersi, Alona guttata*, *Chydorus sphaericus*, *Camptocercus rectirostis*, *Graptoleberis testudiraria* and etc. Bosmina longirostris and *Chydorus sphaericus* are the most common. The more common copepods in the main stream of the Xinjiang River are *Cyclops* sp.,*Thermocyclops* sp.,*Eodiaphomus sinensis*, and *Neodiaptomus sehmackeri* etc.

The average density and biomass of all the investigation sections in the range of the Cladocera were smaller (table 3.8-5). In the proportion of total biomass, the maximum value of Cladocera is 29.6% (Jiaoshan section), and the minimum is 0 (MaBeiju, Jiepaixia, and Jiepaishang sectionsk). The small biomass of Cladocera may be related to poor swimming ability, unsuitable growth in water and sampling time. The biomass of copepods is larger in the shellfish crustaceans. In the qualitative specimens investigated, the individuals of the naupli and the copepods were dominant. On the whole, the biomass of crustaceans was higher.

Table 3.8-5 The amount of crustaceans in the range of evaluation

Sections	Cladocera			Copepods			SUM	
	Density (ind./L)	Biomass (mg/L)	Proportion (%)	Density (ind./L)	Biomass (mg/L)	Proportion (%)	Density (ind./L)	Biomass (mg/L)
Shuanggang	0.2	0.012	9.00	1.4	0.122	91.0	1.6	0.134
Jiaoshan	0.2	0.056	29.6	1.5	0.133	70.4	1.7	0.189
Mabeiju	0	0	0	1.7	0.079	100	1.7	0.079
Mopiling	0.2	0.016	11.2	2.0	0.127	88.8	2.2	0.143
Baziju	0.1	0.060	26.3	1.8	0.222	73.7	1.9	0.228
Jiepaixia	0	0	0	0.3	0.061	100	0.3	0.061
Jiepaishang	0	0	0	0.7	0.118	100	0.7	0.118

3.8.4 Benthic Zoobenthos

According to the survey data, 10 families, 15 genera and 15 species were found in the evaluation area (table 3.8-6), with the dominant species of mollusk is clam. In the seven sections of the survey, the clam appear in five sections, and the number was dominant. The second was tache vermis and aquatic insects, and the other species appeared only once in each section (table 3.8-7). In the survey sections, benthic animal density and biomass were the highest in Jiepaishang section, the second is Jiepaixia section, the minimum density is Mabeiju section, and the minimum biomass is Mopiling.

Table 3.8-6 A list of benthos in the range of evaluation

Species	Latin name of Species	Shuanggang	Jiaoshan	Mabeiju	Mopiling	Baziju	Jiepaixia	Jiepaishang
河蚬	Corbicula fluminea	+		+	+		+	+
长角涵螺	Alocinma longicornis		+			+		
日本沙蚕	Nereis japonica		+					
齿吻沙蚕	Nephthys sp.		+					
尾鳃蚓	Branchiura		+		+			
水丝蚓	Limnodrilus				+			
内摇蚊	Endochironomus		+		+			
长跗摇蚊	Tanytarsus				+			
雕翅摇蚊	Glyptotendipes				+			
圆顶珠蚌	Unio douglasiae		+					
蜉蝣	Ephemera			+				+
钩虾	Gammarus				+			
长角石蛾	Leptoceridae					+		
方格短沟蜷	Semisulcospira cancellata					+		
瘤拟黑骒	Melanoides tuberculata					+		

Table 3.8-7 The amount of benthic animals in the range of evaluation (density Ind./m2; biomass g/m2)

Section	annelid		Mollusk		Aquatic insect		Total amount	
	density	biomass	density	biomass	density	biomass	density	biomass
Shuanggang	0	0	80	127.8	0	0	80	127.8
Jiaoshan	120	2.56	40	72.8	0	0	160	75.4
Mabeiju	0	0	20	40.2	0	0	20	40.2
Mopiling	80	3.2	0	0	0	0	80	3.2
Baziju	0	0	20	15.8	20	0.04	40	15.8
Jiepaixia	0	0	200	281.4	0	0	200	281.4
Jiepaishang	0	0	40	460.4	0	0	400	460.4
Mean value	28.57	0.82	108.57	142.6	2.86	0.0057	140	143.5

3.8.5 Aquatic vascular plants

According to statistics, there are 16 families, 20 genera and 29 species of aquatic vascular plants in the range of evaluation (table 3.8-8).

Among them, the humidogene and the aquatic plants of 11 species, accounting for 37.9%; floating plant 2 species, accounting for 6.9%; floating leaved plants 3 species, accounting for 10.3%; 13 kinds of submerged plants, accounting for 44.8%.Most of them are common species of fresh water in the middle and lower reaches of the Yangtze River. Although there are not many species of aquatic plants in Xinjiang, but other dominant species, except for reed, are all food for herbivorous fish, and they can be used as an attachment to oviposition and benthic animals inhabiting the sticky eggs. At the same time, the place where the aquatic plants are clustered is also the place where other aquatic organisms inhabit, feed or hide.

Table 3.8-8 List of aquatic vascular plants within the range of evaluation

Family name	Chinese	拉丁文名	Living type
potamogetonaceae	马来眼子菜	Potamogeton malaianus Miq.	sinking
	菹草	Potamogeton crispus L.	沉水
	黄丝草	Potamogeton maackianus A. Bennett	沉水
Najadaceae	多孔茨藻	Najas foveolata A. Br.	沉水
	小茨藻	Najas minor All.	沉水
Shelled turtle family	黑藻	Hydrilla verticillata (L.f.) Royle	沉水
	苦草	Vallisneria spiralis L.	沉水
Gramineae	菰	Zizania caduciflora (Turcz.ex Trin.) Hand.-Mazz	挺水
	芦苇	Phragmites australis (Cav.) Trin. ex Steud.	挺水
	荻	Miscanthus sacchariflorus (Maxim.) Benth.	挺水
Polygonaceae	毛蓼	Polygonum barbatum L.	挺水
	水蓼	Polygonum hydropiper L.	挺水
	箭叶蓼	Polygonum sieboldii Meisn.	湿生
Amaranthaceae	喜旱莲子草	Alternanthera philoxeroides (Mart.) Griseb.	漂浮
ceratophyllaceae	金鱼藻	Ceratophyllum demersum L.	沉水
	五刺金鱼藻	Ceratophyllum oryzetorum Kom.	沉水
Leguminous	田皂角	Aeschynomene indica L.	挺水
Lythraceous	节节菜	Rotala indica (Willd.) Koehne	湿生
Lancet	草龙	Jussiaea linifolia Vahl.	挺水
	水龙	Jussiaea repens L.	漂浮
Haloragidaceae	聚草	Myriophyllum spicatum L.	沉水
	轮叶狐尾藻	Myriophyllum verticillatum L.	沉水
Gentianaceae	金银莲花	Nymphoides indica (L.) O. Kuntze	浮叶
	荇菜	Nymphoides peltatum (Gmel.) O. Kuntze	浮叶
Scrophulariaceae	石龙尾	Limnophila sessiliflora (Vahl.) Bl.	沉水
Pedaliaceae	茶菱	Trapella sinensis Oliv	浮叶
lentibulariaceae	黄花狸藻	Utricularia aurea Lour.	沉水
The composite family	醴肠	Eclipta prostrate (L.) L.	挺水
	水蒿	Artemisia selengensis Turcz.	挺水

3.8.6 Fish

（1）Species composition of fish

The main fish composition investigation is mainly carried out by catch survey and fisherman visit. The investigation and identification 4 orders, 10 families and 40 species were investigated and identified. There are 29 Cypriniforms accounted for 72.5% of the total number. Siluriformes and perciformes are 5 species respectively, accounting for 12.5% of the total; 1 kinds of rice fish, accounting for 2.50%. In the Cypriniformes, there are 26 species of cyprinid fishes, accounting for 89.65%. 2 species of loach, accounting for 6.90%, and 1 species of loach, accounting for 3.45%. In Cyprinidae, the subfamily Cultrinae are the most species, a total of 6, accounting for 23.08% of the total number of Cyprinidae. Gudgeons and leuciscinae are both of 5 species, accounting for 19.23% respectively. 3 Xenocyprinae account for 11.54%. Cyprininae, hypophthalmichthyinae and danioninae are 2 respectively, accounting for 7.70%. Only 1 barbinae, accounting for 3.85%. Fish composition see table 3.8-9。

Table 3.8-9 Summary of fish composition in the evaluation area

Cyprinus carpio CYPRINIFORMES
Cyprinus carpio 科 Cyprinidae
鱼丹亚科 Danioninae
1 宽鳍鱲 Zacco platypus
2 马口鱼 Opsariichthys bidens
雅罗鱼亚科 Leuciscinae
3 Mylopharyngodon piceus Mylopharyngodon piceus
4 Ctenopharyngodon idella Ctenopharyngodon idella
5 Squaliobarbus curriculus Squaliobarbus curriculus
6 鳤 Ochetobius elongatus
7 Elopichthys bambusa Elopichthys bambusa
Hypophthalmichthys molitrix 亚科 Hypophthalmichthyinae
8 Hypophthalmichthys molitrix Hypophthalmichthys molitrix
9 Aristichthys nobilis Aristichthys nobilis
Cyprinus carpio 亚科 Cyprininae
10 Cyprinus carpio Cyprinus carpio
11 Carassius auratus Carassius auratus
鲌亚科 Culterinae
12 Pseudolaubuca sinensis Pseudolaubuca sinensis
13 鰵 Hemiculter leucisculus
14 Pseudolaubuca sinensis Culter alburnus
15 蒙古鲌 Culter mongolicus
16 Parabramis pekinensis Parabramis pekinensis
17 团头 Megalobrama skolkovii Megalobrama amblycephala
鲴亚科 Xenocyprinae
18 Xenocypris argentea Xenocypris argentea
19 Xenocypris davidi Xenocypris davidi
20 细鳞斜颌鲴 Xenocypris microlepis
鲃亚科 Barbinae
21 刺鲃 Spinibarbus sinensis
22 唇鱼骨 Hemibarbus labeo
鮈亚科 Gobioninae
23 花鱼骨 Hemibarbus maculatus
24 黑鳍鳈 Sarcocheilichthys nigripinnis

25 吻鮈 Rhinogobio typus
26 蛇鮈 Saurogobio dabryi
鳅科 Cobitidae
沙鳅亚科 Botiinae
27 花斑副沙鳅 Parabotia fasciata
花鳅亚科 Cobitinae
28 泥鳅 Misgurnus anguillicaudatu
平鳍鳅科 Homalopteridae
29 缨口鳅 Crossostoma davidi Sauv
Silurus asotus 形目 SILURIFORMES
Silurus asotus 科 Siluridae
30 Silurus asotus Silurus asotus
胡子 Silurus asotus 科 Clariidae
31 胡子 Silurus asotus Claris fuscus
鲿科 Bagridae
32 Pelteobagrus fulvidraco Pelteobagrus fulvidraco
33 粗唇鮠 Leiocassis
34 大鳍鳠 Mystus macropterus
合鳃鱼目 SYNBRANCHIFORMES
合鳃鱼科 Synbranchidae
35 黄鳝 Monopterus albus
鲈形目 PERCIFORMES
鮨科 Serranidae
36 Siniperca chuatsiSiniperca chuatsi
37 斑 Siniperca chuatsiSiniperca scherzeri
38 大眼 Siniperca chuatsiSiniperca knerii
鳢科 Channidae
39 Ophicephalus argusOphicephalus argus
Mastacembelidae
40 刺鳅 *Mastacembelus sinensis*

（2）Fish ecology

The fauna of the Xinjiang fish is divided into 4 faunal complexes: ① the Chinese plain complex: Mylopharyngodon, Ctenopharyngodon,Elopichthys,Xenocypris, Silver carps genera, Bighead Carp genera, saurogobio, Parabramis, megalobrama, culter, Siniperca, Gu genus, Guan genus and Ta genus.②India plain complex:Wei genus, Clarias, **Mystus**,**Channa, and** Monopterus.③India mountain complex: acrossocheilus of Barbinae；are mainly in the subtropical mountain torrent。④Paleogene Fish complex：Carp, Carassius carassius, Catostomus, and Silurus. The fauna of the Xinjiang fish is a mixture of Dongyang and paleo northern regions, with Dongyang region as its main body.

1）Ecological space utilization

According to the evaluation of fish habitat, in terms of the habitat space utilization, fish can be divided into five hydrostatic groups: bottom living group, middle and lower life groups, middle and upper class living groups, upper life group of water body, and the shore and hydrostatic marsh living taxa（See table3.8-10）。

In the evaluated section, the river valley is broad, the depth is shallow and the river bed is mainly gravel, fishes are more at the bottom and the middle and lower layer. There are fish that are fond of the shoal, for example loach and bagridae. There are catfish and carp which are fond of deep water or trough. There are the bottom fish that like clean water or micro water, such as loach, carp, eel and so on. The middle and upper life groups are mainly fish that prefer to live in the middle and upper water bodies such as deep pools and water tubs, like the roach, the grass carp, etc.。

The fish in the upper body of the water are mainly spindle-shaped, with strong swimming ability and fast moving fish. They are mainly culter, floating fish, and some of the predatory fish such as elopichthys Bambusa Culter Alburnus, etc. The life group of the coastal water grass beach is mainly the fish that likes the clean water environment or has the nesting habits, such as the ophiocephalus.

2）Diets

According to the evaluation of the food of the fish in the river, it can be divided into five groups, such as plankton feeding, omnivorous, algae feeding, vegetative and carnivorous.

Planktonic food fish are mainly planktonic and plant-based fish, such as silver carp and bighia. Omnivorous fish food is of diversity. Plant debris, benthic invertebrates, aquatic insects, large vascular plants, etc. can be used as the food. The main food is Mainly carp, crucian carp, loach and other carp family.

Algae feeding fish is to scrape eating algae as the main food of fish, mainly silver Gu and fine phosphorus plagiognathops microlepis Bleeker subfamily of fish etc；Herbivorous fish are mainly bream and grass carp which eat aquatic vascular plants. Carnivorous fish are fish eat other fish and shrimp as the main food, such as the Guan, fish, and fish and other species.

3) Demand for water environment

Among the fish in evaluation section, the following fish are demanding for flow patterns: zacco platypus, todarades, xenocypris davidi, plagiognathops microlepis, rhinogobio typus, Mystus macropterus Bleeker, and siniperca kneri.

In evaluation section, most fish is in favor of slow or calm water environment and they are not very strict with flow velocity requirements. In addition, during the fattening period, grass carp, squaliobarbus, black carp, silver carp and bighead carp, elopichthys Bambusa, Guan fish like slow - Hydrostatic environment, and during the spawning period they like acute water environment. See table 3.8-10。

Table 3.8-10 Main fish ecological groups in the evaluation area of Bazizui navigation-power junction

species	Habitat space utilization.					diets					Water demand	
	bottom	Middle and lower layer	Middle and upper layer	upper layer	Shallow water on the shore	plankton	Omnivorous	periphyton	Herbivorous	carnivorous	lotic water	Sluggish flow and still water
1 . Zacco Platypus			+				+				+	
2 . opsariichthys			+	+						+		+
3 . green fish	+	+					+				+	+
4 . grass carp		+	+						+		+	+
5. Squaliobarbus		+	+				+				+	+
6 . Guan			+	+						+	+	+
7 . elopichthys Bambusa			+	+						+	+	+
8 . bighead carp			+	+		+					+	+
9 . silver carp			+	+		+					+	+
10 . common carp	+	+					+					+
11 . crucian carp	+	+					+					+
12 .flying fish				+			+					+
13 . *Hemiculter leucisculus*				+			+					+
14. Culter alburnus Basilewsky			+	+						+		+
15 . Culter mongolicus Basilewsky			+	+						+		+
16 . Parabramis		+	+						+			+

species	Habitat space utilization.					diets					Water demand	
	bottom	Middle and lower layer	Middle and upper layer	upper layer	Shallow water on the shore	plankton	Omnivorous	periphyton	Herbivorous	carnivorous	lotic water	Sluggish flow and still water
pekinensis												
17 . Megalobrama amblycephala		+	+				+					+
18 . Silver todarades		+	+					+			+	
19 . The yellow tail todarades		+	+					+			+	
20 . plagiognathops microlepis		+	+					+			+	
21 barbudes Caldwell	+	+					+					+
22 .lips [fish bone]	+	+					+					+
23 . Flowers [fishbone]	+	+					+					+
24 . blacktip Quan	+	+					+					+
25 . Rhinogobio	+	+					+				+	
26 . saurogobio dabryi	+	+					+					+
27 . Parabotia fasciata Dabry	+						+					+
28 . Misgurnus anguillicaudatus	+						+					+
29 *Crossostoma davidi*	+	+					+				+	

species	Habitat space utilization.					diets					Water demand	
	bottom	Middle and lower layer	Middle and upper layer	upper layer	Shallow water on the shore	plankton	Omnivorous	periphyton	Herbivorous	carnivorous	lotic water	Sluggish flow and still water
30 . catfish	+	+								+		+
31 Silurus Silurus	+	+								+		+
32 . yellow catfish	+	+								+		+
33 Leiocassis crassilabris	+	+								+		+
34 . Mystusmacropterus	+	+								+	+	
35 . eel	+	+								+		+
36 . Siniperca chuatsi			+	+						+		+
37 . sinipercascherzeri			+	+						+		+
38 . sinipercakneri			+	+						+	+	
39 . Argus	+				+					+		+
40 . loach	+						+					+

4）Breeding habits

According to the selection of spawning environment and the nature of the fertilized egg, the fish species in the evaluation section can be divided into 5groups: the drifting eggs group, the floating eggs group, the group of producing sticky eggs in flowing water and the stickiness, the ovary group in the still water, and the sinking oviposition group (see Table 3.8-11).

Drifting eggs group that is the fish whose eggs are produced in a certain water environment spawning, and eggs drift with water, including the four major domestic fish， zong fish, and gan fish. Production of eggs floating group, the fertilized egg is lighter, were floating on the surface of hatch, including mandarin fish, snakehead, eel, eel and other parts which Argus and fish nest and guard the eggs habit. The group of producing sticky eggs in flowing water and the stickiness are fishes whose fertilized eggs are attached to the bottom of the fish hatchery. It includes the fishes such as the polygonal and bagridae. The ovary group in the still water is fishes whose fertilized eggs are attached to Water grass and stones near shore, including common carp, crucian carp, *Hemiculter leucisculus and other f*ishes of the subfamily of cyprinidae. The sinking oviposition group is a group of fishes that produce sedimentary eggs on the bank of the river. They are mainly yellow catfish.

Table 3.8-11 Fish oviposition environment demand in Bazizui Navigation-power junction

species	Oviposition type					Oviposition environment demand			
	Floating eggs	Floating eggs	Flow viscosity	Hydrostatic viscosity	Precipitated egg	Flowing water Base sand and gravel	Static or slow Water and water grass / stone bank	Nesting in still water	Flow drifting
1 . Zacco Platypus	+					+			
2 . opsariichthys	+					+			
3 . green fish	+								+
4 . grass carp	+								+
5. Squaliobarbus	+								+
6 . Guan	+								+
7 . elopichthys Bambusa	+								+
8 . bighead carp	+								+
9 . silver carp	+								+
10 . common carp				+			+		
11 . crucian carp				+			+		
12 .flying fish				+			+		
13 . *Hemiculter leucisculus*				+			+		
14. Culter alburnus Basilewsky	+						+		

15 . Culter mongolicus Basile wsky	+						+		
16Parabramis pekinensis				+			+		
17 . Megalobrama amblycephala				+			+		
18 . Silver todarades			+						+
19 . The yellow tail todarades			+						+
20 . plagiognathops microlepis			+						+
21 barbudes Caldwell			+						+
22 .lips [fish bone]			+						+
23 . Flowers [fishbone]			+						+
24 . blacktip Quan	+					+			
25 . Rhinogobio	+								+
26 . saurogobio dabryi	+								+
27 . Parabotia fasciata Dabry	+								+
28 . Misgurnus anguillicaudatus			+					+	
29 *Crossostoma davidi*	+						+		
30 . catfish			+				+		
31 Silurus Silurus			+			+			
32 . yellow catfish					+	+			
33 Leiocassis crassilabris					+	+			
34 .					+	+			

Mystusmacropterus									
35 . eel		+						+	
36 . Siniperca chuatsi		+							+
37 . sinipercascherzeri		+							+
38 . sinipercakneri		+							+
39 . Argus		+				+			
40 . loach	+					+			

5）Spawning environment demand

It can be divided into four groups, such as running water/sediment gravel, still water or slow flowing water/water grass and stone bank, still water/nesting, and running water/drifting, etc.（See table 3.8-11）：

Most fishes produce eggs in running water/sediment gravel environment. They are Zacco Platypus,catfish and yellow catfish. The fishes produce eggs at watergrass or stone on the shore in still water are culter, common carp,crucian carp, and Misgurnus anguillicaudatus. Eels nest and produce eggs in a still water environment. The fish that produce driftwing eggs under flowing water environment are represented by "four major domestic fish", including elopichthys Bambusa , guan fish and Silver todarades。

（3）M igratory fish

There are rivers and lakes and Jianghai reproductive migratory fish in the Xinjiang River Basin. The more famous are the Chinese sturgeon and the Chinese mandarin fish. Due to various factors, the two kinds of fish are not currently found.

There are 11 species of migratory habitat in the assessment section of the river, namely “four major domestic fish”, guan, elopichthys Bambusa, Parabramis pekinensis, silver todarades, yellow tail todarades, and plagiognathops microlepis. Among them，8 species including “four major domestic fish” Squaliobarbus, guan, elopichthys Bambusa, Parabramis pekinensis are migratory fish. They propagate in flowing water during the breeding season with the process of rising water. 3 Xenocyprinae including silver todarades, yellow tail todarades, and plagiognathops microlepis spawn in running water during the flood season, but their migration routes are shorter.

（4）Rare and specific fish fauna

There is no rare fish in the assessment section. Rare fish are Chinese sturgeon, white sturgeon, catfish, zong fish, mullet, and coreosiniperca roulei. Among them, Chinese sturgeon and white sturgeon are national Class I protected wild animals, while Chinese sallow fish are national Class II protected wild animals. Chinese sturgeon, white sturgeon, bighead carp, zong fish, mullet, and coreosiniperca roulei are listed in the "Red Book Fish of Endangered Animals in China."

In 1954-1983, there were Chinese sturgeon and white sturgeon found in the section of Xinyang River near Poyang County in the Poyang Lake area, but the numbers were small and the individuals were small. No records were found in Xinyang River section above Poyang County. According to the history of Yujiang County Fisheries Station, before the 1980s， in Yujiang County thousands of kilograms of crucian carp had been captured. The captures of mullet are also more. But since the 1980s No crucian carp and mullet were collected during the Xinjiang river fish resources survey. In the assessment of river catchment in recent years, zong fish, coreosiniperca roulei almost disappeared. To sum up, Chinese sturgeon, white sturgeon, crucian carp, and mullet in the evaluation of rare fish has no distribution, and Zong fish, and coreosiniperca roulei also basically difficult to see.

（5）Important habitats of fish

① Oviposition field

The glutinous egg fishes of xinjiang river are concentrated in April and June, and there are mainly bagridae, catfish and crucian carp, crucian carp, and so on. Generally, the requirement of oviposit is not strict, as long as the water temperature requirements are met, the necessary adhesion matrix can form their spawning grounds. Some can lay eggs in the static water environment, such as carp, crucian carp, etc. Some require a certain amount of water stimulation to lay eggs, such as such as the catfish and bagridae. The habitat conditions that meet these fish breeding are more common in Xinjiang river waters. Correspondingly, the spawning grounds of these fish are also scattered, and the river sections of the aquatic plant communities of Xinjiang river tend to be the main sites for the spawning and reproduction of Xinjiang fish, and the spawning scale is small and unstable.

According to the investigation, within the scope of the evaluation, a large number of fish spawning grounds has not yet found within the assessment range.

② Overwintering field and bait field

It is generally the deep pool formed by the water flowing under the rapids. The deep lake bed is mostly rock, reef and gravel, and the bait is rich. The part of Xinjiang fish overwintering field are Xinjiang Yushan section downstream lake pool, Shangrao section downstream Maojiatan, the dry flow Jiepai reservoir dam.

After March, the water temperature of the Xinyang River gradually rose, and the fish crawled from the shallow water of the gravel bank or the slow-flow area from the overwintering deep-water area. From April to May, the water level of the main tributaries of the Xinyi River started to rise, and some of the fish went upstream along the tributaries. In the flood season, the fish in the XINJIANG River area traced back to the submerged areas and tributaries with increasing water, broadening the range of feeding.

Fish, with organic detritus and benthic invertebrates as the main food, are generally used shallow water areas, good light conditions, reef or gravel beach, and rich river sections as feeding ground. Most of the feeding areas of hippophyllous habitat are gentle gravel long beach. The feeding areas of slow-flow or hydrostatic fish tend to be along the straight Tan Tam River, the river backwater area, the open and gentle river reach, and the tributary estuary reach and the tributary of the Xinjiang River, which have a gentle flow between the rapids.

According to the survey, within the scope of evaluation, no large scale fish wintering and feeding grounds have yet been found.

3.8.7 Fishery resources

In the early 1980s, some of the main fishing targets of Xinjiang were grass carp, Parabramis pekinensis, *Megalobrama skolkovii,* culter, Xenocypris argentea, *Distoechodon tumirostris* Peters, Cyprinus carpio, Siniperca chuatsi. Due to the different ecological conditions in the various river sections and rivers, the main types of catchment are also different. In Xinjiang river, the highest fish yield is Parabramis pekinensis, Megalobrama skolkovii ,Siniperca chuatsi, and followed by Elopichthys bambusa, and culter； and then followed by Xenocypris argentea, Xenocypris davidi, and Cyprinus carpio. In the late 80s of the 20th century, Xinjiang's main economic fish are: Siniperca chuatsi, Parabramis pekinensis, Megalobrama skolkovii, culter, Elopichthys bambusa, Xenocypris davidi, Xenocypris argentea, Cyprinus carpio, Ctenopharyngodon idella, Mylopharyngodon piceus, Hypophthalmichthys molitrix, Aristichthys nobilis, Carassius auratus, distoechodon tumirostris peters, Silurus asotus, Pelteobagrus fulvidraco, Squaliobarbus curriculus, Hemibarbus maculatus, Anguilla japonica,Hemisalanx prognathus Regan and etc.

According to 2009 Yingjiang Yingtan fishery resources survey, common economic fish include: Cyprinus carpio, Carassius auratus, Xenocyprinae, Silurus asotus, Squaliobarbus curriculus, Pelteobagrus fulvidraco, Parabramis pekinensis, Ophicephalus argus, Siniperca chuatsi, Pseudolaubuca sinensis, Pseudolaubuca sinensis and etc. Hemibarbus (30.25%) and Parabramis pekinensis (20.56%) were the most abundant； Xenocyprinae(14.22%), Cyprinus carpio and

Carassius auratus（13.34%）,Pelteobagrus fulvidraco （11.69%）; “four major domestic fish” accounts for 1.95%. In weight composition, Cyprinus carpio, and Carassius auratus are up to 37.38%; Parabramis pekinensis,Culterinae is 30.88%; “four major domestic fish” is 18.09%（Table 3.8-13）。

Table 3.8-13 Composition of catches in Yingtan section of Xinjiang River

Species	Quantity（piece）	percentage（%）	weight（kg）	percentage（%）
Xenocypris	928	14.22	46	2.65
Squaliobarbus curriculus	410	6.28	82	4.72
Cyprinus carpio, Carassius auratus	871	13.34	649	37.38
Parabramis pekinensis, Culter	1342	20.56	536	30.88
Four Famous Domestic Fishes	127	1.95	314	18.09
Yellow foreheading fish	763	11.69	26	1.50
Hemibarbus, Pseudolaubuca sinensis	1975	30.25	45	2.59
other*	112	1.72	38	2.19
sum	6528	100	1736	2.65

* Including, snakehead, catfish, loach minnow etc.

In 2009, a total of 247 “four major domestic fish” were collected from the 2009 fish resources survey of “four major domestic fish”. Among them, there are 6 Mylopharyngodon piceus, accounting for 2%,101 Ctenopharyngodon idella101， accounting for 11%, 27 Hypophthalmichthys molitrix， accounting for 41%, 113 Aristichthys nobilis, accounting for 46%. Survey shows： The specimen of Mylopharyngodon piceus is small and the weight distribution is very uneven. The age structure of the "four major domestic fish" in xinjiang river is relatively simple, mainly with 1 age and 2 years old fish. Mylopharyngodon piceus of Age1 or Age 2 accounts for 75% of the total. Hypophthalmichthys molitrix of Age1 or Age 2 accounts for 71% of the total. Ctenopharyngodon idella and Aristichthys nobilis1 of Age1 or Age 2 accounts for 81% and 90% of the total respectively. Due to the influence of human activities increased, fish stocks to drop, mainly displays in the following aspects. Fish species and quantity decreased significantly. In recent years, some migratory fish such as shad, and pufferfish almost extinct in Xinjiang river. Taiwan white turtle, lip Hemibarbus, *Tor brevifilis* are very rare. The yield of Hemibarbus maculatus ,Squaliobarbus curriculus also dramatically decreased. The fish is younger, and the trend of miniaturization is obvious. The individual and age of the catch are decreasing. In the investigated “four major domestic fish”, the age structures of Mylopharyngodon piceus, Ctenopharyngodon idella, Hypophthalmichthys molitrix and Aristichthys nobilis were 1-2 years old. In the investigated barbudes Caldwell, the total length of the individual fishing rate below 30cm was 70%. In Fengxi river, The fishing specifications and fishing age of the 7 main economic fishes were all small. They are Hemibarbus maculates, Mylopharyngodon piceus, Ctenopharyngodon idella, Hypophthalmichthys molitrix, Aristichthys nobilis, Cyprinus carpio, and Silurus asotus. Most of the individuals were not sexually mature, and the mortality coefficient was higher in the population, and the fish resources in xinjiang river showed a significant trend of degradation.

3.9 Investigation and Evaluation on Present Situation of Groundwater Environment

(1) Layout of monitoring points

5 monitoring sites were selected along the proposed poject location. Layout of monitoring points see table 3.9-1and fig. 16.

Table 3.9-1 Layout of groundwater monitoring points

Serial number **of monitoring points**	**Monitoring points**	township
GW1	Daxi village	Daxi county
GW2	Hebu village	Yangbu town
GW3	Pingshang village	Xishan county
GW4	Tangbei village	Huangjinbu town
GW5	Laowuyujia	Meigang county

(2) Detection factor and time

13 Detection factor：pH,Nitrate, nitrite, volatile phenols, total hardness, fluoride, sulfate, chloride, CODMn,As,Cd,Cr+6,Pb.

The monitoring process is 9-10 March 2017

(3) Sample analysis method

Analysis is according to the "water and wastewater monitoring and analysis methods" (fourth edition) promulgated by the State Environmental Protection Administration. See table 3.9-2。

Table Table 3.9-2 Analysis method and Monitoring instrument

Detection factor	Monitoring **method**	**detection limit （mg/m^3）**
pH	"Determination of water quality pH glass electrode method" (GB 6920-1986)	0.01（dimensionless）
Nitrate nitrogen	"Determination of water quality nitrate nitrogen UV spectrophotometry (Trial)"（HJ/T 346-2007）	0.08
Nitrite Nitrogen	"Determination of water quality nitrite nitrogen spectrophotometry"（GB 7493-87）	0.003
Volatile phenol	"Determination of water-volatile phenol 4-amino antipyrine spectrophotometry"（HJ 503-2009）	0.0003
Total calcium and magnesium	"Determination of total calcium and magnesium in water EDTA titration method"（GB 7477-1987）	0.05mmol/L
fluoride	“Determination of water fluoride ion-selective electrode	0.05

Detection factor	Monitoring **method**	**detection limit** (**mg/m³**)
	method" (GB 7484-87)	
sulfate	“Determination of water quality sulfate barium chromate spectrophotometry (Trial)" (HJ/T 342-2007)	8
chloride	"Determination of water quality chloride silver nitrate titration method" (GB 11896-89)	10
Permanganate index	"Determination of water quality permanganate index" (GB 11892-1989)	0.5
arsenic	Water and Wastewater Monitoring and Analysis Methods (Fourth Edition) Atomic Fluorescence	0.3ug/L
copper lead zinc cadmium	"Water quality copper, zinc, lead, cadmium Determination of atomic absorption spectrophotometry"》(GB 7475-1987)	copper：0.005 lead：0.005 zinc：0.005 cadmium：0.001
Six valent chromium	"Determination of water quality hexavalent chromium diphenylcarbazide spectrophotometry" (GB 7467-1987)	0.004

(4) evaluation standard

The groundwater quality is carried out according to the standard of groundwater quality standard (GB/T14848-93) class III, see table 1.5-4。

(5) evaluation method

The standard index method is used to evaluate the groundwater environment quality of the project by single factor.

Standard index evaluation formula for single water quality parameters:

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

In the formula：Pi——Standard index of water quality factor i, dimensionless；

Ci——Monitoring concentration of the water quality factor i, mg/L；

Csi——Standard concentration of water quality factor i，mg/L。

When the standard index of water quality factor > 1, it indicats that the water quality factor exceeds the required water quality standards limit. The greater the index value, the more serious the water quality factor exceeded the standard.

(6) Evaluation results and reason analysis

Results of groundwater quality are shown in Table 3.9-3

Table 3.9-3 Ground water monitoring data and Pi value

Article	Parameter	GW1	GW2	GW3	GW4	GW5
PH	monitoring data	7.03	6.995	7.07	7.035	7
	limit value	6.5~8.5				
	Pi value	0.265	0.2475	0.285	0.2675	0.25
	reach the standard?	Yes	Yes	Yes	Yes	Yes
	over limit rate	0	0	0	0	0
N-NO3	monitoring data	1.05	0.8525	1.123	0.966	0.8775

Article	Parameter	GW1	GW2	GW3	GW4	GW5
	limit value	≤20	≤20	≤20	≤20	≤20
	Pi value	0.053	0.043	0.056	0.048	0.044
	reach the standard?	Yes	Yes	Yes	Yes	Yes
	over limit rate	0	0	0	0	0
N-NO2	monitoring data	n.d.	n.d.	n.d.	n.d.	n.d.
	limit value	≤20	≤20	≤20	≤20	≤20
	Pi value	—	—	—	—	—
	reach the standard?	—	—	—	—	—
	over limit rate	—	—	—	—	—
Volatile Vhenols	monitoring data	n.d.	n.d.	n.d.	n.d.	n.d.
	limit value	≤0.002	≤0.002	≤0.002	≤0.002	≤0.002
	Pi value	—	—	—	—	—
	reach the standard?	—	—	—	—	—
	over limit rate	—	—	—	—	—
General Hardness	monitoring data	104.56	111.595	106.135	120.72	114.45
	limit value	450	450	450	450	450
	Pi value	0.232	0.248	0.236	0.268	0.254
	reach the standard?	Yes	Yes	Yes	Yes	Yes
	over limit rate	0	0	0	0	0
Fluoride	monitoring data	0.467	0.514	0.487	0.524	0.4465
	limit value	≤1.0	≤1.0	≤1.0	≤1.0	≤1.0
	Pi value	0.467	0.514	0.487	0.524	0.4465
	reach the standard?	Yes	Yes	Yes	Yes	Yes
	over limit rate	0	0	0	0	0
Sulfate	monitoring data	31.295	32.64	30.45	31.635	33.115
	limit value	≤250	≤250	≤250	≤250	≤250
	Pi value	0.125	0.131	0.122	0.127	0.132
	reach the standard?	Yes	Yes	Yes	Yes	Yes
	over limit rate	0	0	0	0	0
Chloride	monitoring data	49.83	41.71	66.31	57.655	52.26
	limit value	≤250	≤250	≤250	≤250	≤250
	Pi value	0.199	0.167	0.265	0.231	0.209
	reach the standard?	Yes	Yes	Yes	Yes	Yes
	over limit rate	0	0	0	0	0
Permanganate Index	monitoring data	0.923	1.035	0.9645	1.13	0.8855
	limit value	≤3.0	≤3.0	≤3.0	≤3.0	≤3.0
	Pi value	0.308	0.345	0.322	0.377	0.295
	reach the standard?	Yes	Yes	Yes	Yes	Yes
	over limit rate	0	0	0	0	0
As	monitoring data	n.d.	n.d.	n.d.	n.d.	n.d.
	limit value	≤0.002	≤0.002	≤0.002	≤0.002	≤0.002
	Pi value	—	—	—	—	—
	reach the standard?	—	—	—	—	—
	over limit rate	—	—	—	—	—
Cd	monitoring data	n.d.	n.d.	n.d.	n.d.	n.d.
	limit value	≤0.002	≤0.002	≤0.002	≤0.002	≤0.002
	Pi value	—	—	—	—	—
	reach the	—	—	—	—	—

Article	Parameter	GW1	GW2	GW3	GW4	GW5
	standard?					
	over limit rate	—	—	—	—	—
CrVI	monitoring data	n.d.	n.d.	n.d.	n.d.	n.d.
	limit value	≤0.002	≤0.002	≤0.002	≤0.002	≤0.002
	Pi value	—	—	—	—	—
	reach the standard?	—	—	—	—	—
	over limit rate	—	—	—	—	—
Pb	monitoring data	n.d.	n.d.	n.d.	n.d.	n.d.
	limit value	≤0.002	≤0.002	≤0.002	≤0.002	≤0.002
	Pi value	—	—	—	—	—
	reach the standard?	—	—	—	—	—
	over limit rate	—	—	—	—	—

According to the monitoring results of table 3.9-3, compared with Class III standards in *the Groundwater Quality Standard (GB/T14848-93)*, comprehensive water quality index of groundwater the five sample points: Daxi village, Hebu village, Pingshang village, Tangbei village, Laowuyujia reach *"the Groundwater Quality Standard" (GB/T14848-93)* class III standard, indicating that the local groundwater overall water quality is better.

3.10 Major environmental problems

（1）Weak ecosystem service function

The vegetation coverage rate of the project area is relatively high, but most of them are artificial forests with low hills and hills. Because of their simple tree species and simple community structure, their primary productivity is relatively low, and their functions of maintaining biodiversity are relatively weak. Because of overfishing, human activities and so on, the ecological environment is damaged and polluted, and the function of regional ecosystem service is weak.

（2）The problem of agricultural surface source pollution is becoming more and more prominent, affecting the water environment and rural living environment.

The average application amount of chemical fertilizers and pesticides showed an upward trend in the project area. A lot of nitrogen and phosphorus nutrients and livestock and poultry excrement flow into the surface water with surface runoff, affecting the water environment and rural living environment.

（3）Flood disaster

The project area is located in the alluvial plain of the mid and downstream of Xinjiang River. Due to the low topography along the Xinjiang River, it is easily attacked by floods such as Xinjiang river and Baita river. The flood and waterlogging disasters are more serious, which makes the regional social economy suffer great losses.

（4）Aquatic ecological habitat destruction

Project is located in the mid and downstream regions of Xinjiang river. Jiepai navigation-power junction project has been built within the region. No fishway and other migratory facilities, over fishing and other human activities caused the serious aquatic ecological habitat destruction in the region, the decreasing aquatic ecological environment, degradation of diversity, and the aggravated phenomenon of low age, miniaturization and low value of fish.

4. Engineering analysis

4.1 The Environmental Impact Analysis during the Construction Period

4.1.1 The Environment and Air Conditions

The main source of air pollution during the construction period of Bazizui Navigation and Hydropower Project is the flying dust from construction activities such as the excavation and backfill of earth rock, sand processing, concrete mixing, transportation of cement and other dusty materials, as well as the gas emission from construction machinery and vehicles during the operation. The main pollutants are TSP, PM10, NO2 and etc., among which the flying dust is the main air pollution sources during the process of construction.

1) Dust from the concrete mixing

The project set one concrete mixing system and one aggregate processing system, which are both set in the small island of the river in the downstream of the dam axis. The main pollutant of concrete mixing dust is TSP. According to the measured data of the same kind of construction site, the TSP concentration at 50m downwind of concrete mixing station is of 8.90mg / m3 and 1.65mg / m3 at 100m of that. The TSP concentration at 150m downwind site can meet the requirements of *Ambient Air Quality Standard* (GB3095 -2012) that the daily average concentration shall be less than 0.30mg / m3.

2) Traffic dust

Traffic dust mainly comes from construction vehicles. Under normal circumstances, if the cleanliness of the road is same, the faster the speed, the more dust that generate. However, if it is under the same speed conditions, the dirtier the road, the more dust.

In order to meet the traffic needs in the construction area, the 1 # highway is planned to be built on the left bank, the 2 # highway on the river heart island and the 3 # highway on the right bank. All of them are built with concrete pavements. According to the data of the analog survey, the TSP concentration at 50m downwind direction from the dust transport vehicle is 11.62mg / m3, 9.69mg / m3 at 100m downwind direction and 5.09mg/m3 at 150m downwind direction. The TSP concentration at 160m downwind direction can meet the requirements *of Air Pollutant Release Standard* (GB16297-1996) that the unorganized emission concentration shall be less than the limit (5.0mg / m3).

3) Construction work surface dust

Dust generated from construction work side mainly comes from bare ground such as slag yard, excavated side and so on, which is easy to produce dust in dry weather, especially with strong winds.

The amount of dust generated is related to the construction method, working area, construction machinery, and weather conditions. According to the relevant documents, by reference to the construction site, the emission rate of dust in the construction work surface is 19.44 × 10-5g / s.m2.

(2) Mechanical wasted gas

In the process of construction, due to the a large amount use of fuel machinery and transportation vehicles, wasted gas such as NO2 and CO will be generated during the period. Mechanical wasted gas are continuous and unorganized emission sources, which distributed in a way of non-point.

According to the *Environmental Protection Practical Data Manual*, the emission coefficient of air pollutants for diesel engines is No2 for 21.9g / L, CO for 33.3g / L, and gasoline engine is NO2 for 22.3g / L and CO for 191g / L.

4.1.2 Water Environment

The diversion of construction cofferdam will partly change the flow velocity and flow regime at the dam site of the mainstream of Xinjiang River.

After the construction process and the formation of longitudinal cofferdam, the initial drainage and reclamation of foundation pit will be formed, and the SS concentration is above normal. Flushing wastewater from aggregate system, alkaline wastewater with high SS concentration from concrete curing and tank flushing, muddy water from curtain grouting and consolidation grouting, and domestic sewage from construction workers. If the wasted water has been charged without treated, they will influence the water environment of Xinjiang River.

(1) Sand and gravel washing wastewater

The largest amount wastewater emitted during construction period is the flushing wastewater from aggregate system. The production capacity of aggregate system is 500t / h, then the wastewater from aggregate system is about 320m3 / h, that is 7680m3 / d, the main pollutants are the suspended solids SS.

The way of discharge of flushing wastewater from aggregate is the intermittent discharge, which may has fluctuations. According to the composition analysis, the mud content of gravel pack is 0.2% to 1.5% and the average is 0.6%. To calculate from above, the gravel concrete system flushing wastewater SS concentration is between 5000 ~ 37500mg / L and the average is about 15000mg / L, the concentration is above the normal.

(2) Foundation drainage

This project adopts the second-stage diversion plan. The first and second stages are mainly constructed under the protection of cofferdam to form pit drainage, including the initial drainage and reclamation of foundation pit. The regular drainage of foundation pit consists of precipitation, water seepage and construction drainage. The construction drainage mainly consists the high concentrated SS wastewater produced by concrete maintenance, alkali wastewater from curtain grouting and consolidation grouting and so on. Therefore, the main pollutants in foundation pit drainage are SS and PH. Analogous to similar avionics projects, the SS concentration of reclaimed water is about 2000mg / L, and the PH is 9-11 due to the inflow of concrete curing wastewater.

(3) Concrete conservation and tank washing waste water

The total amount of concrete in this project is 926,000 m3. The wastewater of concrete mixing system comes from the flushing of concrete mixing building and material tank. This project sets up a set of concrete system in the construction area in the heart island of the river and disposes two concrete mixing buildings. The volume of each flushing wastewater in concrete mixing building is about 8m3, and flushing two times a day. The amount of flushing wastewater generated is about 32m3 per day. The SS concentration of it is 5000 mg / L and the PH is about 12.

(4) Mechanical oily wastewater

According to the construction organization design, Bazizui navigation junction set the mechanical repair plant. The construction machinery and vehicles used for various construction activities such as earthwork excavation, concrete pouring and foundation treatment of this project include a total of 76 sets of excavators, dump trucks and bulldozers. It is estimated that these construction machines and vehicles will produce 7.6m3 / d flushing wastewater during the repair and cleaning process, and the petroleum concentration of it is about 30 ~ 150mg / L.

In addition, the construction of the project will also use six ships such as positioning ship, sand barge and other vessels. Main pollutants are the oily wastewater generated by the operation of the ship machinery lubricants and cooling water. The oil production capacity of single ship can reach 0.5m3 / D, and the oil concentration is 2000 ~ 5000mg / L (an average is 3500mg / L). According to the actual experience of oil-water separator treatment, the highest concentration of oil-containing wastewater treatment does not exceed 15mg / L. At the peak of this project, if it is estimated to be 6 vessels and its wastewater discharge from ships is about 3.0m3 / d. After oil-water separator treatment, the amount of petroleum emissions is about 45.0g / d.

(5) Cement soil waste water

The cement soil waste water produced by concrete anti-seepage wall is mainly distributed in the earth-rock fill dam, the floodwall on the right bank and the diversion dams. Among which, the left and right bank earth-rock fill dam often generate cement and soil waste water, and then they will gather into the pit and become a regular drainage. The solid grouting waste water is often generated from the sluice, power plant and ship lock. All of them will recuperate into the foundation pit. The curtain grouting cement soil waste water generated from the sluice will also gather into the foundation pit. It is estimated that 50m3 / d of cement soil waste water will be produced during construction.

(6) Domestic sewage

The number of labors in construction peak period is 2060, and the main pollutants in domestic sewage from construction workers are COD, BOD5 and etc. The concentrations are about 300mg / L and 200mg / L respectively. The amount of water used during construction period is 120L / (person · d), and the amount of sewage will takes 80% of total water used, then the daily domestic sewage is about 197.8m3 in the construction peak period.

The discharge amount and particular pollutants during the construction of Bazizui Navigation and Hydropower Project are shown in Table 4.3-4.

Table 4.3-4 Pollution sources during the construction period of Bazizui Navigation and Hydropower Project

Wastewater	**Produced volume (m3 / d)**	**Particular pollutants**
Aggregate flushing wastewater	7680	SS
Concrete tank flushing wastewater	32	SS，pH
Cement soil waste water	50	SS
Mechanical oily sewage	10.6	Petro
Domestic sewage	197.8	COD、BOD_5

4.1.3 Acoustic environment

Noises caused by the excavation, slag and other types of drilling rigs and transport vehicles during the construction.

(1) Construction machinery noise

The sources of mechanical noise mainly come from the construction activities such as the air compressors, excavators, bulldozers, drilling, vibrating, grouting and excavation and slag discharging and etc., which often happen in the dam area and the construction road. The strength of sound source is generally between 80 ~100dB (A).

(2) Aggregate processing system

Aggregate processing system is a continuous point sound source. Refer to the actual measured noise produced from aggregate processing equipment, the sound produced by all the equipment is used as the source intensity, and its noise source intensity can reach 112dB (A).

(3) Other production activities from auxiliary enterprises

Other auxiliary enterprises are steel processing factories and wood processing factories, which has the intermittent point sound source. The source intensity is between 90 and 104 dB (A). Such auxiliary enterprises generally have a simple factory wall, and then the noise will be some weakened due to the blocked by the wall.

(4) Traffic noise

The main traffic noise in the construction site are from trucks with 10t ~ 15t load capacity, vehicle transportation and road construction. Traffic noise source intensity has strong relations with the load type and speed of vehicle, which usually between 70 ~ 90dB.

According to the selection of construction equipment, the noise sources intensity of the main construction machinery, vehicles and processing equipment are strong (take the maximum value), and the details of the noise sources intensity in each construction area are shown in Table 4.3-5.

Table 4.3-5Main construction machinery and its noise source intensity table of Bazizui Navigation and Hydropower Project

Name of the equipment or system	Specifications and models	Maximum noise (dB (A)) of the Single machine (ship)
Excavator	1.0m^3	84
Concrete mixing machine	0.4 m^3	79
Bulldozer	80～120 Horsepower	86
Loader	20t	89
Aggregate processing system		112
Concrete mixing system		104
Metal structure processing plant		95
Integrated processing plant		90(takes the maximum value)
Main construction area		97

4.1.4 Ecosystem

The project sets Xiongjia Village soil material field on the right bank as I_1, the Minfang Village soil material field on the left bank as I_2, and the gravel material field on the Tongkou Village on the left bank, which covers an area of 13.30hm2 in total. The main type of land use of the soil material field is woodland and grassland. The excavation will damage the ground vegetation and habitat. The project will set hub for waste disposal, which covers an area of 249.59hm2. But the waste disposal hub will occupy the area of vegetation, and then may influence the surrounding land use. The transportation and disposal of waste during the construction may easily cause water and soil loss. Due to the diversion of open channel, the hydrological conditions such as flow field, flow velocity and flow pattern in the dam section may be changed, which will affect the habitat and migration of aquatic organisms such as fish.

4.1.5 Solid Waste

The amount of slag generated from excavation and cofferdam demolition of buildings, solid waste such as forest debris from the storehouse and domestic waste of construction workers.

This project produced a total of 7,587,100 m3 of waste slag and 2,500 trees in the storehouse.

The average amount of workers in the construction peak during the construction period is about 2,060 and the labor force required is about 1.7 million working days. According to that 1.0 kg of domestic waste will be produced per capita every day, construction workers will produce 2.06t of household garbage every day, and in total is about 1700t of the construction period.

4.2 Inundation, land occupation and resettlement of Inhabitant

Inundation of the reservoir area and permanent land occupation of the project will leave certain impacts on agricultural production and fishing. Thus, the normal life conditions of inhabitant will also be influenced.

The project does not involve the relocation of inhabitants and will not set a resettlement region. The cultivated land, which will be expropriated, involve Zhuqiao Village, Huangjinbu Town, Yugan County, with an annual resettlement population of 86 people.

The infrastructure construction and land reclamation will have an impact on land resources, soil erosion, and terrestrial ecology.

Inundation of reservoirs and land occupation of the project will mainly influence different kinds of environmental factors such as terrestrial plants, terrestrial animals, land use patterns, water environment and environmental geology. Inundation of reservoirs and land occupation will cause the decrease of vegetation distribution, and the changes of species and distribution of plants and animals.

After the impoundment of reservoirs, the enlargement of aquatic habitats may cause changes of species and distribution of aquatic organism and fish. In the early stage of reservoir impoundment, the decomposition of organic matter in the vegetation will release nutrients to the water body, which may cause water environment problems. During the impoundment of reservoir, environmental problems such as landslide and leakage may occur.

4.3 Analysis of Environmental Impact during Operation

4.3.1 Hydrological situation

When Bazizui navigation and hydropower project began to operate, the project itself does not discharge any pollutants. However, due to the blocking of river's dam, the dam water level, flow and velocity will be changed.

Bazizui Navigation hub is the low dam riverbed power station, which means the water level will not be out of the channel. It will only be adjusted daily in the dry season. When the flood season comes, it will be dynamically adjusted and operated according to water volume. Under the circumstance, the reservoir has no adjustable storage capacity, and is a radial-flow power plant. The impact of the reservoir on the hydrological situation is mainly reflected in the increase of the flow in the lower reaches of the dam site after the reservoir is built up and the peak cutting capacity in the flood season. Meanwhile, the flow in the downstream of the dam site is averaged. After the construction of the Bazizui navigation and hydropower project, the water depth in the upper stream has increased and the water level has been improved. The water level in both upper stream and downstream will have some changes.

4.3.2 Water Environment

The main impacts on the water environment during the operation period of the project are as follows: the water quality of the reservoir and the water temperature. The domestic sewage from staff's and wastewater from vessels will also have impacts on the water environment.

(1) The possible change that may happen on water quality and water temperature

After the completion and operation of Bazizui Navigation and Hydropower Project, the water level in the reservoir section will be raised and the hydrological conditions will change. The main manifestation is that the flow velocity of water bodies is slower than that of natural rivers. Although the reservoir formation will increase the volume of river channels, the diffusibility and degradation capacity of water will be wakened, especially in nearshore area, the self-purification capacity will decline, which will make some change of the water quality in Yugan County, Huangjinbu.

When the project begins its operation, the water level in the reservoir area becomes high than before, which may cause the change of water temperature in the reservoir. Thus, it may affect the terrestrial organisms and irrigated crops in the downstream river sections.

(2) Management of domestic sewage

Because there are only a few administrative staff in Bazizui navigation and hydropower project, the domestic sewage discharge during the operation period is about 22.9m3 / d according to the data that there are 191 administrative staff, the water consumption is 150L / (person · d) and the sewage discharge takes 80% of the total amount.

(3) Wastewater of vessels

After the project is completed and put into operation, the condition of navigation channel will be improved and the number of ships will be increased, which may cause lots of wastewater. According to the channel plan of the Xinjiang River, the main operating vessel is a cargo ship. Therefore, the wastewater of vessels mainly include the bilge oil sewage and domestic sewage. The domestic sewage mainly comes from the daily life of all staff, but the amount of discharge is less. The average oil concentration of the ship bilge is 5000mg / l. The discharge of domestic sewage and bilge oil from vessels is not be allowed in channels of reservoir. The sewage from the vessels shall be collected and then sent to the qualified recycling units or environmental receiving vessels.

4.3.3 Air Quality

After the project has been completed and put into operation, a small amount of exhaust gas discharged from vessels in the waterway will have certain environmental impact for ambient air. The impact of the emissions from ships will only influence the surrounding ambient air within 50m, and will not affect the air quality on both sides of the waterway.

4.3.4 Acoustic environment

The noise during the project operation period is mainly from the power plant of and the traffic noise of vessels navigating in the channel. The influence of hydroelectric noise is confined to the boundary of the factory area only, and it has less influence for the sensitive points around. The average amount of radiation sound level of the vessels is shown in Table 4.3-6.

Table 4.3-6 Average sound level of different types vessels (15m from the vessel)

Type of ship	300~500 Tonnage	500~1000 Tonnage
Average sound exposure value [dB (A)]	71	73

4.3.5 Ecosystem

After the impoundment of the reservoir, the aquatic habitat in reservoir area will change from the original natural channel to the type of slow-flow reservoirs, which may change the species and distribution of fish and aquatic organisms in the reservoir area. Dam blockage will block the continuous habitat of the original river, influencing the natural exchange and migration of the aquatic biological resources in the upper and lower stream of the dam. The change of water level caused by the release of reservoir water and the operation of peak regulation may have impacts on aquatic organisms.

According to the status quo investigation, there is a kind of ancient tree named camphor tree in the submerged area. Five kinds of provincial-level wild plants of Jiangxi Province, such as Yangtong, Chongyang Wood, and Gougu. Sixteen kinds of provincial-level protected animals of Jiangxi Province, such as Turtles, red dotted snake, red chain snake swimming, Chinese water snake, black eyebrow snake, viper, egret, mallard, spot birch, red-necked duck, swallow, golden waist swallow, hedgehog and weasel, are mostly distributed along both banks of the Yangtze River. The water storage in the reservoir area will affect their growth or living environment.

4.3.6 Solid Waste

During the operation period, the Bazizui Navigation and Hydropower Project will produce solid waste such as household garbage from management staff and waste oil residue of power plant.

(1) Management staff garbage

According to the work report, the number of management staff of Bazizui Navigation and Hydropower Project during operation period are 191, and the amount of domestic waste produced is 1.5kg / (person · d). Then the total amount of household garbage produced by the management staff is 286.5kg / d, 104.6t / a for a year.

(2)Household garbage of vessels

The sewage from the vessels shall be collected and then sent to the qualified recycling units or environmental receiving vessels.

(3)Waste residue and other hazardous waste

Compares to similar navigation and hydropower project, power plant will produce 80kg / a waste residue (HW09) and 200kg / a (HW09) oil-containing waste liquid during the operation period.

4.4 Coordination Analysis of the Industrial Policy and Relevant Planning

4.4.1 The Consistency of National Industrial Policies

The Catalog of the Guidance of Industrial Structure Adjustment (2011 Edition) (2013 revision) is a guideline for the State to speed up the transformation of economic development, promote the adjustment and optimization of industrial structure, improve and develop the modern industrial system, guide the investment direction and improve the investment structure. Bazizui Navigation and

Hydropower Project is a navigation and hydropower hub project that mainly focuses on shipping and power generation. It belongs to the first category (encouraged) enumerated in the catalog, namely the "Coastal Deepwater Channel, River Inland Waterway and Navigational Building Construction "projects; It is not listed in the second category (restricted category) and the third category (eliminated category) of the catalog. Therefore, this project conforms to the national industrial policy.

4.4.2 Compatibility analysis of National Inland Waterway and Port Layout Planning

The "National Plan of Inland Waterway and Port Layout" promulgated by the Ministry of Communications pointed out that the layout plan of the high-grade waterway of the Yangtze River is "one horizontal, one net and ten lines". Among them, "one horizontal" means the main line of the Yangtze River; "one net" refers to the high-grade waterway network in the Yangtze River Delta; and "ten lines" refers to the Minjiang River, Jialing River, Wujiang River, Xiangjiang River, Yuanshui River, Hanjiang River, Jianghan Canal, Ganjiang River. At the same time, it was also pointed out that the implementation of the main tributary of the Yangtze River should be carried out in a combination of avionics and electric power and a cascade development project.

Bazizui Navigation and Hydropower Project is located at the intersection of the East-West River, the lower stream of the Xinjiang River. The main task is mainly shipping. It takes into consideration the comprehensive utilization of power generation and other projects. The project construction conforms to the "Plan of National Inland Waterway and Port Layout".

4.4.3 Conformity Analysis of the Construction Planning of Xinjiang River High Level Waterway (2011 ~ 2015)

Baizui Navigation and Hydropower Project is an integrated shipping hub based on shipping, and power generation. It belongs to the transportation sector and is in charge of the Ministry of Communications. The construction of Bazizui Navigation and Hydropower Project is the concrete implementation of "XinJiang River High-Level Waterway Construction Plan (2011 ~ 2015)".

According to "Xinjiang high-grade waterway construction plan (2011 ~ 2015)":

In the "12th Five-Year Plan", the construction goal is to speed up the construction of the Xinjian River High-Level Waterway. By 2015, seventy-nine meters section of Xinyang Hongwei Dam to Bazizui has reached the standard of Grade III Waterway, and the target rate reaches 32.5%.

The method for the construction of the Xinjiang River Waterway during 12th Five-Year Plan period is to integrate the canalization project with waterway regulation works. To improve the navigable conditions of the Xuanjiang River high-level waterway.

The overall construction plan for the channel of Xinjiang River is as follows: the 244km channel from Xinyang port to Zhuxi River estuary is planned to adopt the third-level canalization combined with waterway regulation to reach the standard of III waterway. Namely, the construction of the

Jianshe Boundary Marker hub (existed, to be completed or reconstructed), the Bazizui hub and the Shuanggang (or Poyang Lake) hub will implement the regulation of navigation channel in reservoir area and lake area. The total number of bridges that shall be reconstructed are seven.

Bazizui Navigation and Hydropower Project is a construction project of the "12th Five-year Plan" in the "Xinjiang River High-Level Waterway Construction Plan (2011 ~ 2015)". The plan proposes that: ① Bazizui Project is located in the lower stream of of the Xinjiang River. It is about 12km away from Yugan County and about 46km away from the Boundary Hub. It is mainly of shipping with both integrated utilization of power generation and irrigation. Bazizui's cascade can canalize 46 km's Level III channel, which is an important project to realize the target of Level III waterway planning, to speed up the development of water transportation in Jiangxi Province and meet the needs of large-scale ships. The implementation of this project can effectively promote the development of resources along the Xinyang River and the economic and social development of the Poyang Lake Eco-Economic Zone. It can further raise flood control standards along the banks of the reservoir area and moderately alleviate the large power supply and demand gap in Jiangxi Province, which meets the demand of energy-saving emission reduction policy. Therefore, the construction of Bazizui Navigation and Hydropower Project is very necessary; ② The dam area of Bazizui Navigation and Hydropower Project is the low hilly areas, and the two sides of the bedrock exposed. The Hongshui River is about 759m wide. The dam site control basin area is 15942 km2, the multi-year average runoff of 17.04 billion m3, and the multi-year average flow is 557 m3/s. The normal water level at in the project is 19m high and the lower designed water level is 13m high. Main buildings include sluice gates, riverbed power station, ship lock, fish road, dam and so on. Power station installed capacity of 11000 kilowatts, initially proposed five turbine with a single capacity of 2200 kilowatts. The vessels can navigate 1000-ton level weight, and the scale of lock chamber is 180 × 16 × 3.5m. The sluice gate will open in a full program, the net width of the gate is 418m wide, and the net width of gate hole is 12m wide, which can be divided into 34 holes. The Fish way is planned to be used in the form of a combination of DTH and weir. The reservoir area shall be protected according to the protection standards. The embankments on both sides of the Yangtze River shall be reinforced according to the required flood standards and anti-seepage treatment shall be taken. The total investment in hubs is estimated to be Two billion Yuan with a construction period of 2013-2017.

In the engineering design, Bazizui Navigation and Hydropower Project, located at the lower stream of the Xinjiang River, which is 12 km away from Yugan County. It is 49 km away from the Boundary hub and based on shipping. In order to consider the comprehensive utilization of power generation and other navigation project, it is planned to canalize 37km of Level III channel, with supplementation of corresponding waterway improvement works to improve the condition of 49km long waterway between the Boundary and Bazizui. The recommended dam area is 5942 km2, with an annual average of 18.228 billion m3 and an annual average flow of 578 m3/s. The normal water storage level of the project is 18m high. The main structures are sluice gates, riverbed power stations, ship locks, fish ways and dam. The installed capacity of the power station is 12.6MW (Hushanzui 5.6MW and Dapi Ridge 7MW). The dimension of the ship and lock chamber is 180 × 23 × 4.5 / 180 × 23 × 3.5 (Hushanzui / Dapi Ridge). The waterway is 60 meters wide, and 2.2 meters in depth with a turning radius of 480m. All conditions above can meet the planning requirements.

The construction of Bazizui Navigation and Hydropower Project conforms to the "Xinjiang High-Level Waterway Construction Plan (2011 ~ 2015)".

4.4.4 The Enforcement of Environmental Impact Report on the Construction Plan of High-level Waterway of Ganjiang River and Xinjiang River

(1) The brief introduction of Environmental Impact Report on the Construction Plan (2011-2015) of High-level Waterway of Ganjiang River and Xinjiang River

The Ministry of Environmental Protection issued the review comments on Environmental Impact Report on the Construction Plan (2011-2015) of High-level Waterway of Ganjiang River and Xinjiang River with the environmental review [2013] No. 229, see Annex 6 for details.

1) Environmental Impact Assessment Report main conclusions

According to "Environmental Impact Report on the Construction Plan (2011-2015) of High-level Waterway of Ganjiang River and Xinjiang River" (Transport Planning and Research Institute):

The "Construction Plan of High-Level Waterway of Ganjiang River (2011-2015)" and " Construction Plan of High-Level Waterway of Xinjiang River (2011-2015)" are the implementation of the "Construction Plan of National Inland Waterway and Port Layout (2005-2020)", "The Navigation Development Plan of the Inland Waterway in Jiangxi Province", which conform to the method of the" The Plan for National Main Functional Area"," The Plan for Ecological-Economic Zone of Poyang Lake"," National Economic and Social Development Plan ","The Comprehensive Plan for Ganjiang River of Jiangxi Province", “The Comprehensive Plan for Poyang Lake of Jiangxi Province ","Twelfth Five-Year Plan for the Water Conservancy Development in Jiangxi Province”. The Construction Plan (2011-2015) of High-level Waterway of Ganjiang River and Xinjiang River and the Plan for the safety of the source of Drinking Water in Jiangxi Province”, “The General Plan for the National Nature Reserve in Poyang Lake” and “the Twelfth Five-Year Plan for the Development of Fisheries and Aquaculture in Jiangxi Province”, “Overall Planof Land Use in Jiangxi Province (2006-2020)", "Plan for Environmental Protection and Ecological Construction in the Twelfth Five-year Plan of Jiangxi Province", "The Pollution Prevention and Control Plan of Poyang Lake(2008-2015)", "Poyang Lake Water Conservancy Hub Project Plan (ideas) "and so on. However, it is related to the overall plan of “the Nanji Wetland National Nature Reserve in Poyang Lake”, “the Master Plan of Duchang Migratory Birds Provincial Nature Reserve”, “the Master Plan of the Baishuzhou

Migratory Birds Nature Reserve", "the Surface Water (Environment) Functional Zoning", "Ecological Functional Zone of Jiangxi Province", "Eleventh Five-Year Plan" and "Medium and Long-term Planning of Wetland Protection in Jiangxi Province". There is a need to further adjust the plan or relevant plans to improve the implementation methods.

According to the "Functional Division of Surface Water (Environment) in Jiangxi Province", the Nanchang ~ Hukou Level II Waterway Regulation Project of the Plan directly crosses the Nanchang drinking water source area of Ganjiang River and Nanchang County ~ the new drinking water source area. Dredging will cause suspended matter, the temporary pollution of in some local waters and will cause some pollution to the water quality of the intake. But this pollution can be further precipitated and purified by the water plant, so it may not have serious impact on the safety of drinking water. Supervision and control over the sewage of construction ships in the channel shall be strengthened, and the ships shall not be allowed to discharge sewage in the drinking water source area. At the same time, it is also suggested that the government at or above the county level shall clearly define the scope of specific waters within Level I and Level II protected areas and implement Level II and III standards of "Surface Water Environmental Quality Standards" (GB3838-2002) , and summit the approval to the local government.

According to the "Eleventh Five-year Plan" and "Medium-long Term Plan of Wetland Protection in Jiangxi Province" and "Poyang Lake Wetland Protection Plan", the construction of Nanchang-Hukou Level II Waterway Regulation Project passes through the provincial nature reserve of Poyang Lake Area. According to Article 32 of the "Regulations of the People's Republic of China on Nature Reserves", "No production facilities shall be constructed in the core area and buffer zone of nature reserves, and no polluted facilities that may destroy the environment or landscape shall be constructed in the experimental area of nature reserves". It can be seen that no waterway construction project can be allowed in the core area or the buffer zone of the nature reserve. Therefore, the function of Level II waterway regulation works in Nanchang-Hukou conflicts with the nature reserves. It is proposed to adjust to westward the waterway routes crossing the nature reserve, which can avoid the impact on protected areas.

According to "the Ecological Functional Zoning of Jiangxi Province", the Shihutang Navigation and Hydropower Hub and the Yongtai (now renamed as Xinjian) Navigation and Hydropower Project of the High-Level Waterway of the Ganjiang River, the Xiajiang River Water Control Project and the Taihe (now renamed as Jinggangshan) Water Conservancy Project, are all located in areas with moderately integrated ecological sensitivities. And the second phase of Nanchang ~ Hukou Level II waterway improvement project is crossing the ecological comprehensive sensitive area, the Poyang Lake area. Therefore, the plan and "ecological function zoning in Jiangxi Province" are basically coordinate with each other. It is suggested that environmental protection administrative departments must obtain the consent of the administrative department of environmental protection when implementing the plan and should avoid as much as possible and be care to implement some measures to mitigate the ecological impact.

From the aspects of water environment, atmosphere environment, noise environment, solid waste and ecological environment, the waterway plan is basically reasonable. After the planned waterway level is raised, the number of navigable vessels and tonnage will increase. Marine sewage and household garbage, if untreated, will cause serious pollution to the water environment. Under the precondition of avoiding the sensitive area of water environment, the pollution control of shipping channel and ship pollution management shall be strengthened and the occurrence of pollution accident shall be avoided. Under non-accident conditions, the oil and gas pollution concentration of oil transportation shall be far below the national control standards and will not affect the atmospheric environmental quality. The atmospheric environment capacity in the region is large, and the plan is basically reasonable in the atmospheric environment. The proportion of solid waste generated in the total amount of municipal and rural garbage is relatively small, and the pressure on urban garbage centralized treatment of landfill facilities is little.

The plan and layout of waterway and hub projects in the Construction Plan of the High-Level Waterway of the Ganjiang River and the Xinjiang River are basically reasonable, but there are some unreasonable exits. The plan of high-level waterway shall be constructed in the area of moderate or mild ecological integrated sensitivity. The waterway regulation, construction and operation of the navigation project will cause little interference to these areas. But for the Poyang Lake wetlands, the protection of biodiversity and the ecological functions of flood storage areas are disturbed a lot and should be avoided whenever possible. Nanchang ~ Hukou Level II waterway regulation works directly across the finless porpoise Provincial Nature Reserve, Poyang Lake catfish, Red alburnus national aquatic germplasm resources conservation area, Jiangxi Ganchang drinking water source areas and the Gan River Nanchang ~ new drinking water source area. The environmental rationality is comparatively low. In order to reduce the impact of the implementation of the plan on the four protected areas mentioned above, the plan shall be basically reasonable after adjusting the waterway route to the west and taking the relevant measures proposed in the report.

2) Optimization and adjustment of planning proposals and implementation proposals

(1) Nanchang ~ Hukou Level II waterway improvement project passes through the core area of Laoyemiao Residential Area of Poyang Lake Precipitation Reserve. It is suggested to adjust the waterway routes that crossing the protected area and adjust the route to across the section westward to avoid the impact on the natural reserve. As far as possible, the plan and adjustment program shall be far away from nature reserves, to avoid evacuation and to mitigate ecological impacts. The budget shall be specially planned to adopt ecological compensation measures such as strengthening a series of protection measures, or to make fishery ecological compensation.

(2) The Nanchang ~ Hukou Level II waterway regulation project traverses the drinking water source area in Jiangxi Province's Surface Water (Environmental) Functional Zoning and the Nanchang County-Newly-built drinking water source area. Although the need of waterway function and drinking water source can be meet at the same time, it is suggested that the construction site of dredging project in Qiujiatan beach shall be as far as possible from the intake site of the water in order to avoid the conflicts between the two functional areas. Provisional facilities for quarantine shall be set close to the designation of reserve water source areas. In addition, no construction shall be permitted without the consent of the administrative department of water source protection.

(3) The planned Nanchang ~ Hukou Level II waterway improvement project crosses the core area of National Aquatic Germplasm Resources Conservation Area in Poyang Lake (crossing 10.0km). According to the provisions of the "Measures for the Administration of Aquatic Germplasm Resources Protected Areas" issued by the Ministry of Agriculture, before the implementation of the plan, the remediation project sections crossing the core area should be prepared with demonstration reports on the impact of the construction projects on aquatic germplasm resources conservation areas, which shall also be included in the project Environmental impact assessment report, and to take ecological compensation measures to restore habitats, such as strengthening the proliferation and discharge, fishery ecological compensation and a series of protective measures, and the funds included in the planning investment schedule. Construction cannot be started without the approval of the competent department.

(4) The spawning grounds and feeding grounds of Xiajiang River are located at the downstream of the stake in Xiajiang River. The hub construction will affect the habitat of the spawning grounds, which will greatly influence the fish activities and reproduction and block the migration of fish. It is proposed to reserve fish tracks and other over-fishing facilities in the design and construction of hubs and take ecological compensation measures to restore habitats, such as strengthening a series of protection measures such as multiplying and releasing fisheries and ecological compensation for fisheries, to provide the funds in the list of Total Investment Schedule. The construction cannot be started without the approval of the competent department.

(5) The planned Nanchang ~ Hukou Level II waterway improvement project passes through the wetland biodiversity conservation and flood storage ecological function area with high sensitive in Poyang Lake. The planning construction of the Shihutang pivot, Yongtai hub, Shihu Tong ~ Shen Gangshan Level III waterway regulation, Xiajiang hub and the Taihe hub are in a moderately integrated area of mild ecological sensitivity. The function of the ecological function area where there is a certain contradiction, it is suggested that planning should be implemented as far as possible to avoid sensitive areas, while paying attention to take measures to mitigate the ecological impact.

(6) Because the complexity of the Nanchang ~ Hukou Level II waterway regulation project and

the Poyang Lake Water Control Project, it is mainly reflected in the fact that after the completion of the hub project, there is a gap between the water depth of the upstream channel and the dispatching operation mode of the reservoir, so the project needs to be discussed before the implementation.

(7) It is suggested that the local governments above the county level in Jiangxi Province clearly define the scope of the specific waters within the Level I and Level II drinking water source areas in the Functional Zoning of Surface Water (Environment) in Jiangxi Province.

(8) When the planning and implementation of construction projects near drinking water source protection areas, protective isolation facilities should be set up near the boundaries of drinking water source areas to minimize the impact of suspended solids and other impacts on the water source areas during the construction period.

(9) After the implementation of the waterway construction plan, the ship's sewage collection and disposal device shall be equipped according to the ship's sewage treatment plan proposed in the appraisal. At the same time, it is strictly forbidden to discharge the sewage in the reservoir area, the water source protection area, Poyang Lake and other sections.

(10) The construction of the navigation and hydropower hub project will inevitably form a certain area of inundation, which may involve the relocation and resettlement of some villages and towns. In the process of planning and implementation, we should do a good job in resettlement and pay attention to the natural and social environment brought by the resettlement.

(11) The planning and construction of the hub project will cause severe disturbance to the original landform of the project area, the surface soil and vegetation will be destroyed, and the soil erosion resistance will be greatly reduced. Therefore, during the period of planning and construction, special efforts should be made to ensure soil and water conservation in the project area and prevent soil erosion.

(12) It is suggested that the planning and construction department should strengthen communication with relevant departments such as forestry, fishery, environmental protection, water conservancy, and coordinate the existing zoning and planning.

3) Suggestions on the environmental impact assessment for the next level of project

Based on the environmental impact assessment of Ganjiang River and Xinjiang River high-Level waterway construction plans, the evaluation considers that the environmental assessment of each specific construction project after the implementation can be simplified in some aspects and some of them must be paid attention at the project level.

◆ General advice

Project EIA may draw on the conclusions of the EIA but should be appropriately adjusted according to the specific project conditions.

(1) For the specific level of waterway, if the proposal is consistent with the proposal of construction plan or of the suggestions made by planning EIA, the analysis of the compatibility with other plans or laws and regulations can be briefly analyzed and answered in the project EIA.

(2) The EIA has analyzed the rationality and socio-economic benefits of the fairway scale. In the stage of compiling the EIA of a specific project, if the scale is consistent with the demonstration of this plan, the analysis of the scale can be appropriately simplified.

(3) In the planning EIA, the total amount of pollutants produced in the implementation of the plan has been predicted, and the impact on the specific sensitive points has not been quantified. The EIA of planning and project should emphasize the prediction and evaluation of environmentally sensitive points in the evaluation area, put forward detailed environmental protection measures and carry out economic and technical evaluation and environmental effect analysis.

(4) For the waterways identified in the EIA that may affect the sensitive areas of the environment, the EIA should be intervened as soon as possible, and corresponding mitigation measures and suggestions should be put forward.

(5)The coordinated development of ecological and environmental protection planning (zoning), land use planning, urban planning and tourism planning shall be paid attention. The investigation of resettlement areas shall also be attached importance.

◆The evaluation content that shall be paid attention

For the waterways identified in the EIA that may affect the sensitive areas of the environment, the EIA should be intervened as soon as possible. For the "ecologically and environmentally sensitive areas" proposed for evaluation, specific projects should be avoided before construction. For other possible areas, strict environmental impact assessment should be carried out before the project construction. If there are practical difficulties, they should be identified according to the specifics of the sensitive areas in accordance with provision put forward by the relevant administrative departments. And then when the concrete implementation comes, strict and detailed protective measures should also be given.

(1) Nature reserves and other ecologically sensitive areas

Relevant laws and regulations of the state have imposed strict protection on ecologically sensitive areas such as nature reserves. Therefore, for construction projects that may be involved in the sensitive areas, EIA should be started as soon as possible during the implementation of specific projects. If the waterway regulation project passes the nature reserve, the construction site of the navigation and hydropower hub and the inundated sensitive areas in the reservoir area, the content of landscape environmental impact assessment should be strengthened in the environmental impact assessment.

(2) Important habitat protection

The investigation of three fish species and other important wetland habitats in the planning section shall be emphasized on.

(3) Water pollution control

According to the requirements of "Water Pollution Prevention and Control Law of the People's Republic of China", if the project environmental has some impact on the assessment stage, the project shall avoid the above circumstance if the drinking water source protection areas have been involved.

(4) This evaluation puts forward requirements and principles of environmental protection programs. During the implementation of environmental assessment of construction projects in the planning area, the pollution prevention and control measures during the operation period should be refined according to the specific construction contents of the project, especially the measures for preventing and mitigating water environment pollution and mitigating the ecological impacts. Specific requirements are as follows:

①Attach importance to the environmental impact assessment of the project during construction

Part of plan for the construction of navigation and hydropower project is not clear, and the project environmental assessment should be conducted based on the specific evaluation of the construction program.

② Emphasis on the impact assessment of environmentally sensitive areas

The sketchy of the planning content determines that the evaluation of the impact of environmental sensitive protection goals can only be in principle. Because the planning and implementation is based on the development of avionics, the implementation time is subject to its constraints, and the environmental protection objectives will be changed as the time pass by. Therefore, it is still important to pay attention to the impact assessment of sensitive environmental areas during the project EIA time, especially the investigation of important fish habitats.

③Attach importance to the research and implementation of environmental protection measures and ecological compensation measures of the project

Environmental protection measures and ecological compensation measures belong to the category of end treatment. Only when the nature, size and location of the environmental impact are clear, can they be targeted planning and design. Therefore, attention should be paid to this during the project EIA period.

④Pay attention to the impact of sediment erosion and deposition on the layout. In particular, we should fully study the impact of the built-up and under-construction hubs on the sediment deposition and erosion.

◆ EIA suggestions for specific construction projects

(1) Environmental Impact on Channel Regulation Project during the Construction Period

As the planning stage of the Nanchang ~ Hukou II level waterway regulation works, Shihutang ~ Shen Gangshan III grade waterway improvement works and the Xinjiang River Level III scale waterway regulation works are not clear, this evaluation will not give detailed review for the projects mentioned above. The environmental impact on the waterway improvement project during the construction period (such as the impact on waterway dredging on the water environment) will be fully evaluated, and the environmental impact assessment of each project will be carried out according to the specific construction methods (such as dredging, dam construction, Bank protection works, navigation mark and ancillary facilities, and environmental protection projects) to conduct a detailed environmental impact analysis of the Poyang Lake, the Finless Porpoise Provincial Nature Reserve in Yangtze River. At the same time, effective mitigation measures for environmental protection should be put forward.

(2) Submerged impact Caused by the Construction of Avionics / Water Conservancy Project and Resettlement Countermeasures

The Shihutang Navigation and Hydropower Project and the Xiajiang River Water Control Project have already started construction, and the other three hubs (Yongtai Navigation and Hydropower Project, the Taihe Water Control Project and Bazizui Navigation and Hydropower Project) are only in a normal impoundment level. Because of the lack of specific construction schemes and design parameters, this evaluation did not give details of the submergence caused by the rise of water level, and the influence for the upstream area of the sluice dam. The scope and extent of the impacts (mainly including the submerged impact on the ecological environment, old and famous trees and landscape relics) shall be evaluated in the EIA in the next phase. The specific policies for relocating and resettling residents in inundated areas caused by the construction of avionic / water conservancy projects shall be specified, and the compensation for relocation and the new environmental problems shall also be emphasized.

(3)The environmental impact assessment of Nanchang ~ Hukou Level II waterway regulation project shall be demonstrated in a detailed way.

Because there are lots of complexity between the level II waterway regulation project of Nanchang ~ Hukou Section and the Poyang Lake Water Control Project in the planning of high-level waterway construction in Ganjiang River, which will be mainly reflected after the completion of the project. There is an extremely complicated relationship between the waterway's depth and the operation mode of the reservoir and the ship lock. Therefore, in-depth demonstration needs to be carried out during the EIA of the waterway regulation project.

(4)Protection Measures for the Project and the research and implementation of Compensation Measures for Ecological Rehabilitation

Environmental protection measures and ecological compensation measures belong to the category of end of pipe control. They can only be targeted after the specific content of the environmental impact, such as the nature, size and location has been defined. Therefore, the ecological compensation and other issues shall be paid attention to. The environmental protection mitigation measures and compensation schemes mentioned in this evaluation should be given priority in the next level of planning and environmental impact assessment.

(5) The environmental protection work for supporting infrastructure of the project

For the necessary disposal of sewage and garbage collection from navigation hub and hydro-junction, those facilities shall be implemented in the next level of specific projects.

(2) The implementation of the report on the Environmental Impact on Ganjiang River and Xinjiang High-Level Waterway Construction Plans (2011-2015)

This appraisal will strictly implement the environmental protection measures and the requirements, which are put forwarded by the environmental impact assessment in the "Environmental Impact Report on the Planning of High-levelWaterway of Ganjiang River and Xinjiang River from 2011 to 2015". For details, see Table 4.4-1.

Table 4.4-1List of Implementation Status

Serial number	the main environmental protection measures proposed by Planning EIA	The implementation status
1	In the planning and implementation of construction projects near drinking water source protection areas, protective isolation facilities should be set up near the boundaries of drinking water source areas to minimize the impact of suspended solids and other impacts on the water source areas during the construction period.	Implemented. The nearest water intake is 7.5km away from the downstream of Dongda River, Baima Bridge. Due to the long distance, the water pollution of the project is relatively minor after adopting corresponding environmental protection measures.
2	After the implementation of the waterway construction plan, the ship's sewage collection and disposal device shall be equipped according to the ship's sewage treatment plan proposed in this appraisal. At the same time, it is strictly forbidden to discharge the sewage in the reservoir area, water source protection area, Poyang Lake and other sections	Basically implemented. At present, The Bureau of Navigation in Jiangxi Province has commissioned the Planning and Research Institute of the Ministry of Transport to compile a unified collection and a disposal plan for oil, sewage, domestic waste and other solid waste of ships and vessels of Jiangxi Province.
3	The construction of the navigation and hydropower project will inevitably form a certain area of inundation, the relocation and resettlement of some villages and towns. In the process of planning and	Implemented. This project does not include the resettlement.

Serial number	the main environmental protection measures proposed by Planning EIA	The implementation status
	implementation, we should do a good job in resettlement and pay attention to the natural and social influence brought by the resettlement.	
4	The planning and construction of the hub will cause severe disturbance to the original landform of the project area, the surface soil and vegetation will also be destroyed, and the soil erosion resistance will be greatly reduced. Therefore, during the period of planning and construction, special efforts should be made to ensure soil and water conservation in the project area and to prevent soil erosion.	Implemented. The construction unit has entrusted Zhongshui Zhujiang Planning Survey and Design Co., Ltd. to prepare a soil and water conservation plan report. During the construction period, the work of soil and water conservation will be done strictly in accordance with the requirements in the report.
5	If opinions provided are consistent with the construction proposal or the recommendations of the EIA, the project EIA can be briefly analyzed and the compatibility analysis shall be answered.	Implemented. This project is consistent with the construction plan in the planning, and the environmental impact assessment strictly consults the suggestions put forward by the planning EIA.
6	Emphasized on the investigation of three fish species and other important wetland habitats in the planning section.	Implemented. During the EIA process, investigation of three fish species and other important wetland habitats have been conducted.
7	Environmental protection measures and ecological compensation measures belong to the category of end of pipe control. Only when the nature, size and location of the environmental impact are clear, can they be targeted planning and design. Therefore, attention should be paid to this during the project EIA stage.	Implemented. During the EIA process, the nature, size and location of the environmental impacts are analyzed. Environmental impact measures such as prevention and control of environmental pollution and mitigation of ecological environment are formulated according to the impact analysis.
8	For the necessary disposal of sewage and garbage collection from navigation hub and hydro-junction, those facilities shall be implemented in the next level of specific projects.	Basically implemented. At present, the Maritime and Port of Jiangxi Province has commissioned Planning and Research Institute of the Ministry of Transport to compile a unified collection and disposal plan for oil, sewage and domestic waste.

4.4.5 The Compatibility Analysis of the Development Plan of Inland Waterway

The Inland Waterway Development Plan of Jiangxi Province has comprehensively designed the development plan of the inland waterway transportation for the whole province. By 2020, it will basically realize the modernization of inland waterway navigation and the comparative advantage of inland shipping in the integrated transportation system will be fully demonstrated. The national high-level waterway Yangtze River Route (section of Jiangxi Province), Ganjiang River and Xinjiang

River all meet the planning standards and form a complete system of inland waterway navigation within the province with a clear distinction between the two branches. The 244 km long channel in the downstream away from the Jiangkou belongs to the third channel, 111 km long channel in the upper stream away from Guixi belongs to the fifth channel. The Xinjiang National High Level Waterway plans three steps and 4 hubs. From top to bottom followed by the Jiepai, Bazizui (including Hushanzui of the east Xinjiang River and the Baipiling hub in the west river) and Shuanggang cascade.

According to the Plan for Inland Waterway Development in Jiangxi Province, the Bazizui cascade hub is located 2km downstream away from Bazizui, which is divided into Hushanzui hub in East river and Mopiling hub in West River. The normal water storage level is 19.5m deep and the installed capacity is 11MW (Hushanzui 6.6 MW and Mopiling 4.4MW). The navigation of the Hushanzui shiplock is 500t with a scale of 120 × 12 × 3.0. The navigation of the Mopiling Ship Lock is 1000t with a scale of 180 × 16 × 3.5. The construction time is planned from 2010 to 2020.

In engineering design, Bazizui Navigation and hydropower project is located at about 0.9km downstream of Bazizui, Xiniang River. It is divided into Hushanzui hub in East river and Mopiling hub in West River. The normal water level is 18m deep and the installed capacity is 12.6 MW (Hushanzui 5.6MW, Mopiling 7MW). The navigation of the Mopiling Ship Lock is 1000t with a scale of 180 × 16 × 3.5/180 × 23 × 4.5 (Hushanzui / Mopiling), the navigation channel is 60m in width and 2.2m in depth, and turn radius 480m. All above statistics meet the planning requirements.

The construction of Bazizui Navigation and Hydropower Project conforms to the "Development Plan of Inland Waterway Transport in Jiangxi Province".

4.4.6 Implementation of the Report on the Environmental Impact of Jiangxi Inland Navigation Development Planning

(1) Brief Introduction of Environmental Impact Report of Jiangxi Inland Shipping Development Planning

In April 2006, Jiangxi Environmental Protection Bureau presided over the review meeting of Environmental Impact Report of Inland Waterway Development Planning in Jiangxi Province (prepared by the Ministry of Science and Technology of the Chinese Academy of Sciences) and formed its review opinion. See Appendix 7 for details.

1) Main conclusions of the report

Jiangxi inland shipping development planning is the need to build an overall well-to-do society and to achieve the goal of modernization. The planning is reasonable, which is in line with the relevant national traffic planning and basic coordination of relevant planning in Jiangxi. It also fully considers the requirements of environmental protection, which has been widely public Support and approval.

Although it is difficult to avoid any negative impact on the surrounding environment in the process of planning and implementation, as long as consciously adopting appropriate preventive measures and doing environmental protection in the implementation of specific projects, its social, economic and environmental benefits can be effectively guaranteed

The main environmental protection measures proposed in the report:

◆ Efforts to reduce impacts of ecological environment and suggestions

(1) Arrange the construction schedule reasonably, and try to finish the underwater operation in the dry season. Try not to carry out the operations such as the reefing, dredging and dumping during the main fish breeding and migration season.

(2) From a macroscopic perspective, we will study the overall protection of the ecological environment. We will focus on the study of the distribution of natural reserves and spawning grounds in the watersheds and the migration routes of fish so as to overcome the barriers and protect the biodiversity.

◆ Water Environment Impact Mitigation Measures and Suggestions

(1) New ports and terminals, wastewater from production, domestic sewage and rainwater should be discharged in the drainage system. Wastewater from production and domestic sewage should be collected and discharged to the urban drainage or discharged directly into the water body after reaching the discharge standard. At the same time, the residual oil, waste oil, oily wastewater, waste and garbage disposal facilities shall be set.

(2) According to the layout of the port, it is proposed that the two major ports of Nanchang and Jiujiang as well as the 10 major ports in the region such as Ganzhou, Ji'an, Zhangshu and Jingdezhen should be equipped with collection facilities for pollutants before 2010. All ports shall be equipped with collecting and processing facilities.

◆ The mitigation measures and recommendations for the impact of solid waste

(1)Ships should be set up with special garbage storage and transportation facilities, and garbage collection points shall be set in ports. All above shall be put in the local domestic garbage disposal system to prevent garbage pollution of water bodies.

(2)Adopt measures such as setting up drift boats in the main waterway to enhance waste management.

◆ The mitigation measures and suggestions for social environment impact

(1)Strengthen the coordination with fishery departments and improve the comprehensive utilization of water resources. When construct the dam in the fish-shrimp and crab migration gates, which will have a serious impact on fishery resources. Therefore, the fish facilities should be built and other remedial measures shall be taken to restore fishery resources as soon as possible.

(2)Reasonably and properly resettle immigrants so as to guarantee immigrant life and promote the economic sustainable development of resettlement areas.

◆ Accident risk analysis and emergency measures

(1)To develop strict management rules and regulations on the transportation of dangerous goods such as oil and chemicals, to strengthen the management and prevention of unexpected environmental pollution accidents in waterway, to formulate contingency plans for traffic accidents on dangerous goods ships, and to conduct job training for relevant management and employees, every staff here shall have certificates and know how to regulate the operation.

(2)Improve the salvage mechanism. With the improvement of navigation conditions and the increase of shipping vessels, a complete rescue institution with salvage facilities and corresponding equipment should be set.

(3)Speed up the standardization of ship types, and phase out old ships to improve the safety performance.

2) Suggestions for the next level of EIA of planning and construction projects

Affected by the depth of planning, many problems that cannot be specifically solved during the EIA stage. Thus, they should be solved in the next EIA of planning and construction projects.

(1) Ecosystem

① General EIA requirements of Construction Project

For the regional ecological assessment of general construction projects which does not include sensitive areas, the impact of the project on agro-ecology, land use, soil or water loss and wildlife should be evaluated on the basis of meeting the requirements of the corresponding EIA regulations. Measures which can protect the land, Basic farmland and wildlife shall also be proposed.

The assessment of water ecology should be based on the requirements of the corresponding EIA guidelines. The impact assessment during the construction period, with a focus on evaluating the impacts of underwater dredging, reef refuse disposal and sludge disposal on aquatic ecosystems, aquatic biodiversity, spawning grounds influences.

During the operation period, the impact assessment of oil spill risk will be emphasized. On the reconstruction and expansion project, in assessing the impact of pollutants on water quality, attention should be paid to the superimposition of the original project. The aquatic eco-environmental protection measures during the construction period and the oil spill prevention and emergency measures during the operation period shall be put forward.

② Environmental assessment requirements of the nature reserve construction project

For construction projects that may include nature reserves, their ecological assessment of water areas should put forward effective protection measures against spawning grounds and rare fishes during the construction period based on the requirements of the corresponding EIA regulations, and clarify the key protection measures for the key river during the operation period. EIA report should be accompanied by the appropriate authorities on the approval of construction projects.

(2) Water Environment

① Clarify the relationship between the planning and specific projects in the next level and the protection targets such as drinking water source protection areas, water intakes and fishery aquaculture areas, to predict the impact on sensitive water bodies, and to propose mitigation measures and suggestions.

② The hydrological characteristics of the river where the proposed project is located are analyzed. Based on the construction methods, dredging, reef excavation and earthwork excavation of the specific project and the hydrodynamic conditions of the river, the water environment impact of the project shall be predicted and analyzed, which include pollutant emissions, the impact of the region, impact beyond the scope and extent.

③ For the risk of water environment accidents, the depth of evaluation should be determined in accordance with the requirements of relevant EIA regulations. The environment rationality of port layout and hazardous berths layout, the scope of pollution, the pollution degree and the impact on the protection targets shall be predicted.

(3) Acoustic environment

In the construction project EIA, the assessment of noise should be evaluated based on the model prediction, and the range and extent of noise impact on sensitive targets should be predicted according to the relevant guidelines and norms.

(4) Solid Waste

In the evaluation of construction projects, solid waste generated should be calculated quantitatively in accordance with the number and type, to develop a reasonable and effective management methods and recycling treatment and disposal programs.

(5) Soil and water conservation

Ports and waterway construction projects must prepare soil and water conservation plans in accordance with the relevant provisions, compile contents and deeply meet the requirements of laws and regulations on soil and water conservation and technical specifications.

3) Project EIA needs to be implemented and concerns

(1) The hub project site should be selected carefully to avoid drinking water source protection areas.

(2) Relationships between the nature reserve and construction projects shall be considered to avoid construction in the core area of nature reserve, the buffer zone, and the experimental area. If the experimental area of nature reserve cannot be avoided, we should minimize the negative impact through reasonable choice of construction season and construction techniques.

(3) To arrange the construction progress in a reasonable way, try to finish the underwater operation in the dry season.

(4) The night whistle shall be forbidden in the urban area to prevent noise impact residents along the coast.

(5) In the main waterway, it is proposed to set up a drift boat and other measures to enhance garbage management in the waterway.

(6) Strengthen the coordination with fishery departments and improve the comprehensive utilization of water resources. If the construction of fish-shrimp and crab migration gates may have a serious impact on fishery resources, other remedial measures taken to restore fishery resources as soon as possible.

(7) Reasonably and properly resettle immigrants so as to guarantee immigrant life and promote the economic sustainable development of resettlement areas.

(8) To improve the salvage mechanism. With the improvement of navigation conditions and the increase of shipping vessels, a complete rescue and salvage agency and corresponding equipment should be set up so as to effectively settle the accident.

(2) Implementation of the Report on the Environmental Impact of Jiangxi Inland Navigation Development Planning

The construction of Bazizui Navigation and Hydropower Project conforms to the Plan for the Development of Inland Navigation in Jiangxi Province. This evaluation will strictly implement the environmental protection measures and the requirements of the project environmental impact assessment proposed in the Report on Environmental Impact of the Planning of Inland Waterway Development in Jiangxi. See Table 4.4-2 for details.

Table 4.4-2List of Major Environmental Protection Measures Implemented in Environmental Impact Assessment of Jiangxi Inland Waterway Development Planning

Serial number	Main environmental protection measures proposed by Planning EIA	The implementation status
1	Arrange the construction schedule reasonably, and try to finish the underwater operation in the dry season. Try not to carry out the operations such as the reefing, dredging and dumping during the main fish breeding and migration season.	Implemented. Reasonable arrangements for the duration, diversion works, ship lock works, sluice works and other underwater operations are completed in dry season, the project does not involve the reef, dredging, sewage treatment and recycling.
2	Strengthen the coordination with fishery departments and improve the comprehensive utilization of water resources. If the construction of fish-shrimp and crab migration gates may have a serious impact on fishery resources, fish facilities should be built, or other remedial measures taken to restore fishery resources as soon as possible.	Implemented. The project has designed fish passage and fishery proliferation station, and the reservoir area will adopt artificial fish nests and other ways to restore the fish habitat.
3	Reasonably and properly resettle immigrants so as to guarantee immigrant life and promote the economic sustainable development of resettlement areas.	Implemented. This project does not involve resettlement issues.
4	To establish a strict management system for the transport of dangerous goods such as oil and chemicals, to strengthen the management and prevention of sudden environmental pollution accidents in waterways, to formulate contingency plans for ship-borne accidents of dangerous goods, and to conduct job training for relevant management and employees to the job certificate, standardize the operation.	Implemented. Environmental risk prevention measures and contingency plans have been formulated
5	For construction projects that may include nature reserves, their ecological assessment of water areas should put forward effective protection measures against spawning grounds and rare fishes	Implemented. This project does not include any nature reserves, and environmental protection measures such as pollution

Serial number	Main environmental protection measures proposed by Planning EIA	The implementation status
	during the construction period based on the requirements of the corresponding EIA regulations, and clarify the key protection measures for the key river during the operation period Section of the pollution prevention and control measures; EIA report should be accompanied by the appropriate authorities on the approval of construction projects.	prevention and control and ecological protection during construction and operation periods have been put forward.
6	In the EIA of construction project, the assessment of noise should be based on the model prediction, and the range and extent of noise impact on sensitive targets should be predicted according to the relevant guidelines and norms.	Implemented. The noise prediction in the EIA documents is based on the recommended noise prediction mode in the "Environmental Impact Assessment Technology Guidelines for Acoustic Environment".
7	In the evaluation of construction projects, solid waste generated should be calculated quantitatively, according to the number and type, to develop a reasonable and effective management methods and recycling treatment and disposal programs.	Implemented. The amount of solid waste produced has been quantitatively calculated, and corresponding recovery and disposal plans have been formulated according to the quantity and type.

4.4.7 The Compatibility Analysis of Comprehensive Transportation System Development Planning of the "Thirteenth Five-Year Plan” of Jiangxi Province

Comprehensive Transportation System Development Planning of the "Thirteenth Five-Year Plan” of Jiangxi Province has pointed out: "During the" Thirteenth Five-Year "period, Jiangxi Province, the development of port transportation is basically completed in a way of" two horizontal and one vertical "(two horizontal meansYangtze River Route Jiangxi section, Xinjiang River; A longitudinal means Ganjiang River), the high-grade waterway will be 795 kilometers long.

The capacity of the port will be further improved, the annual handling capacity of cargoes will reach over 300 million tons and the container handling capacity will reach 2.4 million TEUs. Jiujiang Port will be built as an important shipping hub to promote the joint development of Jiujiang Port and Nanchang Port. Bazizui navigation and hydropower project has been involved in the comprehensive transportation system development of Jiangxi province "Thirteenth Five-Year Plan".

To sum up, Bazizui navigation and hydropower project is in line with the comprehensive transportation system development plan of "Jiangxi Province" Thirteenth Five-Year Plan”.

4.4.8 Coordination Analysis of the Comprehensive Treatment Planning in Poyang Lake Area

The scope of Poyang Lake Basin Comprehensive Management Plan is affected by the flood control Hukou Hydrological Station, which also include Nanchang County, Xinjian County, Jinxian County, Yongxiu County, De'an County, Gongqingcheng City, Xingzi County, Hukou County, Duchang

County, Poyang County, Yugan County, Wannian County, Leping City, Fengcheng City and other 14 counties (cities) and Nanchang (East Lake District, West Lake District, Qingshan Lake District, Qingyunpu District and Wanli District), Jiujiang City (Xunyang District and Lushan District) 2 city area, with a total area of 26284 km2.

The overall objectives of the "Poyang Lake Area Comprehensive Management Plan" include maintaining a healthy Poyang Lake and adhering to the integration of both rivers and lakes. The planned governance development aims to strengthen and perfect the construction of engineering and non-engineering measures in Poyang Lake area, enhance the ability of flood control and disaster reduction in the lake area, rationally develop and utilize water resources, maintain the excellent aquatic ecology and environment, realize the modernization of integrated water management, and ensure the flood control safety and drinking water safety, food safety and ecological safety. The sustainable economic and social development shall be supported by the sustainable use of water resources.

According to the needs of sustainable economic and social development, the sustainable utilization of water resources and water conservancy construction in Poyang Lake area shall consider the ecological environment, the influence of regional development on the upstream and downstream. Some controllable indicators have been selected: ①the station flood control water level; ②the water quality standards of the section; ③the ecological base flow of the section; ④the development and utilization of water resources. The water quality standards and ecological basal flow of the section are the basic requirements.

The Poyang Lake Area Comprehensive Environmental Management Plan Environmental Impact Assessment Report passed the review by the MEP in January 2012 and issued its review opinion. See Appendix 8 for details.

The control indicators related to this project in Poyang Lake Area Comprehensive Management Plan are as follows: ① flood control and control level of main control station and flood control level of Xinjiang Meigang Control Station are 29.81m deep; ② water quality standards of control section, Lianhu, Kangshan, Poyang Lake export control section, the water quality target level III, the control index of high salt index ≤ 6, ammonia nitrogen ≤ 1.0; ③ control section ecological base flow, Xinjiang Meizhou control section of the ecological base flow is 35m3/s.

Bazizui Navigation and Hydropower Project is located in Yugan County, Shangrao City and is within the comprehensive planning of Poyang Lake area. According to the control targets, several indicators have been proposed in the "Poyang Lake Area Comprehensive Management Plan": ① Meigang Hydrological Station is located within the reservoir area of this project. According to the operation plan of reservoirs, the reservoir area under flood control belongs to the natural open-drain state, and the calculated floodwater level is 29.81m deep, P = 2%. Under the condition of 15600m3/s, the designed flood level under the natural condition of MeiHang Hydrological Station is 26.70m deep and the design flood level after the construction of the dam is 26.76m deep. The project construction has little impact on flood discharge and does not affect flood control of MeiHang Hydrological Station’s Water level; ② The basic water quality of the dam will not be affected during the operation of the hub, and the water quality of the control section will not be affected; ③ The discharge flow rate at the dam site of the project is 66.9m3/s (of which the basal flow of east river of Xinjiang River is 31.6m3/s, and that of the west river of Xinjiang River is 35.3m3/s), which meet the control section of the Meizhou River ecological base flow 35m3/s requirements. Overall, this project basically conforms to the "Poyang Lake Area Comprehensive Management Plan".

4.4.9 The Compatibility Analysis of "National Main Functional Area Planning" with the project

According to the "National Main Functional Area Planning", Bazizui Navigation and Hydropower Project is located in the main producing area of agricultural products in the Yangtze River to provide agricultural products as the main function, along with providing ecological products, service products and industrial products for other functions to develop the high-intensity industrialization and urbanization mode. Its functional orientation is: an important area for ensuring the safety of agricultural products, a beautiful homeland for rural residents to live and work in peace and contentment, and a demonstration area for building a new socialist countryside. In the development direction, the district should strive to protect cultivated land, stabilize grain production, develop modern agriculture, enhance comprehensive agricultural production capacity, increase farmers' income, speed up the building of a new socialist countryside, ensure the supply of agricultural products and guarantee the national food safety.

Bazizui navigation and hydropower project does not belong to the large-scale and high-intensity industrialized urbanization and development project. The project covers a small area after protective measures and has little impact on the main function of providing agricultural products in the region. After the implementation of the project, of ecological service function, and at the same time, it has a good promoting function for enhancing comprehensive agricultural production capacity, increasing farmers' income and accelerating the construction of a new socialist countryside in the project area, which is in line with the "Plan of the National Main Functional Areas."

4.4.10 The Consistency with National Economic and Social Development Related Plans

(1) Consistency with China's National Economic and Social Development Plan.

The key construction projects of transport construction in the Outline of the Thirteenth Five-Year Plan for National Economic and Social Development of China pointed out: To speed up the advancement of the Yangtze River, Pearl River-Xijiang River, Huaihe River and Minjiang River around the Bohai Sea, Yangtze River Delta and Pearl River Delta, the construction of avionics and power stations will vigorously promote the construction of international shipping centers in Shanghai, Tianjin, Dalian and Xiamen, the construction of specialized berths such as containers, crude oil and liquefied natural gas in coastal ports can also be promoted in an orderly manner, and steadily push forward the construction of an international cruise terminal such as Phoenix Island in Hainan so as to enhance port intelligence level. The construction of Bazizui Navigation and Hydropower Project will improve the navigation conditions of Xinjiang River and comply with the content of speeding up the construction of advanced Inland waterways along the Yangtze River, Pearl River, Xijiang River, Huaihe River and Min River. Therefore, the Bazizui Navigation and Hydropower Project conforms to the Outline for the Thirteenth Five-Year Plan of China's National Economic and Social Development.

(2) Conformity with the plan of national economic and social development in Jiangxi Province

Article Eight of the “13th Five-Year Plan for National Economic and Social Development in Jiangxi Province”, “Building New Support for Modern Infrastructure”, Section III, “Enhancing the Capacity of port transport”, points out that: "We shall focus on the implementation of the Yangtze River in Jiangxi, Ganjiang, Xinjiang high-level waterway construction, the formation of the Yangtze River Jiujiang section of a channel, Nanchang to Hukou second channel, Ganzhou to Nanchang, Guixi to Duchang channel. The "two horizontal and one vertical" high-level waterway network with organic convergence of the branch channel and the branch channel belongs to the construction of the Xinjian high level waterway is included in the "Outline of Thirteenth Five-Year Plan of National Economic and Social Development of Jiangxi Province".

(3) The compatibility analysis of Shangrao City's national economic and social development planning.

Chapter 5 "Interconnection Enhances the Supporting Capacity of Infrastructure" in Chapter 5 of "Building a Regional Comprehensive Transportation Hub" in Chapter 5 of the 13th Five-Year Plan for National Economic and Social Development of Shangrao City states that "enhancing the capacity of port and shipping should be promoted. Waterway management and port construction, optimize the port function, enhance the level of intensification, scale and modernization, and focus on promoting the construction of the channel of the river and implement the channel dredging project to integrate into the golden waterway of the Yangtze River, accelerate the construction of the port of Xinjiang River and Poyang Lake. "The Bazizui Navigation and Hydropower Project belongs to the construction of the channel of the Xinjiang River and is included in the traffic key project of" The 13th Five-Year Plan for National Economic and Social Development in Shangrao City " Its construction is in line with Shangrao City's national economic and social development plan.

(4) The Compatibility Analysis of Yugan County with national economic and social development planning

Chapter One of the Thirteenth Five-Year Plan for National Economic and Social Development of Yugan County, Article 6 "Building an Integrated Public Transportation Hub", entitled "Enhancing infrastructure construction and accelerating well-to-do society" states: "With the port of Yugan as Gateway to the main channel of the main channel for the river, connecting the trunk channel network in the province through this water transport system so that Yugan dry water actively participate in the port area of Poyanghu Lake, to enhance throughput and radiation capacity, to promote the opening up to serve the hinterland. According to the economic development of the transport requirements and the development conditions of the channel of the river to speed up the construction of Bazizui Navigation and Hydropower project, the East branch of Xinjiang River, Piaoshan To Tongjiatan, Zhushan Lake to Tuan Lake belongs to the five-level waterway.

Therefore, the construction of the Bazizui cascade is in line with Yugan County's national economic and social development plan.

4.4.11 Coordination Analysis with Ecological Function Regionalization

According to "Ecological Function Zoning of Jiangxi Province", the project belongs to the ecological environment of the northern Jiangxi Plain (I), the southern sub-region of the Poyang Lake Plain (I-3), the protection of the agricultural environment in the lower reaches of the Xinjiang Rao River Flood control flood storage ecological function zone (I-3-4). The main functions are agricultural environmental protection, flood control and flood storage. Other functions include soil and water conservation, water quality protection and water conservation. Comprehensive service functions are important (see Table 4.4-3).

The implementation of this project will help to intensify the efforts in the area of ecological restoration of regional vegetation protection and soil erosion areas and promote the construction of regional ecological agriculture. Meanwhile, this project will help to improve the irrigation conditions of farmland along the banks of the reservoir area, Therefore, the construction of this project accords with the target of agro-ecological environment protection and water and soil conservation in the region, and the "Ecological Function of Jiangxi Province Zoning "has good coordination.

Table 4.4-3 Summary Table of Jiangxi Ecological Functional Area (Excerpt)

Ecological function partition unit			The region and area	The main ecological problems	Ecological sensitivity	Ecosystem service functions	Protection measures and development direction
Ecological Area	Ecology sub region	Ecological function area					
I North Jiangxi Plain Lake Ecological Zone	I-3 Ecological Sub-region of Farmland and Waters in the South Poyang Lake Plain	I-3-4 Xinjiang River downstream Raohe Plain agriculture environment protection and flood control ecological function area	Yugan County, 5058.34 km2	The pressure of agricultural non-point source pollution is relatively high. The quality of forests affected by floods and floods along the lake is poor. The soil erosion around Yugoslavia is serious, and the risk of schistosomias is is high	Soil erosion is moderately sensitive. Slightly sensitive to acid rain, slightly sensitive to water environment pollution, slightly sensitive to arable land resources, slightly sensitive to geological disasters and slightly sensitive to comprehensive sensitivity	The main service functions are agricultural environmental protection and flood control and flood diversion. Other functions include soil and water conservation, water quality protection and water conservation, and comprehensive service functions are more important	Vigorously develop ecological agriculture, a substantial increase in peasant income; improve flood control standards and quality along the river along the lake to ensure the safety of flood season; earnestly protect the forest vegetation and increase the ecological restoration of soil and water conservation in the hills and hills; efforts to strengthen the prevention and treatment of schistosomiasis as soon as possible Eliminate snails; effectively protect the water quality and safety, giving priority to the construction of Tianhe Mountain Ecological Function Protection Zone and the embankment eco-efficient agricultural demonstration zone

4.4.12 Coordination Analysis with "Functional Zoning of Surface Water (Environment) in Jiangxi Province"

According to the "Functional Zoning of Surface Water (Environment) in Jiangxi Province", the water functional zoning of the river where the Bazizui Navigation and Hydropower Hub is affected belongs to the Xinjiang River reservation area, the remaining reservation area for the Xinjiang River reserve and the drinking water source area.The water (environment) functional divisions of Xinjiang River and its major tributaries involved in this project are shown in Table 4.4-4. The functional zoning of surface water environment is shown in the appendix figure 19.

The downstream of east construction site of Bazizui navigation and hydropower project is the intake port of Yugan County Zhangjiagang, which is 4.7km away from the secondary drinking water source protection zone, and 7.7km away from drinking water source protection zone. The position relationship between the dam site and the water intake port of Yugan County Water Works Zhangjiagang is shown in appendix figure. 20.

Table 4.4-4 List of functional zone of surface water (environment) involved in the project

Serial number	River lake reservoir	Water function area name	Water environment function area name	Water quality goals	starting point	End position	Length (km)
1	Xinjiang	Xinjiang Reservation Area in Yujiang	Landscape entertainment water area	III	The Junction of City of Yingtan and Yujiang County	The Junction of Yujiang County pinghsanglujia and Yujiangyugan	23.5
2	Xinjiang	Xinjiang Reservation Area in Yugan	Landscape entertainment water area	III	The Junction of Yujiang County pinghsanglujia and Yujiangyugan	The Fork of East River and West River of Xinjiang in Yugan County	32.0
3	Xinjiang East River	Xinjiang East River Drinking Water Source Area in Yugan	Drinking water source protection area	II ~ III	The Fork of East River and West River of Xinjiang in Yugan County	0.2 Km away from the water intake of the Water Plant in Yugan County	10.5
4	Xinjiang East River	Xinjiang East River Reservation Area in Yugan ~ Poyang	Landscape entertainment water area	III	0.2 Km away from the water intake of the Water Plant in Yugan County	The Junction of Le’an River and East River in Panjiawan, Poyang County	34.5
5	Xinjiang West River	Xinjiang West River Reservation Area in	Landscape entertainment water area	III	The Fork of East River and West River of Xinjiang in	Sanjiangkou into Poyang Lake in Ruihong Town, Poyang County	55.0

		Yugan			Yugan County		
6	Xinjiang Baita River	Baita River in Yujiang under the Reservation Area	Landscape entertainment water area	III	Xiangshui bridge in Yujiang County	The estuary of Baita River into Xinjiang River in Yujiang County	19.0

During the construction period of the project, it may cause some adverse effects on the water environment of the Xinjiang River where the dam site is located. However, by adopting the necessary environmental protection measures, the impact on the water environment during the construction period can be reduced to a minimum level, which will not have any polluted impact on the drinking water downstream of the dam. During the project operation period, the necessary environmental protection measures are taken and environmental management and monitoring plans are formulated and implemented. The reservoir area and the downstream water environment can meet the water function target requirements of the river section where the project is located.

4.4.13 Coordination Analysis with "Red Line Division of Ecological Space Protection in Jiangxi Province"

The "Red Line Division of Ecological Space Protection in Jiangxi Province" was issued by Jiangxi Provincial People's Government on July 5, 2016 with GFF [2016] No. 30. Compared with the red line zoning map of ecological space protection in Jiangxi Province with the land occupation, there is no spatial overlap between the reservoir inundation area and the red line zoning of ecological space protection in Jiangxi Province. Therefore, this project is consistent with the "red line zoning of ecological space protection in Jiangxi Province". Figure 18 shows the relationship between the dam site of Bazizui Navigation and Hydropower Project and the location of red line in the protection of ecological space.

4.5 Environmental Rationality Analysis of the Project

4.5.1 Comparison Analysis of normal water level schemes

4.5.1.1 Comparison Analysis of Normal Water Level Project

The "Planned Inland Waterway Development in Jiangxi Province (2020)" proposed a normal water storage level of 19.5m deep for Bazizui Navigation and Hydropower Project (including Hushanzui and Baipiling). Compared with the four schemes of 17m, 18m, 19m and 20m, the comparison of normal water level schemes in project feasibility study report shows that the geological conditions of the four schemes can meet the requirements, and the hydraulic layout and construction conditions are also feasible. The design flood level and level of sluices and other permanent structures are consistent and do not affect the comparison of normal water level. Each of the normal water level schemes is mainly from the requirements of shipping, convergence with the upstream cascade navigation level (related to the transformation of the Jiepai hub), power generation benefits and investment, reservoir inundation and protection project investment and economic evaluation indexes, power generation and other aspects of the comparative analysis of the major technical and economic indicators of the program can be seen in the following table 4.5-1.

Table 4.5-1 The Comparison Table of main technical and economic indicators in Bazizui navigation and hydropower project of the normal water level

Project	Unit	SchemeI	Scheme II	Scheme III	Scheme IV
Normal water level	m	17	18	19	20
Installed capacity	MW	5.6	12.6	20.6	29
Years of average electricity	10^4kW·h	1998	4503	7376	10351
Installed hours of use	h	3569	3574	3581	3569
Reduce the annual license plate power generation	10^4kW·h	7	92	496	1706
Character mouth average net electricity for many years	10^4kW·h	1998	4411	6880	8645
Waterway improvement works volume	10^4m^3	51.09	18.89	1.62	0
Waterway regulation project investment	10 thousand Yuan	5594.31	2068.68	177.33	0
Waterway maintenance fee	10 thousand Yuan	12307.48	3413.32	1560.50	1100.00
Submergence indicator (water surface)	Mu	29012.08	30817.08	33191.14	37080.31
Inundated reservoir investment (including the protection of land)	10 thousand Yuan	22704.02	24849.02	28546.02	32898.02

Project	**Unit**	**SchemeI**	**Scheme II**	**Scheme III**	**Scheme IV**
Protection project investment	10 thousand Yuan	42063.84	58108.80	85904.23	118402.35
Bazizui pivot project total investment	10 thousand Yuan	339634.5	366845.2	408643.7	453924.17
Jiepai ship lock transformation investment	10 thousand Yuan	11932.63	10624.00	0	0
Meet the total investment in tertiary channel program	10 thousand Yuan	363874.56	380882.52	410204.24	455024.17
Unit kW investment	Yuan/kW	606490	291147	198371	156526
Unit kW · h investment	Yuan/（kW·h）	169.95	83.16	59.40	52.51
Suggestion	**From the engineering perspective, the project feasibility study design's recommended is scheme II, the water level 18m deep.**				

In terms of total investment and economic benefits, the lower the water level, the lower the investment.

From the convergence of the cascade water level, the upstream Jiepai hub was completed in 1996 with 19m deep water level in the upstream and 26m deep water level in the downstream. In view of the lack of understanding of the construction conditions and influencing factors at that time, especially the inadequate consideration of the reservoir area, as a result, the upper Jiepai hub has been operating at a water level of 24m deep and cannot reach the planned level of 26m. With the development of economy and society, land acquisition of displaced persons in the reservoir area has become the most important factor in project construction and is receiving more and more attention from local governments and project owners. In particular, this project is located in the downstream of XinjiangRiver and at the same time it also belongs to the Poyang Lake area, the low-lying, reservoir area inundation should be paid special attention. Although the planned water level of 19m in this project can basically connect with the upstream cascade water level, it will cause large flooding in the reservoir area, which will bring social stability risks and local pressure on the project construction. Reducing the water level can effectively reduce the adverse effects of inundation in the reservoir area, The problem that cannot connect with the upstream cascade navigable water level can be solved through the alteration of the Jiepai Hub, that is, with little input and cost to realize cascade water level, so as to achieve the goal of the third-class waterway as a whole. Therefore, based on the original planned water level, it is more realistic to reduce the water level.

From the perspective of improving waterway conditions and enhancing navigation support, the high water level scheme is benefit for shipping, which can effectively reduce the investment in waterway dredging projects and can ensure the safety of sailing vessels. It will be more favorable to the long-term maintenance of high-level waterways especially after the construction of the project.

From the inundation of reservoirs and investment in the reservoir area protection project, the higher the water level, the greater investment in protection. And then the increase in investment over 18m deep is especially evident.

In terms of the impact on the power generation in the upstream Jiepai power plants, the 17m and 18m schemes have less influence, which is no more than 2%. But for the 19m and 20m schemes, it may have a greater impact, which will affect 10% and 34% respectively.

We can see that total investment in each program is relatively large, but benefits of the power generation are not good.

As a whole, all four schemes can achieve the development target of the third grade waterway through channel regulation and upstream cascade lock alteration, but the scheme above 19m has a great impact on inundation and drainage in the reservoir area, which has a great impact on the cascade generation of electricity in the upper boundary sector. Therefore, it is difficult to meet the shipping requirements and reduce the difficulty of waterway maintenance and high-level waterway maintenance. Therefore, reduce the pressure on flood control and drainage in the reservoir area, reduce the social stability risks and development and construction resistance brought by cascade development are necessary. From the perspective of overall coordination of the left and right banks, the normal water level in 18m deep is reasonable.

4.5.1.2 Comparison Analysis of Environmental Conditions of Normal Water Level Scheme

The environmental comparison of each normal water level scheme of the Bazizui navigation and hydropower project proposed by the project feasibility study is shown in Table 4.5-2.

After comparing and analyzing the normal water level scheme of BaZiZui navigation and hydropower project in the feasibility study of this project, this project recommends a normal water level of 18m from environmental protection point II, and the normal water level scheme recommended by engineering feasibility study is the same.

Table 4.5-2 The Comparison between different schemes of Bazizui navigation and hydropower hub of the normal water level program

Environmental impact factors	**Scheme I**	**Scheme II**	**Scheme III**	**Scheme IV**	**Environmental comparison**
	17m	18m	19m	20m	
Average annual power generation	1998	4503	7376	10351	From the perspective of alternating carbon emissions from

Environmental impact factors	**Scheme I**	**Scheme II**	**Scheme III**	**Scheme IV**	**Environmental comparison**
	17m	18m	19m	20m	
（10^4kW·h）					thermal power plants, the greater the amount of power generaed,the greater amount of the carbon replacement, Scheme Four is better than Scheme Three, and Scheme Three is better than Scheme Two, which are all better than Scheme one.
Waterway improvement works volume（10^4m^3）	51.09	18.89	1.62	0	The higher the water level, the smaller the volume of waterway regulation, program IV does not require waterway regulation. Scheme Four is better than Scheme Three, and Scheme Three is better than Scheme Two, which are all better than Scheme one.
Occurrence of ship accident and environmental risk probability	The project will meet the requirements of Class III waterway through the transformation of ship locks and the regulation of waterway by ship boundary. Ship accidents and less environmental risks occur.			To meet the requirements of Class III waterway,the risk rate is low	Scheme IV is the best, scheme I, II, III are basically the same.
Submergence indicator (water surface)（Mu）	29012.08	30817.08	33191.14	37080.31	The higher the water level, the greater the submergence range, the greater the investment in protection projects, especially the submerged range of solutions III and IV, and the investment in protection projects has obviously increased. The greater the flooding index, the
Protection project investment	42063.84	58108.80	85904.23	118402.35	

Environmental impact factors	**Scheme I**	**Scheme II**	**Scheme III**	**Scheme IV**	**Environmental comparison**
	17m	18m	19m	20m	
					more vegetation and farmland are broken, the greater impact on terrestrial ecology and agricultural production. The better the scheme I is than the scheme II and the better than the scheme III and the better the scheme IV.
Impact on water environment	Programs III and IV may affect the normal sewage discharge at the Jinbu Industrial Park in Yugan County, while schemes I and II have no effect on them.				Scheme I, II is superior to scheme III, IV
Impact on the ecological environment	The higher the water level, the greater the submerged area, the scope of land acquisition and the amount of demolition, the greater the impact on the terrestrial ecological environment along the two sides of the Yangtze River.				Scheme I is better than scheme II is better than scheme III is better than scheme IV
Comprehensive environmental comparison	Under the precondition that the schemes I, II and III pass the waterway regulation, all the four schemes can meet the requirements of waterway III and risks rate is low. However, the volume of the waterway regulation works of Scheme I is obviously larger than that of other schemes. Compared with schemes I and II, the investment in schemes III and IV is higher than that in schemes I and II, and the investment in protection projects is obviously increased. The impacts on the terrestrial ecology and agricultural production of vegetation and farmland are obviously enhanced. Yugan County Golden Buzhen Industrial Park's outfall of sewage will affect the normal sewage. After comprehensive comparison, the normal water level is 18m deep, and scheme II is superior to the scheme I, III, IV.					
Suggestion	**From the perspective of environmental protection, the recommended water level is 18m.**					

4.5.2 Comparison and Analysis of Dam Site Schemes

4.5.2.1 Comparison and Analysis of Dam Project

The project feasibility study design proposed three dam sites as the project comparison and selection dam sites, and the location of the three selected dam sites shown in Figure 4.5-1.

Solution 1: East River dam site (downstream the Hushanzui dam site) is about 2.5km downstream of the entrance of East River. The dam site at West River (downstream the Mopiling dam site) is about 2.2km downstream of the entrance of the West River.

Solution 2: East River dam site (upstream the Hushanzui dam site) and the West River dam site (upstream the Mopiling dam site) is in the fork of the East and West Rivers' downstream about 0.9m, two hubs located in the same dam axis.

Solution 3: The dam site of the main channel (Daxi dam site) is located about 1.4km upstream of the junction of the East and West rivers. In order to prevent the East River getting dry, the project plans to build Shuanggang Shipping Hub in the East River to let the water back to the fork of the East River and West River and then along the West River flow into the Poyang Lake area and then set up river-crossing pivot in the West River. The dam site is the downstream Mopiling dam site (about 2.2km downstream of the West River inlet) in the solution one.

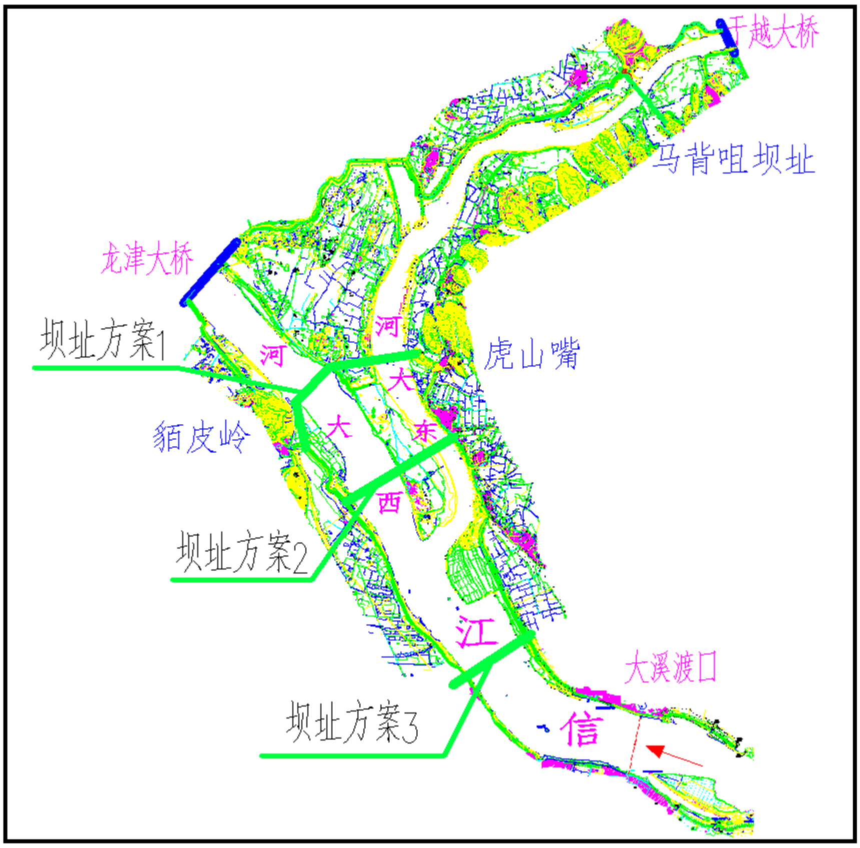


Figure 4.5-1 Bazizui pivot location map

In the project feasibility study design, the three schemes of the dam sites were compared and selected respectively from topographic and geological conditions, hub layout, engineering quantity, navigational conditions, waterway convergence conditions, construction conditions, reservoir inundation and total project investment. The three schemes' comprehensive comparison analysis is shown in Table 4.5-3.

According to the comparison and selection of the three schemes of dam sites in Table 4.5-3, all the three schemes have the engineering conditions for constructing a low-head navigational junction according to the topographic and geological conditions, and the second scheme is relatively slightly superior. From the layout of the hub, three schemes are basically the same. In the third scheme, there is less one power station, but 12-hole sluices are built. The civil works quantities of the three schemes are basically the same. From the navigation conditions, the solution 2's upstream and downstream channel conditions are better. From the construction conditions, the river diversion of the second solution is more concise and cost the least investment, and the third solution is the most expensive and the longest period of river diversion investment. From the total project investment, the second solution is the lowest, and the highest is the third solution. Taken together, this stage recommends solution 2 as the selected dam site.

4.5.2.2 Comparison and analysis of dam site environment

The environmental comparison and selection of the three dam sites proposed in the project feasibility study is shown in Table 4.5-4.

From the point of view of environmental protection, solution 1 and solution 3 are located in the secondary protection area of the water intake of Hongjiazui Waterworks and the project construction has legal restricted conditions. After comprehensive comparison and selection of the environment, this evaluation recommends solution 2's dam site from the perspective of environmental protection and is the same as the project feasibility study design recommendation solution.

Table 4.5-3 Dam site comprehensive comparison table

project	**Scheme I**	**Scheme II**	**Scheme III**
Topographic and geological conditions	From the topography and geology conditions, all three schemes have the engineering conditions for constructing a low-head navigational hub, and scheme two is relatively superior.		
Hub layout	The layout of the hub is the layout of the right ship lock of the left workshop, which mainly includes 2 ship locks, 32-hole sluice gates, 1 gate bank section, 2 power stations, 1 fish channel and earth dam connecting section with a total length of 2230m	The layout of the hub is the layout of the right workshop of the left lock, including 2 ship locks, 32-hole sluice gates, 1 gate bank section, 2 power stations, 1 fish channel and earth dam connecting section with a total length of 1510m	The layout of the main riverbed hinge is the right workshop layout of the left lock, including 1 lock, 32-hole sluice gate, 1 gate section, 1 power station, 1 fish channel and earth dam connecting section with a total length of 850m. No power station, the rest is the same with the first one, mainly including 1 ship lock, 20 holes sluice gate, 1 gate section, 1 fish channel and earth dam connecting section, total length 1330m

project	Scheme I	Scheme II	Scheme III
Project volume	earth work excavation volume is 3.1729 million m^3 Dredging volume is 5,529,100 $m^{3;}$ the earth and rock fill volume is 1,170,700 m^3	earthwork excavation volume is 3.1729 million m^3 Dredging volume is 7.9394 million m^3 earth and rock fill volume is 806,300m^3	Earth excavation is 14.450 million m^3 Dredging volume is 5,529,100 m^3 earth and rock fill volume is 845,900m^3
Navigation conditions	Mopiling Pivotal Lock Project upstream and downstream navigation channel connection more smoothly. Hu Shan mouth pivot ship lock project upstream and downstream waterway convergence conditions are not very good	On the west major river navigation lock project, the downstream approach channel can be directly connected with the main channel, and the upstream and downstream are very smooth. The upstream connecting section of the Dongdahe pivotallock project has a relatively straight fairway. The lower reaches of the main channel are basically smooth	The downstream navigation conditions of the Daxi Junction Shiplock Project are poor. Mopiling Pivotal Lock Project upstream and downstream navigation channel connection more smoothly
Channel convergence conditions	There is no essential difference between the conditions of the three dam routes.		
Construction Conditions	Open channel diversion, a open channel navigation, the second	Open channel diversion, a open channel navigation, two East River lock, concrete pouring intensity of 55,000 m3 / month, the total construction period of 54 months, 407	Staging diversion, a navigation aid, two main river bed, West River lock, concrete pouring intensity of 30,000 m3 / month, the total construction period of 56 months, diversion project investment 604 million yuan.

project	Scheme I	Scheme II	Scheme III
	phase of the East River Lock, concrete pouring intensity of 55,000 m^3 / month, the total construction period of 54 months, the diversion project investment of 512 million yuan.	million investment diversion project.	
Reservoir area submerged	Construction Requisition Requisition Involved in the total land area of 40,400 mu, an estimated investment of 249 million yuan.	Construction and requisitioning involves a total land area of 39,200 mu and an estimated investment of 248 million yuan.	The expropriation and requisition for construction involves a total area of 33,700 mu of land, with an estimated investment of 192 million yuan.
Total investment (100 million yuan)	39.06	37.31	39.31
Suggestion	From the engineering analysis, the project feasibility study design recommended that Scheme II is the best choice.		

Table 4.5-4Dam environment comparison analysis table

Projects	Scheme I	Scheme II	Scheme III	Environmental comparison
Project covers an area (mu)	4.04	3.92	3.37	The larger the area of the project, the greater impact on vegetation and farmland and on the terrestrial ecology and agricultural production. The third scheme is better than the second

				scheme.
Earthwork excavation (million m^3)	278.60	317.29	146.50	The greater the amount of earth excavation, the greater impact on the ambient air, surface water environment, the program three is better than the program one is better than the program two.
Water environment protection goal	In the reservoir area, there are distributed 6 drinking water intakes.			The three programs are basically the same.
Downstream dam source of drinking water	Dongdahe dam site from Yugan water plant Zhangjiagang intake about 6km, Yugan County water plant Zhangjiagang intake about 7.2km; West Dam site from Hongjiazui water plant water intake about 2.7km.	Dongdahe dam site from Baimaqiao Township Gaoyuan waterworks intake about 7.5km, Yugan County Waterworks Zhangjiagang intake about 8.7km; West Dam site from Hongjiazui waterworks intake about 4km.	Daxi dam site of main channel is about 9.9km from Gaoyuan waterworks inlet of Baimaqiao Township and 11.1km of water intake of Zhangjiagang Water Supply Plant of Yugan County; and about 2.7km from water intake of waterworks site of Hongjiazui Township of West River Dam.	Scheme1and scheme 3 of Xishahe dam site is located in the second-level protection zone near the water intake of Hongjiazui Township Waterworks and the scheme II is the best.
Hydrological characteristics	Three dam site program control basin area, hydrological characteristics of the basic project.			The three dam site programs are basically the same.
Soil and water conservation	The greater the amount of excavation, the greater the soil erosion, the smallest amount of earth and rock excavation program three, the program once, the second largest program.			Scheme three is better than scheme one, and Scheme one is better than scheme two.
Ecological impact.	The larger the project area, the greater the impact on the ecological environment. The first project covers the largest area, the second solution and the third solution.			Scheme three is better than scheme two, and Scheme two is better than scheme one.
Water pollution in the reservoir area	The larger the area of the reservoir area is, the larger the environmental capacity is. The larger the pollutant concentration in the reservoir area is.			Scheme one is better than the two and the two is better than the three.

Navigation conditions	The junction of upstream and downstream navigation channels of the Piedie Pivotal Lock Project is smooth; the connecting conditions of the upper and lower reaches of Hu Shan Mouth Pilot Project are not very good	The navigation channel of the downstream of the Xisdahe Junction can be directly connected with the main waterway by a straight line, and both the upper and lower reaches are smooth. The upper connecting channel of the Dongdahe Junction Project is straighter, and the lower arc has a larger arc radius Connect the main channel, basically smooth.	The navigation conditions of the downstream of the Daxi Junction Shiplock Project are poor; the navigation channels on the upstream and downstream channels of the Piedie Pivotal Lock Project are relatively smooth.	The better the navigation conditions, the lower the environmental risk, and the second is better than the third one in terms of environmental risk.
From the perspective of environmental protection, Scheme 1 and Scheme 3 are located in the secondary protection area of the water intake of Hongjiizui Waterworks and the project construction has legal restriction conditions. Through comprehensive comparison and selection of the environment, program two is better than others.				
Suggestion	**From the perspective of environmental protection, program II is recommended.**			

4.5.3 Environmental rationality analysis of yard location

According to the design of construction organization, a total of 2 soil material fields and 1 sand and gravel material field are set in the project. The stone material is purchased from the stone field of Hexi Village, Dayuan Town, Wannian County. No stone factory was set. The basic information of the yard is shown in Table 4.5-5. The schematic diagram of the yard location is shown in Figure 4.5-2 and Figure 15, and the scene photos are shown in Figure 4.5-3.

Table 4.5-5 Bazizui navigation and hydropower project yard basic situation table

Project	Soil material field		Gravel material yard
	Right bank I_1 Soil material field	Left bankI_2 soil material field	
Distance（km）	1km to Right bank, Hushanzui Dam of Dongdahe River	2km to Left bank, Maopiling dam of Xidahe river	1.3km upstream
Administrative divisions	Xiongjiacun Village, Baimaqiao countryside	Minfangcun village，Daxi village	tongkoucun village of Baimaqiao countryside
Status quo	Grassland hills	Mixed trees, low hills	A long sandstone original reservoir area, sand has been mined, the remaining part of the gravel field
Environmentally sensitive point	None	None	None
Rock	Ptbn Phyllite residual	Ptbn Phyllite full weathered soil	

characteristics	slope fill and full, strong weathered soil		
Area（ 10^4 m^2）	28.09	24.82	28.01
Reserves（10^4 m^3）	365.17	322.66	290
Mining and transport conditions	3# Near Right bank construction road，the traffic conditions and convenience	1# Near Left bank construction road， the traffic conditions and convenience	Direct access road gravel yard, convenient transportation
Current mining situation	Large yard area, useful thickness and stability, the overall mining conditions are better.	Large yard area, useful thickness and stability, the overall mining conditions are better.	There is gravel mining activity upstream

Figure 4.5-2 yard location diagram

Right bank □1soil material field

Left bank □2 soil material field

Figure 4.5-3 yard site photos

After comprehensive analysis, the earthwork required for the project is mined from the Xijiacun earthwork material field on the right bank I1 and the earth material field on Minhangcun II2 on the left bank. The soil material field at Xijiacun I1 on the right bank is about 1km away from the right bank of the Tushanzha dam site on Dongdahe River, The area near the road is very convenient for traffic. I1 soil material field currently covers an area of almost grassland with a total material area of about 280,900 m2. The material field of Minfang Village I2 on the left bank is about 2km away from the left bank of Xidahe River's Maopiling Dam site, # Left bank construction near the road, convenient transportation, I2 soil material field currently covers an area of almost woodland, yard total area of about 248,200 m2. The gravel material required for the project is mined from the gravel yard of Tongkou Village. The gravel material yard of Tongkou Village is located on the right bank of Xinjiang River, 1.3km upstream of the dam site. There is a simple road leading to the gravel yard and the traffic is very convenient.

The selected Xiongjia Village soil material field on the right bank I1 of the project, the soil material field of Minfang Village on the left bank I2 and the gravel material field of Tongkou Village on the left bank are all located near the dam site with the shortest distance, effectively reducing the length of temporary road construction, reducing temporary land occupation and avoiding more vegetation loss, less disturbance to the environment and less perturbation. Due to the close distance, the impact of dust generated during transportation is relatively small. The present site of the Xiongjiacun earth material field in the selected right bank I1 is used as wasteland, the existing farmland in Minfang Village I2 on the left bank is woodland, and the gravelly field in Tongkou village is floodplain, which can effectively protect the cultivated land in the project area. Stone used in the project from Wannian County, Dahyuan Town Dutch Village Stone Market purchased. Therefore, from the perspective of environmental protection, the yard selection is reasonable.

4.5.4 Reasonable Analysis of Slag Site Selection

The spoil of this project is mainly in the hub construction area with basically no spoil in the protected area.

A total of 7,578,000 m3 of wastes have been disposed of in this project, and a spoil yard for the spoil disposal area of the hub has been set up. The status quo characteristics and rationality analysis of spoil grounds are shown in Table 4.5-6.

On the river heart island between Dongdahe River and Xidahe River downstream of dam site of spoil dump site, the area of spoil dumping site is 2.45 million m2, and the average ground elevation level of spoil dump site is 19.0m and the filling height is 3.5m, 757.8 million m3, mainly to accommodate the main structure of construction waste, construction demolition cofferdam dregs and waterway dredging.

Table 4.5-6 Main Environmental Characteristics and Reasonable Analysis Table of Waste Dumping Yard

Name	Hub spoil yard
Location	Downstream dam about 1km, east and west rivers between the heart of the island
Topography	Ground elevation of about 19.0m, the terrain is relatively flat
Waste slag（$10^4 m^3$）	757.8
Covering area（$10^4 m^2$）	245
Vegetation characteristics	Cultivated land, meadow and woodland
Residents nearby	None
Expected recover	Spalling the topsoil prior to spoil, reclamation after the spoil is completed
Ecologically sensitive area	Does not involve nature reserves, scenic spots and other ecologically sensitive areas

The spoil grounds of the hub mainly cover arable land, meadows and woodlands with small transport distances and short roads for newly-built roads. Environmental impacts such as soil erosion and dust pollution caused by road construction are small. Prior to the spoil, the surface soil is pre-stripped, reclaimed after the spoil is completed, and the reclamation can be carried out after the spoil is finished, which has little effect on the total cultivated land area. There are no ecological sensitive areas such as nature reserves and scenic spots in the hub spoil grounds. There is also no distribution of key protected wild animals and plants of the state and Jiangxi Province within the scope of the land occupation. There are no surrounding villages, settlements and other environment-sensitive target distributions. Therefore, it is reasonable to analyze the site selection of spoil grounds from the perspective of environmental protection.

4.5.5 Environmental Rationality Analysis of Construction Layout

According to the construction design of the project, the temporary works of Bazizui Junction Project are all arranged on the island of Hexin mainly including the concrete mixing system, concrete prefabrication plant, steel processing plant, metal structure temporary storage yard, mechanical repair plant, construction substation, construction water supply system, construction and living area, site lab, etc. The temporary construction covers a total area of about 621,500m2, which are all arranged near the dam site with small distance. This can reduce the impact of soil and water loss, dust and vegetation loss caused by construction road construction, Reduce road dust and noise during construction. Within 200m of the boundary of the construction site, there is no sound environment such as residents and schools, sensitive air and ambient air. The construction site does not involve the rare protection of plants, animals and plants and special vegetation communities. Overall, it is reasonable to locate various construction facilities at Bazizui Navigation.

5. Prediction and Evaluation of Impact on Environment

5.1 Hydrological situation

5.1.1 Existing Hub Projects

The Jiepai Navigation and Electricity Hub is the first step of the Xinjiang River shipping project that is located on the mainstream of the Xinjiang River at the hub of Xuyang Village, Zhongtong Town, Yujiang County, Yingtan City, and Hongtang Town, Guixi City in Jiangxi Province. And the hub is 12.5 kilometers away from Yingtan City, which is a shipping-based, with power generating, irrigation and other functions of the avionics hub. The Jiepai Navigation and Electricity Hub is located at the upstream of Bazizui Navigation and Electricity Hub and is not within the backwater area of Bazizui Navigation and Electricity Hub.

The main body of the project consists of a 1000-ton ship lock, an installed capacity of 210MW hydropower station, a overflow dam, a flat-slab dam and a highway bridge. Started by the end of 1992, the main project was completed in July 1997. On the August 18, 2002, the project officially started working for the impoundment.

Jiepai Navigation and Electricity Hub is mainly for shipping and has some other benefits like generating electricity. The junction is composed of block power station, concrete drainage sluice, overflow dam, ship lock, earth dam and highway bridge. The navigation of the ship lock is at 1000t class and installed capacity of power station is 20000 kw. The designed storage level of this project is 26 meters, and the corresponding storage capacity is 97 million m^3, and the reservoir area is $18.45km^2$. Now the actual operating water level is 24 meters.

Jiepai Navigation and Electricity Hub has been in operation for 12 years since it was put into operation in August 2002, and the mode of operation and dispatch of the project has become more and more mature. Scientifically and reasonably dispatch and operation of the project enable the project to fully utilize the comprehensive benefits of water resources such as shipping, power generation, irrigation and urban beautification, and make positive contributions to the local economic development and social development. Therefore, the operation and dispatch methods used in this analysis are mainly based on the principles of operation and dispatch used in 2012 ~ 2013 and made some improvements.

Jiepai Navigation and Electricity Hub is located in the middle and lower reaches of the Xinjiang River. The slope of the river is relatively slow, and the power station is a low-head runoff power station. The dispatch mode of the project shall first consider the flood control safety of the project itself and the reservoir area, then the scheduling of profiting (Shipping, power generation and other profit-making functions) is carried out. From the perspective of the mode of the Jiepai Navigation and Electricity Hub's operation and dispatch in 2012 ~ 2013, the project is operated based on the upstream inflow combined with the water level in front of the dam, and its operation modes are as follows.

(1) Flood control operation mode

When the traffic flow at the dam site is more than or equal to 3000 m^3 / s, the flood control operation mode is on. In order to ensure the safety of the Jiepai Navigation and Electricity Hub's buildings and reservoir area, all the projects' sluice gates are fully open for flood discharging until the watercourse is basically restored to the natural state for flood control.

(2) Shipping, power generation dispatching mode

When the traffic flow at the dam site is less than 3000 m^3 / s, it enters the operation mode of profiting, and the floodgates of the junction will be closed or partially opened, so that the water level in front of the dam is maintained at a certain water level (flood season is from April to July, and the water level should be controlled within 23.3 meters. From August to the next year's March, the water level should be controlled within 24.0 meters.) to raise the upper level of the dam, increase the fairway depth, improve the shipping conditions and use the water fall formed by the dam's gates to generate electricity to meet the requirements for shipping, power generation and so on.

5.1.2 The flow of Bazizui Dam in natural state

5.1.2.1 Runoff's characteristics

The water catchment area above the pivot of Bazizui Dam is 15942km2. The runoff of the Xinjiang River is mainly formed by precipitation. The temporal and spatial variation of runoff is basically the same as that of precipitation. The distribution of runoff during a year is not uniform, with a large difference between flood and dry flow. According to the characteristics of runoff and rainstorm or flood in Meigang Station, the period from March to August is divided as flood season, and September to the following February is dry season. The average flow rate of Meigang Station is 563 m^3 / s for many years, accounting for 79.0% of the annual flood volume in flood season and 21.0% of the water volume in dry season.

The variation of runoff interannual is unstable and fluctuates greatly. The maximum annual average flow rate of Meigang Station is 951m^3/ s (from March 2012 to February 2013), and the minimum annual average flow rate is 120 m^3/ s (from March 1991 to February 1992), with a ratio of 7.93. The runoff's distribution of Meigang Station during the year is shown in Table 5.2-1 (a).

Table 5.1-1 (a) Results of Meigang Station's Runoff during the Year

Month	arch	pril	ay	une	uly	ugust	S eptembe	ctober	N ovembe	D ecembe	anuar	ebru	year

							r		r	r	y	ary	
Average flow（m^3/s）	52	61	140	520	02	57	281	91	212	191	203	361	63
Proportion（%）	.8	4.0	7.2	2.2	0.6	.4	4.1	2.9	3.1	2.9	3.1	5.0	00
Abundant or withered proportion（%）	79.0						21.0						00

The site of Bazizui Dam has a catchment area of 15942 km^2. Meigang Hydrological Station is located on the mainstream of the Xinjiang River about 27.2km upstream of the dam site. And the controlled catchment area of Meigang Station is 15535 km^2, which is only 2.6% less than that of Baizui Dam. Due to the catchment area of Bazizui Dam and Meigang Hydrological Station are close, and there is no large tributary flowing in, therefore, the inflow rate of Bazizui Reservoir can be calculated by using the area ratio method according to the runoff of Meijian Hydrological Station. Runoff distribution of Bazizui Dam within the year is shown in Table 5.2-1 (b).

Table 5.2-1(b) Distribution results in annual runoff of Bazizui dam

Month	March	April	May	June	July	August	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	year
Average flow rate（m^3/s）	669	986	1170	1560	720	366	288	196	218	196	208	370	578
Proportion（%）	9.8	14.0	17.2	22.2	10.6	5.4	4.1	2.9	3.1	2.9	3.1	5.0	100
Plentiful and dry year（%）	79.0						21.0						100

5.1.2.2 Dam site runoff frequency

The results of the flow and diversion ratio at all levels in the East and West Dahe rivers of the Xinjiang River are shown in table 5.1-2. The result of the diversion ratio of the East and West rivers of Bazizui of the Xinjiang river is shown in table 5.1-1. The results of the design of the run-off of Bazizui are shown in from table 5.1-2 to table 5.1-5.

Annual runoff calculation results of sections of Bazizui, Hushanju, and Mopiling

are shown in table 5.1-6.

Table 5.1-2 The results of the flow and diversion ratio at all levels in the East and West Dahe rivers of the Xinjiang River

Flow level（m3/s）	Diversion ratio of East river K 东	Diversion ratio of West river K 西
Q Bazizui>1200	0.36	0.64
300<Q Bazizui≤1200	0.39	0.61
200<Q Bazizui≤300	0.44	0.56

100<Q Bazizui≤200	0.53	0.47
60<Q Bazizui≤100	0.64	0.36
Q Bazizui≤60	0.72	0.28

Table 5.1-3 Bazizui Annual runoff frequency calculation results

dam section	mean value（m^3/s）	Frequency at all levels（%）design value（m^3/s）							
		5	10	20	50	75	80	90	95
Bazizui	578	976	864	742	545	421	395	334	291
Hushanju	225	381	337	289	213	164	154	130	128
Mopiling	353	595	527	453	332	257	241	204	163

Table 5.1-4 Bazizui runoff frequency calculation results during dry season(Sept. ~ next Feb. ）

Dam	mean value（m3/s）	Frequency at all levels（%）design value（m3/s）							
		5	10	20	50	75	80	90	95
Bazizui	244	520	434	343	211	140	127	98.2	81.3
Hushanju	107	203	169	134	93.0	74.3	67.3	62.8	52.1
Mopiling	137	317	265	209	118	65.7	59.7	35.2	29.2

Table 5.1-5 Bazizui Minimum monthly runoff frequency calculation results

Dam	mean value（m3/s）	Frequency at all levels（%）design value（m3/s）							
		5	10	20	50	75	80	90	95
Bazizui	105	241	196	151	86.7	54.3	48.6	36.8	30.4
Hushanju	55.5	106	104	79.9	55.5	39.1	35.0	26.5	21.9
Mopiling	49.5	135	92.0	71.1	31.2	15.2	13.6	10.3	8.50

Table 5.1-6 Bazizui, Hushanju and Mopiling runoff calculation results over the years

Hydrological year	Bazizui dam site（m3/s）	Hushanju dam site（m3/s）	Mopiling dam site（m3/s）
1952	682	266	416
1953	819	320	500
1954	874	341	533
1955	558	218	340
1956	516	201	315
1957	435	170	265
1958	602	235	367
1959	410	160	250
1960	434	169	265
1961	488	190	298
1962	726	283	443
1963	305	119	186
1964	403	157	246
1965	508	198	310
1966	495	193	302
1967	584	228	356
1968	563	220	344

Hydrological year	Bazizui dam site（m3/s）	Hushanju dam site（m3/s）	Mopiling dam site（m3/s）
1969	628	245	383
1970	784	306	478
1971	332	129	202
1972	491	192	300
1973	884	345	539
1974	402	157	245
1975	933	364	569
1976	658	256	401
1977	684	267	417
1978	344	134	210
1979	343	134	209
1980	573	223	349
1981	536	209	327
1982	540	211	330
1983	717	280	437
1984	523	204	319
1985	373	145	228
1986	341	133	208
1987	573	224	350
1988	663	259	405
1989	689	269	420
1990	141	75	66
1991	123	65	58
1992	702	274	428
1993	725	283	442
1994	701	273	428
1995	961	375	586
1996	369	144	225
1997	869	339	530
1998	941	367	574
1999	795	310	485
2000	643	251	392
2001	546	213	333
2002	751	293	458
2003	411	160	251
2004	411	160	250
2005	455	177	277
2006	642	251	392
2007	368	143	224
2008	458	179	280
2009	548	214	334
2010	925	361	564
2011	448	175	273
2012	976	381	595
2013	526	205	321

Hydrological year	Bazizui dam site（m3/s）	Hushanju dam site（m3/s）	Mopiling dam site（m3/s）
Aver.	578	225	353

5.1.2.3 Dry water runoff

Analysis of runoff characteristics in low water period is based on the series of natural runoff series from March 1952 to February 2014 of Meigang station in 62 years. In the runoff series of megang station, there are two dry water run-off sections. The first period is from March 1954 to February 1969, with a long time of about 15 years. The annual average runoff in dry season is 513m3/s, and the dry season average flow is 176m3/s. The second period is from March 1977 to February 1992, with a long time of about 15 years, and the annual average discharge is 465m^3/s in dry season, and the average flow rate in dry season is 199m^3/s

The dry period of the Xinjiang River Basin is usually from September to February of the next year, and the runoff in the flood season is more concentrated, and the runoff in the dry period is generally smaller.

The average annual flow rate of Mei Gang station is 238m^3/s, and the most dry month is from October to January. The average annual flow rate is 191, 212, 191 and 203m^3/s respectively. In December, the amount of water was the most dry, accounting for only 2.9% of the average amount of water for years. From March 1952 to February 2014, the most dry flow volume in dry season is 120m^3/s (March 1991 to February 1992), and the most abundant flow is 699m^3/s (March 1983 to February 1984)

Corresponding to the grade III channel of this project, the water level of 98% to 95% is guaranteed. If 95% frequency flow is as the minimum navigable flow of the project, Bazizui minimum navigable flow is 43.9m^3/s, Hushanju and Mopiling dam minimum navigable discharge were respectively 31.6, 12.3m^3/s. According to the daily average flow rate of Bazizui hub, the low water flow rate of Bazizui dam, and the East river dam and the West river dam sites are calculated respectively. The results are shown in table 5.1-7 and figure 5.1-2

Table 5.1-7 Analysis results of the low flow rate assurance rate of Bazizui hub

Dam	Each frequency design value (m^3/s)				
	75%	80%	90%	95%	98%
Bzuizui	121	102	64.5	43.9	25.8
Hushanju	64.2	54.0	41.3	31.6	18.5
Mopiling	56.8	48.0	23.2	12.3	7.30

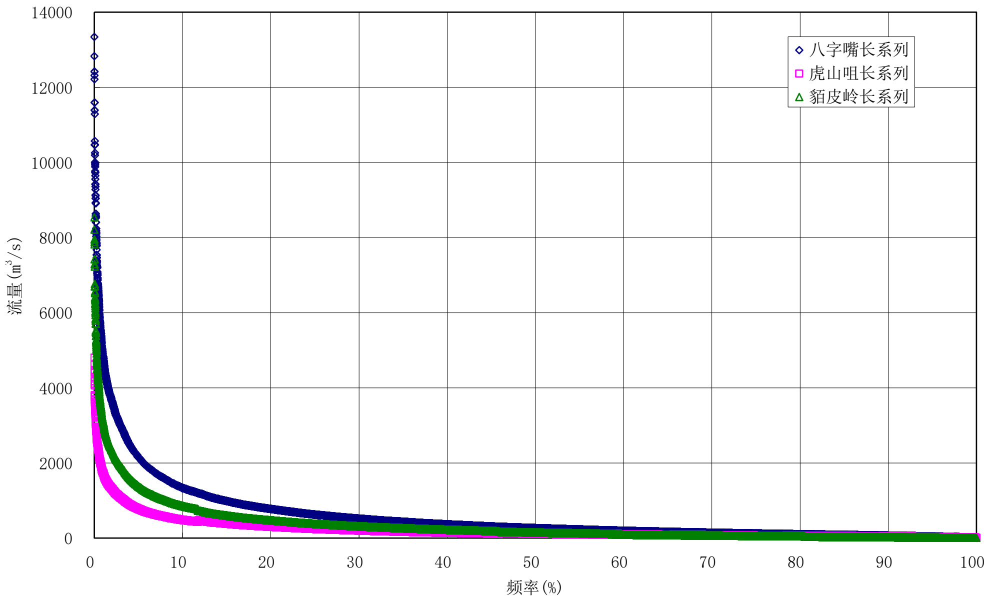


Fig.5.1-2 The curve diagram of the flow guarantee rate of the integrated diachronic curve method for Bazizui Navigation-power Junction

5.1.2.4 Design flood

The water collector area above the dam site of Bazizui dam site is F=15942km^2, and the design flood results of Bazizui are detailed in table 5.1-8.

Table 5.1-8　Design flood results of Bazizui

Dam section	Frequency at all levels（%）design value（m^3/s）									
	0.1	**0.2**	**0.33**	**0.5**	**1**	**2**	**3.33**	**5**	**10**	**20**
Bazizui	23400	21600	20300	19200	17500	15600	14200	13100	11200	9160
Hushanju	8420	7780	7310	6910	6300	5620	5110	4720	4030	3300
Mopiling	15000	13800	13000	12300	11200	9980	9090	8380	7170	5860

5.1.2.5 Relation between Water level and flow

The relation curves of the water level and flow of the dam section at Bazizui are detailed in table 5.1-9, table 5.1-10, figure 5.1-3, and figure 5.1-4.

Table 5.1-9　Curve of relations between water level and flow of Mopiling dam site

Flow（m^3/s）	Dam water level（85 National height datum，m）					
	Lower envelope curve	corresponding water level in Ruihong station				Upper envelope curve
		Below 15m	16m	17m	18m	
0	9.88	14.50	16.00	17.00	18.00	19.01
8.01	10.58	14.52	16.01	17.00	18.00	19.01
27.0	11.53	14.55	16.02	17.00	18.00	19.03
81.0	12.71	14.66	16.05	17.01	18.00	19.07
160	13.64	14.90	16.12	17.08	18.00	19.12
260	14.27	15.24	16.22	17.15	18.04	19.21
364	14.67	15.56	16.37	17.23	18.09	19.32

486	15.05	15.91	16.55	17.33	18.18	19.45
612	15.42	16.22	16.76	17.43	18.30	19.58
726	15.75	16.48	16.97	17.57	18.41	19.69
940	16.30	16.90	17.36	17.85	18.62	19.86
1176	16.87	17.34	17.78	18.19	18.90	20.03
1419	17.39	17.75	18.19	18.55	19.16	20.20
1689	17.92	18.19	18.59	18.94	19.45	20.39
1971	18.45	18.61	18.96	19.28	19.72	20.54
2259	18.90	18.99	19.32	19.59	19.96	20.70
2562	19.34	19.34	19.64	19.91	20.22	20.86
2910	19.83		19.98	20.20	20.47	21.06
3355	20.36		20.36	20.59	20.81	21.30
3966	20.99			21.07	21.22	21.63
4655	21.60			21.60	21.65	21.97
5357	22.08				22.08	22.25
6099	22.50					22.56
6862	22.83					22.83
7668	23.12					
8545	23.32					
12000	23.88					
14000	24.18					

Remark：The relation between Ruihong station and dam position see Table 2.1-1。

Table 5.1-10 Curve of relations between water level and flow of Hushanzui dam site

flow（m^3/s）	Dam water level（85 National height datum，m）					
	Lower envelope curve	corresponding water level in Boyang				Upper envelope curve
		Below 15m	16m	17m	18m	
0	11.72	14.57	16.00	17.00	18.00	18.99
20.0	12.24	14.57	16.01	17.00	18.00	18.99
49.0	12.76	14.61	16.03	17.01	18.00	19.01
74.0	13.12	14.66	16.06	17.03	18.01	19.05
118	13.60	14.79	16.10	17.07	18.02	19.10
174	14.10	15.01	16.20	17.14	18.05	19.18
228	14.55	15.29	16.28	17.20	18.11	19.29
291	14.95	15.66	16.44	17.28	18.18	19.42
355	15.35	16.03	16.60	17.37	18.28	19.53
413	15.69	16.34	16.78	17.45	18.36	19.64
533	16.26	16.84	17.15	17.68	18.55	19.85
661	16.82	17.34	17.61	18.00	18.78	20.06
798	17.34	17.78	18.05	18.40	19.04	20.26
950	17.87	18.28	18.49	18.80	19.37	20.47
1109	18.38	18.71	18.94	19.18	19.69	20.65
1307	18.96	19.20	19.43	19.64	20.06	20.84
1441	19.32	19.54	19.75	19.98	20.32	20.95
1637	19.78	19.93	20.12	20.35	20.62	21.13
1887	20.30	20.30	20.50	20.70	20.93	21.33
2231	20.87		20.88	21.06	21.24	21.61
2619	21.43			21.43	21.57	21.90
3013	21.88				21.88	22.14
3430	22.29					22.42
3860	22.67					22.67
4313	22.99					

4807	23.23					
6000	23.66					
7000	23.93					
8000	24.13					

Remark：The relation between Boyang station and dam position see Table 2.1-1。

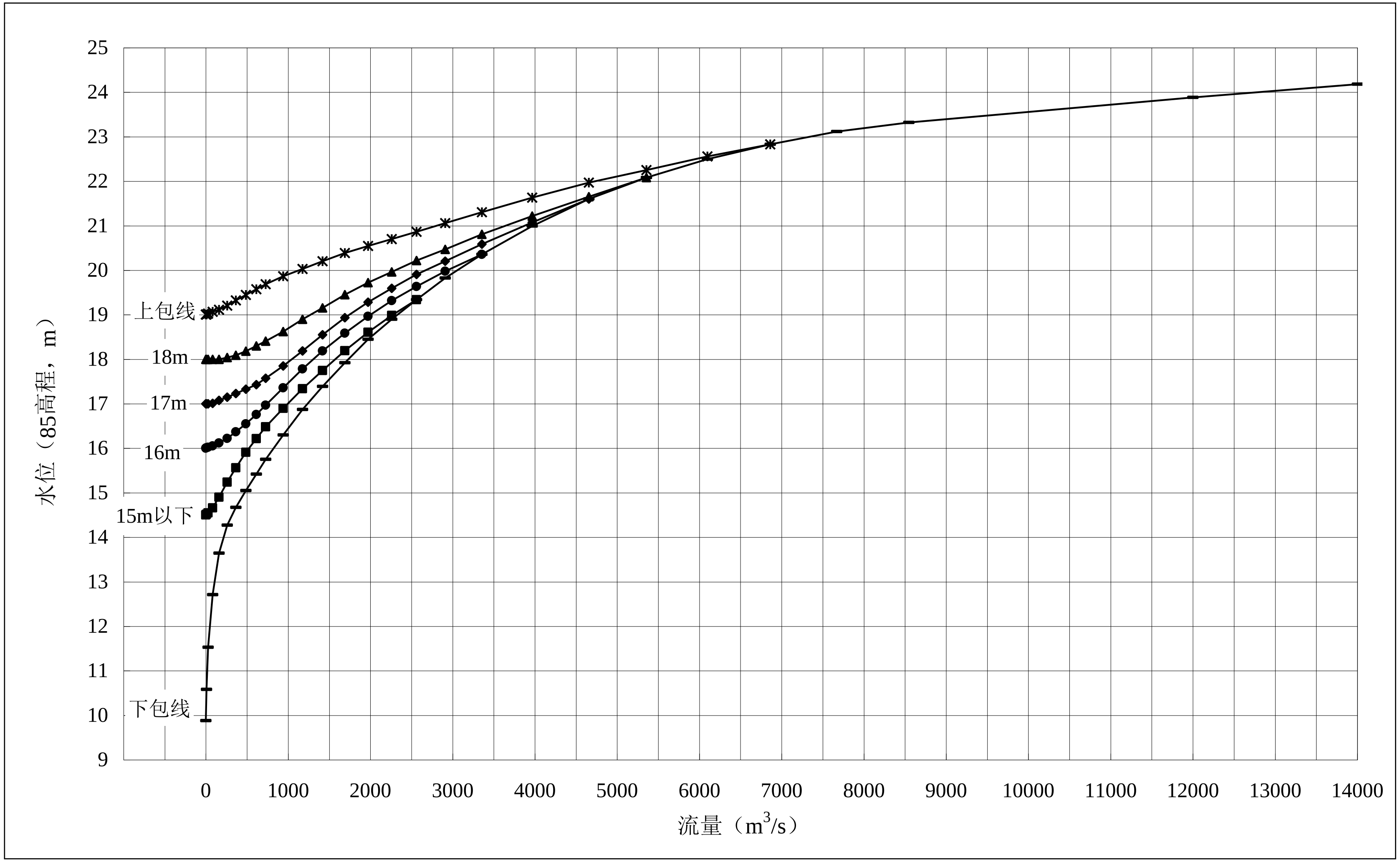


Fig.5.1-3 Curve of Relations between Water level and flow of Mopiling dam site

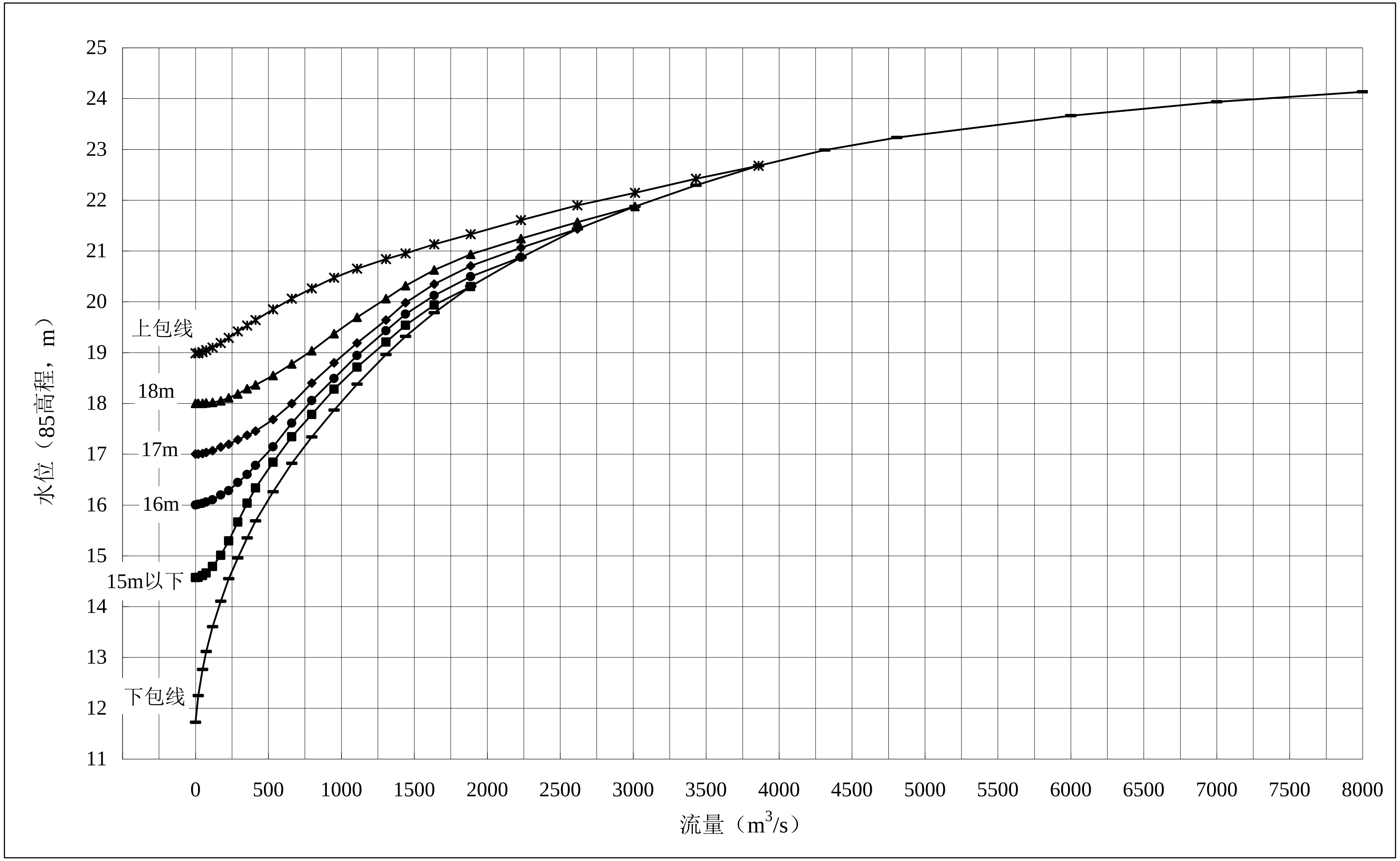


Fig.5.1-4 Curve of Relations between Water level and flow of Hushanzui dam site

5.1.2.6 Calculation of backwater in the reservoir area

As large scale sluice discharge is designed in the project, and the operation mode of the reservoir requires a full open gate to discharge flood during the flood, with flood water line at all levels to restore the natural state, the submergence water line of the reservoir is controlled by the water surface line composed of the boundary flow of 1100m3/s and the normal reservoir water level of 18.0m in front of the dam.

Result of the water surface line of the main stream in the reservoir area is shown in Table5.1-11。

Table 5.1-11 Result of the water surface line of the main stream in the reservoir area of Bazizui navigation-power conjunction project

No.	Section	Distance (km)	Normal height 18m(flow 1100m^3/s)			Multi-year average flow surface line	regulation discharge of waterway 80m^3/s	Remarks
			natural（lower envelop curve）	natural（Synthetical Handle line）	After reservoir built			
1	BM		15.70	16.15	18.00	15.34	18.00	Mopiling dam site
2	BH		15.70	16.15	18.00	15.34	18.00	Hushanzui dam site
3	B01	0	15.70	16.15	18.00	15.34	18.00	Bazizui dam site
4	B02	1.37	15.70	16.15	18.00	15.34	18.00	
5	B03	2.95	15.71	16.16	18.00	15.34	18.00	
6	B04	4.27	15.71	16.16	18.00	15.34	18.00	
7	B05	5.51	15.72	16.17	18.01	15.35	18.00	
8	B06	6.24	15.73	16.17	18.01	15.35	18.00	
9	B07	7.25	15.76	16.20	18.02	15.36	18.00	
10	B08	8.32	15.81	16.24	18.03	15.38	18.00	
11	B09	9.42	15.86	16.28	18.05	15.40	18.00	
12	B10	10.69	15.94	16.34	18.07	15.43	18.00	
13	B11	12.03	16.03	16.40	18.08	15.48	18.00	
14	B12	13.06	16.12	16.47	18.10	15.53	18.00	
15	B13	14.54	16.18	16.52	18.12	15.55	18.00	
16	B14	15.91	16.19	16.53	18.13	15.56	18.00	
17	B15	17.20	16.22	16.55	18.14	15.57	18.00	
18	B16	17.86	16.27	16.59	18.15	15.60	18.00	
19	B17	18.39	16.32	16.63	18.16	15.64	18.00	
20	B18	19.05	16.39	16.68	18.17	15.69	18.00	
21	B19	19.50	16.43	16.71	18.18	15.71	18.00	
22	B20	20.19	16.47	16.74	18.19	15.74	18.00	

No.	Section	Distance (km)	Normal height 18m(flow 1100m³/s)			Multi-year average flow surface line	regulation discharge of waterway 80m³/s	Remarks
			natural（lower envelop curve）	natural（Synthetical Handle line）	After reservoir built			
23	B21	20.63	16.49	16.76	18.19	15.75	18.00	
24	B22	21.17	16.50	16.77	18.20	15.75	18.00	
25	B23	21.52	16.51	16.77	18.20	15.75	18.00	
26	B24	22.12	16.52	16.78	18.20	15.76	18.00	
27	B25	22.87	16.53	16.79	18.21	15.76	18.00	
28	B26	23.22	16.53	16.80	18.21	15.76	18.00	
29	B27	23.84	16.54	16.80	18.21	15.77	18.00	
30	B28	24.63	16.56	16.82	18.22	15.78	18.00	
31	B29	25.15	16.58	16.83	18.23	15.78	18.00	
32	B30	25.64	16.59	16.84	18.23	15.79	18.00	
33	B31	26.01	16.59	16.85	18.23	15.79	18.00	Meigang Hydrologic Station
34	B32	27.00	16.67	16.91	18.26	15.84	18.00	
35	B33	28.26	16.84	17.05	18.31	15.96	18.00	
36	B34	29.68	17.06	17.23	18.38	16.13	18.00	
37	B35	30.77	17.12	17.28	18.41	16.18	18.00	
38	B36	32.21	17.18	17.34	18.43	16.23	18.00	
39	B37	33.38	17.32	17.45	18.48	16.35	18.01	
40	B38	34.15	17.55	17.65	18.56	16.62	18.01	
41	B39	34.95	17.85	17.92	18.66	17.02	18.01	
42	B40	35.79	18.21	18.25	18.81	17.45	18.01	
43	B41	37.28	19.16	19.17	19.35	18.39	18.03	Baita river fork
44	B42	38.18	19.64	19.64		18.83	18.08	
45	B43	39.25	19.98	19.98		19.21	18.19	
46	B44	41.10	20.52	20.52		19.79	18.65	
47	B45	42.56	20.69	20.69		19.94	18.72	
48	B46	43.80	20.80	20.80		20.02	18.75	
49	B47	44.73	20.86	20.86		20.06	18.77	
50	B48	45.78	20.90	20.90		20.09	18.78	
51	B49	46.72	20.93	20.93		20.11	18.79	
52	B50	47.48	20.97	20.97		20.14	18.80	
53	B51	48.27	21.10	21.10		20.25	18.86	
54	B52	48.96	21.19	21.19		20.32	18.89	Jiepai conjunction

From table 5.1-11, it is known that when the water flow at the dam site is equal to the 1100m³/s of the boundary flow, the water level in front of the dam is 1.65m higher than that in the natural state, and 2.66m higher than the average annual discharge volume, and the backwater length is 37.28km. The smaller the flow of water in the upstream of the dam, the higher the water level in the upstream of the dam site is.

5.1.3 Calculation of Ecological Flow at Downstream of the Dam

Bazizui Navigation-Power Junction Project is located at where the east branch and the west branch of Xinjiang River separate. There are two junctions in this Project - Hushanzui Junction in the east branch of Xinjiang River and Mopiling Junction in the west branch of Xinjiang River. Facilities like ship locks, powerhouses, sluice gates are provided at both junctions, so ecological flow at downstream of the dam of the two branches shall be calculated separately, together as ecological flow at downstream of the dam of this Project.

(1) Tennant Method

Tennant Method, a method that relies on river flow statistics, is based on historical flow record and describes the flow conditions within a river channel by percentage of mean annual runoff according to hydrographic data. The ecological impact of different river flows is estimated based on the pre-determined percentage of mean annual river flow. According to the Tennant Method, the minimum flow to be discharged accounts for 10% of mean annual flow.

Mean annual flow through dam section of this Project is 578m3/s, including 225m3/s of the east branch of Xinjiang River, and 353m3/s of the west branch of Xinjiang River. According to the Tennant Method, ecological flow of the east branch of Xinjiang River is 22.5m3/s and that of the west branch of Xinjiang River is 35.3m3/s, provided that minimum ecological flow of this Project is not less than 10% of the mean annual flow thereof.

(2) Water requirement for navigation

This Project is a navigation-oriented navigation-power project, which is mainly constructed for navigation in the river channel.

According to the plan, at downstream of Hushanzui Junction there is a dual-port junction, which is under feasibility design phase, in which, the normal storage level of the dual-port junction is 12m; the minimum navigation level at upstream of the dual-port junction is 12m; minimum navigation level at upstream of the east branch of Xinjiang River adopts an assurance rate of 95% and the water level corresponding to Q = 31.6m3/s is 12m, which is the same with the minimum navigation level at upstream of the dual-port junction. Poyang Lake is at downstream of the dam site of Mopiling Junction, but Poyang Lake Junction is still under study phase. Characteristic water level of the lake is undefined, adopting an assurance rate of 95% and the water level corresponding to Q = 12.3m3/s is 13.69m (as the design minimum navigation level at downstream). Poyang Lake Junction exerts no influences on coordination with downstream water level.

Therefore, navigation base flow discharged by the Bazizui Junction is 43.9m3/s, of which, that of Hushanzui Junction is 31.6m3/s and that of Mopiling Junction is 12.3m3/s.

(3) Water requirement for industrial and agricultural production and daily life

From Hushanzui dam site to the downstream of Shuanggang cascaded dam site, there are Gaoyuan Waterworks in Baimaqiao Town, Zhangjiagang Waterworks and Shuanggang Waterworks in Lusi Town, Yugan County playing as intakes, water intake quantities of which are 0.04m3/s, 0.23m3/s and0.12m3/s respectively with a total water intake quantity of 0.39m3/s.

From Mopiling dam site to the downstream of Poyang Lake, Water works in Hongjiazui Town, Waterworks in Jiangbu Town, Heshan Waterworks in Fenggang Town and Waterworks in Ruihong Town are proposed to be constructed as intakes, water intake quantities of which are 0.12m3/s, 0.06m3/s, 0.008m3/sand0.12m3/s respectively with a total water intake quantity of0.308m3/s.

In summary, calculation results of ecological base flow are shown in Table 5.1-12; minimum ecological water requirement of the two branches of Xinjiang River is 10% of the mean annual flow; ecological base flow equals to the minimum ecological water requirement or the water requirement for navigation (the larger one) plus water requirement for industrial and agricultural production and daily life; ecological base flow at downstream of the dam of the Hushanzui Junction is 31.99m3/s, and that Mopoling Junction is 35.608m3/s, making a total ecological base flow at downstream of the dam of this Project of 67.598 m3/s.

Table 5.1-12 Calculation results of ecological base flow

Ecological base flow	**West branch of Xinjiang River (m^3/s)**	**Xinjiang River (m^3/s)**
Mean annual flow 10%	35.3	57.8
Water requirement for navigation	12.3	43.9
Water requirement for industrial and agricultural production and daily life	0.308	0.698
Ecological base flow proposed to be adopted	35.608	67.598 (the larger one)

Analysis on satisfaction degree of discharged flow against ecological flow requirement

① Construction period

This Project adopts the Phase II diversion plan. During the construction period, the river still maintains the characteristics of continuous over-current, and no blanking or discontinuous flow will occur. River channel at downstream of the dam can meet the ecological flow requirement.

② Initial storage period and operation period

At the dam site of this Project, the flow is Q = 121m3/s when the assurance rate is 75％ in the dry season, of which 64.2m3/s is for Hushanzui Junction and 56.8m3/s is for Mopiling Junction, meeting the discharged ecological flow requirement of 67.6mm3/sat the dam site, of which 32.0m3/s is for Hushanzui Junction and 35.6m3/s is for Mopiling Junction. Discharged flow in the initial storage period shall be controlled not less than 67.6m3/s to meet the ecological flow requirement.

Rated flow of Hushanzui Hydropower Station is 142.5m3/sand that of Mopiling Hydropower Station is 178.1m3/s. The power station shall operate at the rated flow, so as to guarantee the ecological base flow requirement of both the east and the west branches of Xinjiang River, which is 32.0mm3/sand 35.6m3/s respectively.

5.1.4 Hydrological Regime Analysis during Construction Period

According to the diversion plan of this Project, a phased diversion method is adopted to ensure navigation and continuous flow during the construction. The cofferdams on both left and right banks completed during junction construction occupy the river channel and reduce the section area of the water. As a result, the water level in the upper reaches of the dam has been raised during the construction period, because of which the flood discharge head is raised, so the flood can flow smoothly as usual, and the river maintains the characteristics of continuous over-flow without blanking or discontinuous flow. During the construction period, change of hydrological regime is mainly reflected in change of over-flow section in the dam site, flow rate is accelerated in part of the channel, which is obvious under the condition of large flow. Overall, construction of this Project exerts little influences on the hydrological regime in the river channel.

5.1.5 Hydrological Regime in the Initial Storage Period

According to the design of construction organization, at the end of March of the fifth year, this Project will meet the requirement of water-retaining operation and water storage will begin in April. Assuming that the mean monthly flow at the dam site of this Project is Q = 961m3/s in April, the discharge ecological flow will be 67.6m3/s (that of east and west branches of Xinjiang River is 32.0m3/s and 35.6m3/s respectively), and it will take 43h reach a normal storage level of 18m (corresponding to a storage capacity of 136 million m3) . In the initial period, the storage time is short and the hydrological regime is less affected.

5.1.6 Hydrological Regime in the Operation Period

(1) This Project is under a run-of-river development mode and utilizable capacity of the reservoir is very small, which exerts almost no regulation function against the runoff. Therefore, in the design representative year, mean annual, monthly, even daily flow and water level at downstream of the Bazizui gate dam are the same with the runoff and water level in the design representative year at the dam site under present conditions. That is, after this Project is completed and put into operation, mean annual, monthly, even daily flow and water level at downstream of the gate dam are almost the same as before.

(2) No navigation-power junction project can change distribution of inflow from upstream of the dam site, and the same applies to this Project. After this Project is put into operation, it is impossible to change the incoming runoff and interval water flow in the upstream of the dam site. The annual runoff and representative daily flow process at upstream of the dam site in the design representative year after this Project is put into operation (runoff and representative daily flow in the design representative year at the dam site under present conditions) are the same as before.

(3) According to the operation scheduling plan of this Project, if inflow from the upstream of the dam is 1100m3/s or the downstream water level is 18.0m or above, the reservoir shall be discharged openly to restore natural river status. After the flood, water storage in the reservoir shall begin until inflow from the upper reaches is less than 1100m3/s and water level in the lower reaches is less than 18.0m. When the inflow at the dam site equals to the transitional flow of 1100m3/s, the water level in front of the dam will be 1.65m higher than the natural state, 2.66m higher than that in the mean annual flow status and the backwater length will be 37.28km. The lower the inflow from upstream of the dam site, the higher the banked-up water level along the upper reaches of the dam site.

(4) Under operation mode of this Project for beneficial use, generating discharge of Bazizui Power Station basically equals to the generating discharge of upstream power station plus the interval flow. However, in order to ensure that the navigation base flow discharged by Bazizui Power Station is greater than or equal to 67.6m3/s, meeting navigation and ecological requirement at downstream of the dam site, daily inflow has been adjusted appropriately. The inadequate part of the navigation base flow discharged by upstream power station is supplemented by the Bazizui Reservoir. After this Project is completed and put into operation, the minimum flow at downstream of the dam site will increase to over 67.6m3/s, and the small flow at downstream of the gate dam will be supplemented appropriately during non-flood period. When inflow from upstream of the Bazizui dam site is less than 67.6m3/s, the inflow from downstream of the dam site will increase to more than 67.6m3/s.

(5) This Project is a low-dam and run-of-river power station, water level of which is within the river

channel scope. The reservoir is only adjusted daily in the dry season, but the regulating capacity is limited. When the flow increases, the downstream water level also rises, and water area of the same section increases correspondingly. After this Project is completed, under different levels of floods, water area in the reservoir area will increase in various degrees, and average flow velocity of corresponding sections will decrease in various degrees. Therefore, after this Project is completed, the flow velocity at downstream of the gate dam is smaller than that under the current conditions.

In summary, operation of this Project has little influence on flow, water level and flow velocity at both upstream and downstream of the dam.

5.1.7 Sediment Impact Analysis

Xinjiang River is a river with less sediment, and the mean annual sediment transport quantity at Bazizui dam is 2.136 million tons, of which that of Hushanzui dam site is 917,000 tons and that of Mopiling dam site is 1,439,000 tons.

In respect of overall project layout, operation scheduling mode and reservoir type, the change of water flow pattern is relatively small compared with the natural situation, especially in the flood season with large amount of incoming sediment. Discharge capacity of the sluice for flood discharge and sediment flushing is large and the sluice is fully open, and water flow pattern and hydraulic factors basically maintain unchanged, so sediment is not easy to silt in the reservoir and most of incoming sediment from upstream of the dam site can be discharged out of the reservoir with the water flow.

5.2 Surface Water Environmental Impact Assessment

5.2.1 Water Environmental Impact Analysis during Construction Period

Pollutant production analysis is carried out according to the work scope, construction method, engineering layout, etc. During construction of this Project, wastewater produced by flushing and washing of sand and gravel, wastewater discharged from the foundation pit (including concrete curing wastewater, cement soil wastewater produced by grouting and other wastewater), domestic sewage from construction and living camps, wastewater from produced by flushing mechanical parking and maintenance fields and other construction wastewater will have an impact on the water environment. And the wastewater produced by flushing and washing of sand and gravel has the characteristics of large discharge and high SS concentration, which is the main water pollution source during construction.

(1) Wastewater produced by flushing and washing of sand and gravel

Wastewater produced by flushing and washing of sand and gravel is the largest water pollution source during the construction period, and the quantity of wastewater is about 320mm3/h with SS as the main pollutant. According to composition analysis of the borrowing site of sand and gravel, mud content of the gravel material is 0.2% ~ 1.5% with an average value of 0.6%, based on which SS concentration in the flushing and washing wastewater produced by the sand-gravel concrete system is 5000~37500mg/L, with an average value of about 1,5000mg/L, which is relatively high.

Quantity of wastewater produced by flushing and washing of sand and gravel is larger and the SS concentration is high, so direct discharge without treatment will affect water quality of Xinjiang River located at downstream of the outlet. From the perspective of water conservation and clean production, wastewater produced by flushing and washing of sand and gravel from navigation-power junctions currently under construction is basically reused as reclaimed water, that is to say all the wastewater is reused after treatment. Accordingly, in Phase I of this Project, the SS concentration of wastewater produced by flushing and washing of sand and gravel can be reduced below 70mg/L, and all the wastewater is reused, exerting little influence on water quality of Xinjiang River.

(2) Wastewater discharged from the foundation pit

Waste water regularly discharged from the foundation pit is composed of precipitation, seepage water and construction water. Content of suspended matters and the pH value of such wastewater are relatively high due to foundation pit excavation, concrete pouring and curing and anti-seepage construction. The construction water is mainly composed of water used for concrete grouting and curing and dam filling water. Through analogy analysis with the monitoring data of other hydropower projects, concentration of suspended matters in waste water regularly discharged from the foundation pit of this Project is about 2,000mg/L and the pH value is 9-11. Direct discharge will adversely affect water quality of water area near the outlet and Xinjiang River at downstream of the outlet. Therefore, waste water regularly discharged from the foundation pit shall be properly treated before drainage. After treatment, the pH value of wastewater can be adjusted to 6 ~ 9, and the concentration of suspended matters can reach the standard, which can basically reduce or erase the adverse impact on the pH value and SS concentration of Xinjiang River at downstream of the outlet.

(3) Wastewater produced by flushing and washing of the concrete bucket

Compared with similar projects, pH value of the wastewater produced by flushing and washing of the concrete bucket of mixer is about 9 ~ 11, and concentration of suspended matters in the waste water is about 5,000mg/L. Therefore, the waste water quantity is small, the suspended matters concentration is high, and the discharge mode is intermittent and concentrated one.

Due to small quantity and simple and non-toxic pollutants, after being drained into the water body, the wastewater produced by flushing and washing of the concrete bucket will thoroughly mixed and will not cause any significant adverse impacts on the water body. Discharge after treatment basically does not affect the water quality of Xinjiang River.

(4) Oily wastewater produced by repairing and rinsing of machine

Wastewater produced by repairing and rinsing of machine at machine repairing plants and parking lots in the project area contains mechanical oil and the main pollutant is petroleum, concentration of which is about 30-150mg/L. Such oily wastewater is discharged intermittently. And drainage ditches are arranged around the machine repairing plants and parking lots to collect construction machinery flushing wastewater. At the end of those ditches, filter tanks are set. And the oily waste water after oil removal and being filtered and precipitated is reused for dust fall. The oil contamination is disposed of by qualified unit and will not exert adverse impact on water quality.

(5) Oily wastewater produced from bilges of construction vessels

Average oil concentration of oily wastewater produced from bilges of construction vessels is 3,500mg/L. If such wastewater is directly discharged without treatment, the surface water environment will be affected greatly. Standard discharge concentration after treatment is not more than 15mg/L.

According to relevant regulations, oily wastewater produced from bilges of construction vessels shall be treated by the built-in oil-water separator and be discharged after reaching the standard. The discharge standard of water containing petroleum is not more than 15mg/L; for small vessels not equipped with oil-water separator, the waste water shall be temporarily stored in a built-in container and then be delivered to an oily waste water collecting vessel or an oily water receiving unit on the shore for disposal. Oily wastewater produced from bilges of construction vessels (mainly dredgers and material carriers) has limited influences on petroleum concentration of the water environment.

Domestic wastewater

Main construction area of this Project is on the central island at the fork of Xinjiang River. There are 1,500 workers at the peak construction period and corresponding daily production of domestic wastewater is about 144m3. The main pollutants are COD and BOD5, with a concentration of 300mg/L and 200mg/L respectively. Direct discharge of such wastewater will have a certain impact on the water quality. Complete sewage treatment plant is used to treat the wastewater, after which the concentration of COD and BOD5: BOD5 ≤20mg/L, COD≤ 60mg/L. The water after treatment is used for dust fall and greening, exerting little influences on water quality.

(7) Influences on the intake

① Influences on intakes within the reservoir area

According to the construction organization plan and the hydrological regime analysis during the construction period, works in the dam site junction area will only affect the water level and flow velocity near the dam site, and will have little impact on the water level and flow velocity in the reservoir area. Therefore, during the construction period, normal operation of the intakes in the reservoir area will not be affected.

According to the investigation, the nearest intake at upstream of the Bazizui junction dam site is the Shenling Waterworks in Daxi Town, which is about 4.2km upstream of the dam site. Construction of the dam site will not cause obvious adverse impacts on the water quality.

② Influences on the intake at downstream of the dam

According to the investigation, the nearest drinking water intake at downstream of Mopiling junction dam site is the Waterworks in Hongjiazui Town proposed to be constructed. Location of the intake is initially proposed to be set at about 1km downstream of the Longjin Bridge and at the right bank of the west branch of Xinjiang River, about 4km away from the dam site. After visits to the relevant departments, it is known that construction of the Waterworks in Hongjiazui Town has not yet started because land use has not been approved, and the specific construction time has not yet been determined. The Waterworks in Hongjiazui Town may be put into operation after completion of this Project.

Besides the proposed Waterworks in Hongjiazui Town, the nearest intake to Mopiling junction dam site is the Waterworks in Jiangbu Town, which is about 11km downstream of the dam site. The nearest intake to Hushanzui junction dam site Gaoyuan Waterworks in Baimaqiao Town, which is about 7.5km downstream the dam site. Because of the long distance, normal construction activities at the junction will not cause obvious pollution impacts on normal operation of the intakes after taking the necessary pollution prevention and control measures.

5.2.2 Predication of Water Environmental Impact during the Operation Period

The reservoir itself will not discharge pollutants, but operation of it will change the hydrological regime in the reservoir area and the river reach downstream of the dam, affecting the process of dilution, diffusion and degradation of pollutants in the water body. Impact of the reservoir on the water quality of the river reach in the reservoir area is mainly because of increase of water level, water area and water depth, decrease of flow velocity as well as sedimentation, which are caused by banked-up water; impact on the river reach downstream the dam site is mainly due to the different flow or water quality of the discharged water from the reservoir compared with that under the natural conditions. Control changes of water environment in the reservoir area through prediction of water temperature, pollution sources in the reservoir area, overall water quality in the reservoir area, water quality in water bodies near the reservoir, eutrophication and water environmental capacity to ensure safety of drinking water sources and reduce the impact of reservoir construction on water environment.

For details of surface water environmental protection targets of this Project, see Table 1.7-3.

5.2.2.1 Water Temperature

Discriminate water temperature structure of Bazizui Reservoir using α Index Method:

α=mean annual runoff / total capacity

When α＞20, the water temperature structure is a mixed one; when 10<α<20, it is transitional one; when α＜10, it is stratified one.

Rated head of this Project is 2.30m, and this Project is a low-head and run-of-river power station. Mean annual runoff at the dam site is 18.228 billion m3, and capacity below the normal pool level is 136 million m3. After calculation, α value of Baizizui reservoir is 134, which is much larger than the critical value of 20.Therefore, water temperature structure of Baizizui reservoir is a typical mixed one. Due to the frequent exchange of reservoir water, the water stays in the reservoir for a short time, so the water temperature does not appear to be stratified, and difference between temperatures of inflow and outflow is not large.

5.2.2.2 Prediction of Pollution Sources

(1) Prediction of industrial pollution sources

In the reservoir area of this Project, stands the Industrial Park of Yugan County, Huangjinbu Town with a wastewater treatment plant with a treatment capacity of 10,000 t/d at present and a long-term (the year of 2020) capacity of 20,000 t/d. The Class I B standard under the Discharge Standard of Pollutants for Municipal Wastewater Treatment Plant (GB18918-2002) is adopted. The treatment rate is 100%, and the concentration of ammonia nitrogen in water discharged by the wastewater treatment plant is≤8mg/L, that of BOD5≤20mg/L, that of COD ≤60mg/L, that of TN≤20mg/L, and that of TP ≤1mg/L. This prediction of industrial pollution sources is conducted in accordance with the planned treatment capacity of 20000 t/d.

It is calculated that by 2020, quantities of main pollutants discharged from the Industrial Park of

Yugan County, Huangjinbu Town are COD 438t/a and ammonia nitrogen 58.4t/a.

Based on the above analysis, it is estimated that quantities of main industrial pollutants emitted by this Project will be COD 438t and NH3-N 58.4t by 2020.

(2) Prediction of non-point source pollution

In accordance with the current national policies and regulations, application amount of fertilizer and pesticide shall be strictly controlled and the policy of returning farmland to forests shall be implemented. According to the 12th Five-Year Plan for national economy and social development of Shangrao City and related planning requirements, Shangrao City will strengthen rural water environment remediation efforts to speed up the process of water and sanitation reform in rural areas, and actively develop eco-agriculture and organic agriculture, rationally use fertilizers and pesticides, promote use of biological fertilizers and biological pesticides and proactively carry out pollution remediation work against large-scale livestock and poultry breeding to mitigate rural non-point source pollution. Therefore, it is estimated that the non-point source pollution loads of the 6 towns in Bazizui Reservoir area will be able to maintain the status quo or decrease slightly by 2020. In the prediction target year, non-point surface source loads of the 6 towns in the reservoir area adopt the current pollution load. Then, in the year of 2020, total quantities of pollutants loads into the reservoir are COD3999.46t, NH3-N 494.61t, TN 913.08t, TP 80.75t.

5.2.2.3 Overall Reservoir Water Quality Prediction during the Operation Period

According to the analysis of pollution load, industrial pollution sources are distributed within the reservoir area of this Project. Annual discharges of industrial pollution sources are COD 438t/a and NH3-N58.4t/a. According to the Technical Guidelines for Environmental Impact Assessment – Surface water Environment (HJ / T2.3-93), the water quality in the reservoir area of this Project shall be predicted using the long-and-narrow lake advection evanescent mode.

①Calculation model

$$C_l = \frac{C_p Q_p}{Q_h} \exp\left(-K_1 \frac{V}{86400 Q_h}\right) + C_h$$

Where:

Cl - average concentration of pollutants at long and narrow outlet of the reservoir, mg/L;

Cp - pollutant emission concentration, mg/L;

Ch - background concentration at upstream of the reservoir, mg/L;

Qp - pollutant emission flow, m3/s;

Qh - mean annual reservoir inflow, m3/s;

K1 - comprehensive attenuation coefficient of pollutants, 1/d;

V - Total reservoir capacity, m3.

② Predicative indexes:

COD and NH3-N are selected as predicative indexes for water quality simulation selected.

③ Model parameters:

According to morphological characteristics of the Bazizui Reservoir and empirical data of existing reservoirs, the degradation coefficients of COD and NH3-N are all taken as 0.08.

④ Prediction time frames:

2020 is selected as the prediction target year to predict dry season water quality in the reservoir area of this Project.

⑤Prediction results

Catchment area of the Bazizui dam site is 15,942km2; catchment area under control of the Meigang Hydrological Station located on the mainstream of the Xinjiang River about 27.2km upstream of the dam site is 15,535km2, which is only 2.6% less than that of Bazizui dam site. Because of such small difference in catchment area and there is no major tributary flow in, so the inflow of Bazizui Reservoir can be calculated according to the runoff of Meijiang Hydrological Station using the Area Ratio Method.

The total capacity of Bazizui Reservoir is 344 million m3, and the actual water quality concentration in the dry season of 2017 in front of the dam of Bazizui Reservoir is used as the background value for calculation in corresponding water periods. The calculation conditions and results are shown in Table 5.2-1. It is calculated that the water quality in the Bazizui Reservoir area in the dry season of 2020 will reach the Class III water quality standard under the Environmental Quality Standards for Surface Water (GB3838-2002).

Table 5.2-1 Prediction results of water quality in the reservoir area of Bazizui Navigation-

power Junction Project (the year of 2020)

Water season	Predictive index	Reservoir inflow (m^3/s)	Pollution load (g/s)	Background concentration (mg/L)	Prediction results (mg/L)	Water quality classification
Dry season	COD	246	140.33	9.66	9.90	III
	NH3-N		17.49	0.084	0.11	

5.2.2.4 Reservoir Eutrophication Prediction

Nitrogen and phosphorus are the main factors that affect the water quality. In this Project, Vollenweider Model is conservatively adopted to predict concentration of nitrogen and phosphorus in the reservoir.

The study demonstrates that nitrogen and phosphorus are the indicative factors that will represent the nutrient level of water body. In eutrophic water body, the concentration of nitrogen and phosphorus is generally high. This report selects TN & TP as the representative factor, to predict the annual mean concentration of TN & TP in Bazizui reservoir by adopting the Vollenweidwer model recommended by Code for Environmental Impact Assessment of Water Conservancy and Hydropower Project (HJ/T-2003). The calculation formula is as shown below:

$$C = C_i\left(1+\sqrt{\frac{H}{q_s}}\right)^{-1}$$

q s= Q inflow / A， H＝V / A

In which, the physical meaning, unit, and value of the related parameters are as shown in Table 5.2-2.

The Ci in Vollenweidwer model is determined as per the mean concentration of nitrogen and phosphorus from upstream runoff.

Table 5.2-2 Predicted parameter table of annual mean concentration of TN & TP in Bazizui reservoir

Parameter	Physical meaning	Unit	Value
C	Annual TN concentration	mg/L	0.187
	Annual TP concentration	mg/L	0.041
Ci	Inflow TN concentration	mg/L	0.204
	Inflow TP concentration	mg/L	0.045
H	Mean depth of reservoir	m	5.92
qs	Annual mean water amount per unit area	$m^3/m^2\cdot a$	793.9

Parameter	Physical meaning	Unit	Value
Q_{inflow}	Mean annual reservoir inflow	m3	182.28×10^8
A	Reservoir area	m2	22.96×10^6
V	Reservoir capacity	m^3	1.36×10^8

At the dam site of Bazizui Navigation-Power Junction, the mean annual runoff, reservoir area at the normal water level, and the reservoir storage capacity at FSL, shall be 182.28×108m3, 22.96km2, and 1.36×108m3 respectively. As per the calculation based on the model and relevant parameters, it is shown that the annual mean concentrations of TN & TP are 0.187mg/L and 0.041mg/L respectively.

As per the predicted analysis & calculation of TN & TP in the reservoir of Bazizui Navigation-Power Junction, the annual mean concentrations of TN & TP of the water body in the reservoir of Bazizui Navigation-Power Junction in the predicted target year will be less than 0.30mg/L and 0.050mg/L separately. With reference to the assessment standards of reservoir eutrophication level (see Table 5.2-3), the TN & TP concentration of the stream segment of Bazizui Navigation-Power Junction belongs to the lower limit of medium eutrophication, in the predicted target year after the engineering construction. Therefore, it is concluded that the eutrophication phenomenon will not occur to the overall reservoir after the construction of Bazizui Navigation-Power Junction.

Table 5.2-3 The phosphorus content index criterion of eutrophication conditions of the reservoir

Nutritional status	Index	TP	TN	CODMn
Poor	10	0.001	0.02	0.15
	20	0.004	0.05	0.40
Medium	30	0.010	0.10	1.00
	40	0.025	0.30	2.00
	50	0.050	0.50	4.00
Rich	60	0.100	1.00	8.00
	70	0.200	2.00	10.00
	80	0.600	6.00	25.00
	90	0.900	9.00	40.00
	100	1.300	16.00	60.00

5.2.2.5 Reservoir's two-dimensional water quality model forecast

As per the positional relationship between the reservoir's water intake and drain outlet, and the sewage quantity of the drain outlet, and in order to ensure the safety of drinking water source, multi-type of predictive factors will be selected to make the selective analysis & assessment of impacts upon the water intakes of Huangjinbu Town Industrial Park Water Treatment Plant, Meigang Town Water Treatment Plant, Yangbu Town Water Treatment Plant, and Daxi Town Water Treatment Plant, and their water source protection area.

Predictive factors include the TN, TP, BOD5 and CODmn.

Predictive Plan: As per the worst impact principle, the forecast time bucket selects the dry season. Xinjiang River's average monthly flow during the dry period (guaranteed rate 90%) is adopted. The impacts of drain outlet of Huangjinbu Town Yugan County Industrial Park Sewage Treatment Plant upon the water quality of water intakes of Huangjinbu Town Industrial Park Water Treatment Plant, Meigang Town Water Treatment Plant, Yangbu Town Water Treatment Plant, and Daxi Town Water Treatment Plant will be predicted.

The polluted belts along river banks may be formed nearby the drain outlet. The two-dimensional simulation will be carried out for the water quality of the water body nearby the drain out within the reservoir area of Bazizui Navigation-Power Junction, by adopting the two-dimensional steady-state mixed-decay model.

(1) Two-dimensional steady-state mixed-decay model

① Formula

The analysis formula of two-dimensional steady-state mixed-decay model is as shown below:

$$c(x,y)=\exp(-\frac{K_1 x}{86400u})\{c_h+\frac{c_p Q_p}{H(\pi M_y x u)^{1/2}}[\exp(-\frac{uy^2}{4M_y x})+\exp(-\frac{u(2B-y)^2}{4M_y x})]\}$$

In which, c(x, y) refers to the pollutant concentration at the forecast points (x, y), mg/L;

u refers to the average velocity of middle section at the outlet of rivers, m/s;

K1 refers to degradation coefficient, 1/d;

Qp refers to sewage discharge flow, m3/s;

Cp refers to sewage discharge concentration, mg/L;

x refers to the distance from the drain outlet to the flow direction of the forecast points, m;

ch refers to the background concentration of pollutants in the river, mg/L;

H refers to mean water depth within the polluted belts, m;

B refers to river width, m;

My refers to transverse diffusion coefficient, m2/s;

y refers to the vertical distance between the forecast point and the water flow direction, m.

② Parameters

Degradation coefficient K1:

$$K_1 = \frac{u}{\Delta x} \ln \frac{C_1}{C_2}$$

As per the morphological characteristics of Bazizui Reservoir, and combined with the empirical data of constructed reservoirs, the degradation coefficient K1 will take the value of 0.05~0.2 (0.05~0.1 will be taken by the river section approaching to the front part of the dam and with a smaller flow velocity, while 0.2 will be taken by the river section at the tail of the reservoir).

The value of diffusion coefficient My will be estimated with the Fischer empirical formula.

My＝（0.1～0.2）H（gHI）1/2

In which, I refers to hydraulic gradient, m/m;

g refers to gravitational acceleration, m/s2;

H refers to the mean water depth within the polluted belts.

(2) Forecast results

After the completion of reservoir construction, the hydrological parameters based on the daily mean flow (guaranteed rate 90 %), are as shown in Table 5.2-2. In which, the working conditions in which the mean river width is 900m is only applied to calculate the impacts of drain outlet of Huangjinbu Town Yugan County Industrial Park Sewage Treatment Plant upon the water quality of water intake of Meigang Town Water Treatment Plant.

The concentration forecast results of TN & TP, BOD5, and CODmn in water body affected by the Huangjinbu Town Yugan County Industrial Park Sewage Treatment Plant, are as shown in Table 5.2-6, 5.6-7 & 5.6-8. As per the forecast results, under the hydrological conditions of daily mean flow (guaranteed rate 90 %), after the establishment of the dam, the maximum concentration of TN &TP, BOD5, and CODmn of the sections of 4 water intakes are respectively 0.932mg/L, 5.05mg/L, and 18.0mg/L.

Both the Huangjinbu Town Yugan County Industrial Park Water Treatment Plant water intake and Meigang Town Water Treatment Plant water intake are the upstream water intake. The prediction also considers that backflow phenomenon may also occur during the retaining water process, which may bring the pollutants at the reservoir bottom and drain outlet to the drinking water source protection area. BOD5 concentration nearby the water intake of Huangjinbu Town Yugan County Industrial Park Water Treatment Plant is 4.32mg/L, which does not conform to the third level requirements of Environmental Quality Standards for Surface Water (GB3838-2002). However, the water quality of all the other water intakes within the reservoir area reaches the third level requirements of Environmental Quality Standards for Surface Water (GB3838-2002). During the retaining water process, the sewage drainage may pollute the water intake of Huangjinbu Town Industrial Park Water Treatment Plant. In other period, it will not cause obvious impacts upon the water quality at water intake.

Table 5.2-5 Hydrologic parameters after the construction of dam

Hydrologic parameters		H(m)	U(m/s)	K1	I(m/m)	My	Q90（m^3/s）
After the construction of dam	Average river width 500m	2.2	0.06	9.8	0.0001	0.018	64.5
	Average river width 900m	2.2	0.03	9.8	0.0001	0.018	64.5

Table 5.2-6 Forecast results of TN & TP concentration of upstream & downstream water body of sewage drain outlet (Unit: mg/L)

Vertical(m) / Transverse(m)	-450	-175	15500	20250
5	0.658	0.932	0.106	0.077
500	0.166	0.168	0.069	0.053
900	/	0.166	/	/
Remarks: It is predicted under the hydrological conditions of daily mean flow (guaranteed rate 90 %). The origin of coordinates will be located at the sewage drain outlet of Huangjinbu Town Yugan County Industrial Park Sewage Treatment Plant. The vertical distance from the water intakes of Huangjinbu Town Water Treatment Plant, Meigang Town Water Treatment Plant, Yangbu Town Water Treatment Plant, and Daxi Town Water Treatment Plant, to the sewage drain outlet shall be -450m, -175m, 15500m, and 20250m separately. If the distance is negative, it means that the drain outlet is located at the upstream of water intake.				

Table 5.2-7 Forecast results of BOD_5 concentration of upstream & downstream water body of sewage drain outlet (Unit: mg/L)

Vertical(m) / Transverse(m)	-450	-175	15500	20250
5	4.32	5.05	1.39	1.04
500	3.09	3.14	1.29	0.98
900	/	3.11	/	/

Remarks: It is predicted under the hydrological conditions of daily mean flow (guaranteed rate 90 %). The origin of coordinates will be located at the sewage drain outlet of Huangjinbu Town Yugan County Industrial Park Sewage Treatment Plant. The vertical distance from the water intakes of Huangjinbu Town Water Treatment Plant, Meigang Town Water Treatment Plant, Yangbu Town Water Treatment Plant, and Daxi Town Water Treatment Plant, to the sewage drain outlet shall be -450m, -175m, 15500m, and 20250m separately. If the distance is negative, it means that the drain outlet is located at the upstream of water intake.

Table 5.2-8 Forecast results of CODmn concentration of upstream & downstream water body of sewage drain outlet (Unit: mg/L)

Vertical(m) / Transverse(m)	-450	-175	15500	20250
5	**15.8**	18.0	**5.3**	**4.0**
500	12.1	12.3	5.1	3.8
900	/	**12.2**	/	/
Remarks: It is predicted under the hydrological conditions of daily mean flow (guaranteed rate 90 %). The origin of coordinates will be located at the sewage drain outlet of Huangjinbu Town Yugan County Industrial Park Sewage Treatment Plant. The vertical distance from the water intakes of Huangjinbu Town Water Treatment Plant, Meigang Town Water Treatment Plant, Yangbu Town Water Treatment Plant, and Daxi Town Water Treatment Plant, to the sewage drain outlet shall be -450m, -175m, 15500m, and 20250m separately. If the distance is negative, it means that the drain outlet is located at the upstream of water intake.				

5.2.2.6 Reservoir branch forecast

From the Jiepai dam site to Bazizui dam site, there are three larger tributaries, namely, Baitahe River, Huangzhuangxi River, Zhuqiaohe River. In which, the mouths of Baitahe River and Huangzhuangxi River are located at the upstream of backwater area of Bazizui Navigation-Power Junction. The construction and operation of Bazizui Navigation-Power Junction will not cause the obvious unfavorable impacts upon them. Zhuqiaohe River is also located within the range of backwater area of Bazizui Navigation-Power Junction. The backflow phenomenon may also occur during the retaining water process, which may bring the pollutants at the reservoir bottom and drain outlet to Zhuqiaohe River.

The watercourse length, relief and average gradient of the downstream reach of Xinjiang River are 69km, 10m, and 0.145‰ separately. The length and longitudinal gradient of main stream of Huangzhuangxi River shall be 22.2km and 2.20‰ respectively, while that of the main stream of Zhuqiaohe River shall be 27.2km and 1.55‰ separately. The longitudinal gradients of both Huangzhuangxi River and Zhuqiaohe River are larger than that of the main stream of the downstream reach of Xinjiang River. Therefore, the flow backward of Xinjiang River will have a slight impact upon the tributaries. Besides, at the end of the water retaining operation, the impact will be gradually lowered, until totally disappeared.

5.2.2.7 Domestic sewage of the administrative staffs and ship sewage

(1) Domestic sewage of the administrative staffs

During the operation period of Bazizui Navigation-Power Junction, there are a few administrative staffs. If there are 191 administrative staffs, and the water consumption amount is 150L/ (person. d), the domestic sewage drainage amount during the operation period will be about 22.9m3/d, by assuming that the sewage drainage amount will be 80% of the water consumption amount. The domestic sewage of the administrative staffs will be recycled for irrigation purpose or used by the greening within the junction's administrative area, after being treated by the domestic sewage package unit.

(2) Ship sewage

The domestic sewage comes from the daily life of the working staffs of fleet, while the drainage amount is small. The drainage of domestic sewage and oil containing sewage from the bilge, will strictly be forbidden from draining within the navigation channel of the reservoir area. The ship's sewage will be collected by the ship's own domestic sewage collection facility and oil containing sewage separation and collection facility, and then sent to the port. Finally, it will be recycled by the qualified unit at the port or uniformly accepted and treated by the environmental receiving vessel.

5.2.2.8 Water quality of under the dam

The water intakes of Baimaqiao Town Water Treatment Plant and Yugan County Water Treatment Plant distributed under the dam of Bazizui Navigation-Power Junction, are respectively 7.8km and 8.9km away from the downstream of Hushanzui Junction's dam site of East Branch of Xinjiang River. Meanwhile, the sewage drain outlet of Huangjinbu Town Yugan County Industrial Park Sewage Treatment Plant is 25km away from the upstream of Bazizui dam site. Although the drain outlet is located at the upstream of water intake, the impact is not so significant due to the farther distance.

In wet season, Xinjiang River has a large amount of natural inflow. In this period, Bazizui Navigation-Power Junction almost controls the discharged volume as per the inflow. The hydrological conditions of the downstream reach of the dam approaches to the natural status. Therefore, the dam operation in wet season has a slight impact upon the water quality of downstream reach of the dam. In dry season, Bazizui Navigation-Power Junction carries out the peak and frequency regulation operation, releasing the unsteady flow. At the daily load valley period of electric power system, Bazizui Navigation-Power Junction will adopt the base-load working system. The discharged volume for power generation purpose shall be no less than 66.9m3/s, conforming to the minimum navigation depth requirements of downstream navigation. Therefore, at some periods of the dry season, the operation of Bazizui Navigation-Power Junction can increase the downstream flow, causing favorable impacts upon the downstream water environment.

As per the simulation calculations made by the aforesaid models, the pollutant concentration at the dam site after the water retaining of Bazizui reservoir, is lower than that before the construction of dam. Therefore, the construction of Bazizui Navigation-Power Junction will not increase the pollutant concentration of the discharged flow. Combined with the above analysis, the operation of Bazizui Navigation-Power Junction will not cause the adverse impacts upon the downstream hydrological conditions. Therefore, the operation and construction of Bazizui Navigation-Power Junction will not cause the obviously adverse impacts upon the water quality and sensitive targets of water environment of the downstream of dam.

5.2.2.9 Analysis of impacts upon reservoir drain outlet during the engineering operation period

At present, only 1 drain outlet, namely the drain outlet of Huangjinbu Town Industrial Park Sewage Treatment Plant, is mainly distributed within the reservoir area where the project is located. As per the physical investigation results of submerge of the reservoir area, after the construction of new hydropower station and other protective works, the engineering construction will cause no impacts upon the normal discharge of the drain outlet within the reservoir area.

5.2.2.10 Impacts analysis of initial water retaining within the reservoir area

The preliminary water retaining plan of the engineering design shall be as follows: In flood season, the upstream inflow shall be more than 690m3/s, but less than 1100m3/s. Meanwhile, when the downstream water level is less than 18.0m, the reservoir shall continuously keep retaining water for about 43h, under the condition that the 67.6m3/s of ecological basic flow must be discharged. Finally, the normal storage level will be reached, and the entire water retaining process will be completed.

As per the above mentioned water retaining plan, the backflow phenomenon will occur during the water retaining process, which may bring the pollutants at the reservoir bottom and drain outlet to the drinking water source protection area, and further affect the normal water supply at the water intake.

In order to ensure the water quality and water supply safety within the drinking water source protection area, the assessment suggests that the water retaining shall be performed in 3 phases, when the upstream inflow shall be more than 690m3/s, but less than 1100m3/s in flood season, and when the 67.6m3/s of ecological basic flow discharge is ensured. The interval between two phases shall be about 2 weeks, while the continuous water retaining period will be about 15h for each phase. Prior to water retaining, the retaining time shall be informed to each water drawing unit, so that they can take the corresponding countermeasures. In water retaining period, 1 piece of water quality monitoring section shall be provided separately at the location which is 100m away from the water intakes of Huangjinbu Town Industrial Park Water Treatment Plant, Meigang Town Water Treatment

Plant, Huangjinbu Town Water Treatment Plant, Yangbu Town Water Treatment Plant, and Daxi Town Water Treatment Plant, to monitor the water quality. When the monitoring results show that the pollutant concentration rises, the junction shall be informed immediately to stop retaining water. When the monitoring results show that the pollutant concentration exceeds the standards, the water intakes shall be informed to stop drawing water, and the junction shall be informed to stop retaining water.

As per the water quality pollution features of similar constructed hydraulic engineering at the initial water retaining period, the concentration of SS, organic matter, mineral substance, bacteria, pathogenic bacteria, and others within the reservoir will greatly rise during the first 5 days of the initial water retaining period. In order to ensure the safety and quality of the water drawn by the water treatment plant, the monitoring frequency and density upon the water intakes shall be strengthened, to timely monitor the change status of the quality of drinking water. When the water quality declines, the water treatment plants shall be informed to strengthen the disinfection and purification treatment, so as to ensure the safety of resident' drinking water.

5.2.3 Surface water EIA conclusion

(1) The water pollution source during the construction period mainly includes two parts, namely, industrial and domestic sewage. The total sewage discharge amount is relatively small, but the pollutant concentration is much higher. After the relative countermeasures are taken to make the sewage satisfy the first discharge level of Integrated Wastewater Discharge Standard (GB8978-1996), it will have much less impact upon the water quality of receiving water. Besides, at the end of construction, the pollution source will also disappear. Therefore, the engineering construction sewage will little impact upon the surface water environment within the river reach of engineering area.

(2) The temperature of water within the reservoir area belongs to mixed type. The temperature difference between the discharged water and natural water is slight, which will cause little impact upon the downstream ecological environment.

(3) As per the predicted analysis and calculation of TN & TP of the water body within the reservoir area of Bazizui Navigation-Power Junction, the annual mean concentrations of TN & TP of the water body in the reservoir of Bazizui Navigation-Power Junction in the predicted target year will be less than 0.30mg/L and 0.050mg/L separately. Therefore, it is concluded that the eutrophication phenomenon will not occur to the overall reservoir after the construction of Bazizui Navigation-Power Junction.

(4) As per the forecast results, under the hydrological conditions of daily mean flow (guaranteed rate 90 %), after the establishment of the dam, the maximum concentration of TN &TP, BOD5, and

CODmn of the sections of 4 water intakes are respectively 0.932mg/L, 5.05mg/L, and 18.0mg/L. BOD5 concentration nearby the water intake of Huangjinbu Town Yugan County Industrial Park Water Treatment Plant is 4.32mg/L, which does not conform to the third level requirements of Environmental Quality Standards for Surface Water (GB3838-2002). However, the water quality of all the other water intakes within the reservoir area reaches the third level requirements of Environmental Quality Standards for Surface Water (GB3838-2002). During the retaining water process, the sewage drainage may pollute the water intake of Huangjinbu Town Industrial Park Water Treatment Plant. In other period, it will not cause obvious impacts upon the water quality at water intake.

(5) This engineering belongs to the low head dam. During the engineering operation period, it will not cause the impact of flood discharging atomization and gas super saturation.

(6) During the engineering operation period, the ship’s domestic sewage and oil containing sewage, as well as the domestic sewage of the Junction administrative area will not be discharged, until they are collected, treated, and consistent with the standards. Therefore, they will have less impact upon the receiving water.

(7) As per the preliminary water retaining plan of the engineering design, the backflow phenomenon will occur during the water retaining process, which may bring the pollutants at the reservoir bottom and drain outlet to the drinking water source protection area, and further affect the normal water supply at the water intake.

In order to ensure the water quality and water supply safety within the drinking water source protection area, the assessment suggests that the water retaining shall be performed in 3 phases, when the upstream inflow shall be more than 690m3/s, but less than 1100m3/s in flood season, and when the 67.6m3/s of ecological basic flow discharge is ensured. The interval between two phases shall be about 2 weeks, while the continuous water retaining period will be about 15h for each phase. Prior to water retaining, the retaining time shall be informed to individual water drawing unit, so that they can take the corresponding countermeasures. In water retaining period, 1 piece of water quality monitoring section shall be provided separately at the location which is 100m away from the water intakes of Huangjinbu Town Industrial Park Water Treatment Plant, Meigang Town Water Treatment Plant, Huangjinbu Town Water Treatment Plant, Yangbu Town Water Treatment Plant, and Daxi Town Water Treatment Plant, to monitor the water quality. When the monitoring results show that the pollutant concentration rises, the junction shall be informed immediately to stop retaining water. When the monitoring results show that the pollutant concentration exceeds the standards, the water intakes shall be informed to stop drawing water, and the junction shall be informed to stop retaining water.

As per the water quality pollution features of similar constructed hydraulic engineering at the initial water retaining period, the concentration of SS, organic matter, mineral substance, bacteria, pathogenic bacteria, and others within the reservoir will greatly rise during the first 5 days of the initial water retaining period. In order to ensure the safety and quality of the water drawn by the water treatment plant, the monitoring frequency and density upon the water intakes shall be strengthened, to timely monitor the change status of the quality of drinking water. When the water quality declines, the water treatment plants shall be informed to strengthen the disinfection and purification treatment, so as to ensure the safety of resident' drinking water.

5.3 Terrestrial Ecological EIA

5.3.1 Impact upon the terrestrial plants and vegetation

(1) Impact during the construction period

During the engineering construction period, the impact upon the terrestrial plants and vegetation mainly refers to the damage caused to the terrestrial plants and vegetation, due to the engineering and construction land occupation within the construction area of the Junction engineering. The permanent land occupation area of the engineering mainly includes the Junction buildings, the client's office, administrative, and living area, permanent road accessible to the outside, and others. The temporary construction occupation area mainly includes sand and stone processing system, concrete production system, temporary storage yard of metal structure, borrow area, spoil area, inside road, warehouse, living camps of the construction personnel, and others. The engineering's permanent land occupation area is 2213.38hm2, including 75.59hm2 of farmland, 15.86hm2 of forest land, and 8.57hm2 of grass land. The temporary land occupation area is 497.45hm2, including 284.31hm2 of farmland, 69.00hm2 of forest land, and 68.73hm2 of grass land.

The present vegetation at the engineering's permanent land occupation area, such as Junction engineering area, office, administrative, and living area, and others, and temporary land occupation area, such as temporary storage yard of metal structure, spoil area, warehouse, living camps of the construction personnel, and others, mainly include farmland, artificial Pinus massoniana forest, riparian zone thicket and thick growth of grass, and others. The present vegetation at the borrow area and other temporary land occupation area mainly include low mountain grass thicket and artificial forest. The present vegetation along the protecting embankment of the reservoir area mainly includes cynodon dactylon, centipedegrass, horseweed and other meadow, as well as the Vitex negundo var.cannabifolia thicket, imperata cylindrical thick growth of grass, sowthistle tasselflower herb thick growth of grass, and others growing at the river bank. During the engineering construction period, the vegetation growing at the above mentioned permanent land occupation area and temporary construction area will be completely destroyed.

The floristic element of all the vegetation growing at the above mentioned permanent land occupation area and temporary construction area belongs to the types which will be distributed within a much wider scope. During the construction period, the population quantity and distribution scope of the above mentioned plants will be reduced, but their breeding populations and species extinction will not be affected.

During the engineering construction period, the impact upon the terrestrial plants and vegetation growing at the temporary land occupation area is temporary. At the end of the engineering, the terrestrial plants and vegetation growing at the temporary land occupation area will be quickly restored by adopting the land reclamation and soil and water conservation measures.

(2) Impact during the operation period

During the operation period, the impact of Bazizui Navigation-Power Junction upon the terrestrial plants and vegetation mainly includes the vegetation loss caused due to reservoir inundation, which is irreversible. The total inundation area of the reservoir inundation area is 2027.19hm2 (including 3.55hm2 of land area, and 2023.63hm2 of water area), including 3.47 hm2 of farm land, and 0.08 hm2 of forest land.

The scope of reservoir inundation area mainly includes the lower terraced plains on both banks of Xinjiang River. The farmland is dominated, while the economic forest mainly includes the artificial wetland pine plantation, artificial orchard, and other, with small quantity and area. The shrub and thicket mainly include the Vitex negundo var.cannabifolia shrub, Sageretia thea (Osbeck) Johnst shrub, and others. The meadow mainly includes the cynodon dactylon, centipedegrass, and others. Besides, within the inundation scope, there are also some ancient trees and community of cinnamomum camphora, which are kept as the feng-shui forest and feng-shui tree. The vegetation of the inundation area is the results of secondary evolution of the ecosystem under the long-term and continuous interference of human beings. They are the widely distributed type along the low elevation riparian belt of the assessment area. After the water retaining, the above mentioned vegetation will be inundated and lost, while the impact is irreversible. There is no locally special vegetation within the inundation area. Except that the ancient trees and rare plants shall be protected, other vegetation affected by the inundation belongs to the normal species which are widely distributed outside the inundation area. Therefore, the locally inundated vegetation will not cause the species extinction or disappearance. The reservoir inundation will almost have no impact upon the floristic composition within the assessment area.

The floristic composition within the assessment area demonstrates the features of transition from tropical elements slightly dominated tropical zone to the temperate zone. It is the significant joining locations of floristic composition of subtropical zone and temperate zone. Therefore, plant species are abundant. After the water retaining, the water area within the reservoir area will increase, while the thermal capacity will be significantly improved, and the annual temperature difference will be reduced. Besides, the frost-free season will be prolonged to a certain degree. The local climate formed due to the change of these natural conditions will be favorable for the growth of plants growing around the reservoir. Meanwhile, the abundant floristic composition within the assessment area will also be favorable for the restoration and consequent succession of the plants growing around the reservoir.

5.3.2 Impact upon ancient trees and key protected rare and wild plants

5.3.2.1 Impact upon ancient trees

As per the current status investigation, there are 3 nos. of ancient trees within the assessment area, which belongs to the cinnamomum camphora, distributed in the Fanjiabu Village of Daxi Town and Yuye Village of Yangbu Town, and located within the flood bank of Daxiwei. They are located above the normal storage level, so the water retaining will not inundate them. As these 3 nos. of ancient trees are close to the flood bank, which may be affected by the construction of flood bank. Therefore, monitoring measures shall be taken during the construction period, to eliminate the damage caused by construction.

Table 5.3-1 Analysis summary of impact upon ancient trees

S.N.	Species	Distribution Location	Relationship to the engineering	Level	Growth Conditions	Photo	Impact Analysis
1	cinnamomum camphora	Fanjiabu Village of Daxi Town	It is located within the engineering area, and above the inundation line. Therefore, it will not be inundated, after the water retaining.	Third-level ancient tree	Tree height 8m, diameter at breast height 75cm, not labeled		It is located above the inundation line, while the water retaining has less impact upon it. However, it is close to the flood bank, which may be affected by the

							construction of flood bank.

S.N.	Species	Distribution Location	Relationship to the engineering	Level	Growth Conditions	Photo	Impact Analysis
2	cinnamomum camphora	Yuye Village of Yangbu Town	It is located within the engineering area, and above the inundation line. Therefore, it will not be inundated, after the water retaining.	Third-level ancient tree	Tree height 9m, diameter at breast height 65cm, not labeled		It is located above the inundation line, while the water retaining has less impact upon it. However, it is close to the flood bank, which may be affected by the construction of flood bank.
3	cinnamomum camphora	Yuye Village of Yangbu Town	It is located within the engineering area, and above the inundation line. Therefore, it will not be inundated, after the water retaining.	Third-level ancient tree	Tree height 10m, diameter at breast height 70cm, not labeled		It is located above the inundation line, while the water retaining has less impact upon it. However, it is close to the flood bank, which may be affected

							by the construction of flood bank.

5.3.2.2 Impact upon key protected rare and wild plants

The national key protected rare and wild plants distributed within the assessment area of Bazizui Navigation-Power Junction mainly include 1 type of cinnamomum camphora, which belongs to the second protection level. However, the cinnamomum camphora are widely distributed within the assessment area.

The Jiangxi Provincial key protected rare and wild plants distributed within the assessment area of Bazizui Navigation-Power Junction mainly include cleyera japonica, bischofia polycarpa, dalbergia hupeana hance, horned holly, and acer palmatum (bischofia polycarpa and acer palmatum belong to garden tree species), totally 5 species. They are relatively normal species within the assessment area.

As to the national key protected rare and wild plants distributed within the assessment area, namely, cinnamomum camphora, it is not only large in quantity, but also widely distributed. Except for 3 nos. of ancient trees, a lot of young cinnamomum camphora are widely distributed on the hilly area. Therefore, it is normal species. The engineering will not threaten its existence and breeding. Therefore, the impact is slight.

As to the Jiangxi Provincial key protected rare and wild plants distributed within the assessment area, there is no locally special species. All the 5 types of Provincial level protected plants are distributed on the hilly areas surrounding the Bazizui reservoir, beyond the scope of engineering construction area and reservoir inundation area. Besides, they are also widely distributed. Therefore, Bazizui Navigation-Power Junction will not cause larger adverse impact upon the above mentioned protected plants.

5.3.2.3 Impact of invasive alien plants

The entrance and exit of the assessment scope by the construction personnel, and the entrance of engineering building materials and vehicles, will intentionally or otherwise bring the alien plants into this area. The alien plants can better adopt and utilize the interfered environment than the local species, which will cause the population reduction of local species, and the gradual decline of trees.

The invasive alien plants in this area mainly include Conyz Canadensis, ambrosia artemisiifolia, water hyacinth, alternanther philoxeroides, garden euphorbia herb, Solidago canadensis L., and others. In which, the invasive alien harmful plant Conyz Canadensis is widely distributed in the wasteland. Originally growing in North America, Conyz Canadensis was found in Yantai City, Shandong Province in 1860. In the following 7 years, it was found subsequently in Zhejiang Province (Ningbo City), Jiangxi Province (Jiujiang City), Hubei Province (Yichang City), and Sichuan Province (Nanxi City). At present, it is almost found in the entire country.

Morphological features of Conyz Canadensis: It is the annual herb, with the height of 30-120cm. Its root is conical, while its stem erects. It has the striola and seti, while the upper metropolis has many branches. The leaf takes the form of strip lanceolate or round bar-type. The leaf is 3 - 10cm long, and 1 – 10mm wide. The leaf blade apex acuminate, and base attenuate. The leaf blade petiolate, or slightly serrate. There is no obvious petiole. The diameter of capitulum is about 4mm, with short peduncle. It will be distributed in conical or umbrella conical shape in most cases. There are 2-3 layers of involucres, with the lineari-lanceolatus shape. The ligulate flower is lilac, while the tubiform floret is yellow. The achene is oblong, with undercoat. The pappus is dirty white.

The seed of Conyz Canadensis is tiny, with pappus. After becoming mature, it will come off by itself. It can spread to the farther places by the force of wind. The seed production is high. In average, each plant will produce 25000 nos. of seed, with much stronger breeding capacity. It is one of the worst weed in farmland. Its ecological adaption capacity is relatively strong. It can adapt to all sorts of weather conditions varying from cold temperate zone to tropical zone. It is favorable to grow in the farmland, field side, road side, ditch side, wasteland, and open space surrounding the settlement. It grows best under the conditions of warm weather, abundant sunshine, and loose, wet and fertile soil. Under such conditions, it often grows in groups and forms the simple community. Especially in wasteland, it often forms the pioneer community of vegetation succession, together with Erlgeron annuus, Daucus carora, and others. If scattered, they will be found in the communities dominated by Cynodon dactylon, Zoysia japonica, Roegneria kamoj and other short grass communities, growing as the companions.

Conyz Canadensis is prone to grow in the local environments of assessment area, and gradually become the local pioneering community, eliminating the local autochthonous flora. The assessment area is relatively close to the location where the large-scale disaster occurs. Therefore, during the engineering construction period, its seeds will be possibly taken to other places, invading and forming the simple pioneering community. It will affect the natural succession of plant communities, reducing the regional biological diversity.

At present, the invasive alien plant phenomenon is not severe in the assessment area. However, alertness must be improved to fight against the possible invasion of alien plants, while some countermeasures shall be taken to reduce their invasion and distribution.

5.3.3 Impact upon terrestrial animal

(1) Amphibians

The engineering land occupation of Bazizui Navigation-Power Junction, earth excavation and other engineering construction activities, and construction personnel activities will cause the direct impact upon the amphibians, especially Bufo bufo gargarizans, Rana nigromaculata, and other amphibians that lives in the low altitude area. Due to their relatively larger population, and wider distribution, and active escape capacity against the engineering construction activities, the impacts of the engineering construction are mainly temporary and small scaled, which will not endanger their population.

After the completion and water retaining of Bazizui Navigation-Power Junction, the change of hydrological, weathering, soil, and other environment conditions around the reservoir will be in favor of the growth of the aquatic vegetation, which will create a much better living conditions for the amphibians liking the good water quality, more aquatic plants, and clean water body. Besides, their breeding process also depends upon the water body. Therefore, such change will be in favor of their breeding and growth.

(2) Reptiles

The engineering land occupation of Bazizui Navigation-Power Junction, earth excavation and other engineering construction activities, and construction personnel activities will cause the direct impact upon the reptiles, mainly including the Elaphe rufodorsata, Sinonatrix annularis, Chinese Water Snake, Elaphe taeniura, Agkistrodonhalys, and others. The adverse impacts of the engineering construction are mainly temporary and small scaled, and they also have a certain active escape capacity against the engineering construction activities. Therefore, the above mentioned adverse impacts will not endanger their population.

After the completion and water retaining of Bazizui Navigation-Power Junction, the change of hydrological, weathering, soil, and other environment conditions around the reservoir will be in favor of the growth of the aquatic vegetation, which will create a much better living conditions for the reptiles, most of which prefers the good water quality, more aquatic plants, and clean water body. Besides, their breeding process also depends upon the water body. Therefore, such change will be in favor of their breeding and growth.

(3) Birds

1) Impacts during the construction period

The impacts of engineering construction upon the birds mainly include the direct damage of bird habitat caused by borrow earth from the borrow area, excavation of soil and rocks, and other construction activities, which will reduce the activity space and food source of birds. The construction personnel activities, resident relocation activities, and construction machinery noises, will interfere and affect the normal life of birds, forcing partial birds to fly to other places.

The vegetation at the borrow area of this project mainly includes the hilly thicket and artificial forest, while the vegetation composition is relatively simple. The local birds mainly include the normal species, such as sparrow, blackbird, turtle dove and others, without any national or provincial level protected birds. Therefore, the borrow earth activities from the borrow area will have less impacts upon the birds.

The embankment construction within the reservoir area will mainly cause impacts upon the Egretta garzetta, Grey Heron, Common Kingfisher and other birds distributed along the river bank, destroying their habitats and forcing them to fly away. However, such impact is temporary. At the end of construction, the birds habitats along the embankment will be gradually recovered, which will cause the bird species adapting to such environments gradually recover their original distribution.

2) Impacts during the operation period

After the water retaining and operation of Bazizui Navigation-Power Junction, the change of hydrological and weathering conditions around and nearby the reservoir will be favorable for the restoration of terrestrial vegetation, cause the positive impacts upon the birds' habitats, and also be favorable for the species, population and distribution of birds living around and nearby the reservoir. The positive impacts mainly include: ① after the water retaining, partial valleys, farmlands, shrubs, and others will be inundated. The birds have a much better capacity of relocation and anti-interference, while there are still a large scale of farmlands, shrubs and other suitable living environments at both banks of Xinjiang River within the assessment area. Therefore, the reservoir inundation will have less impact upon the bird population. ② After the water retaining, the reservoir, riparian zone, and other relatively static water body and shallow water area will occur together with the water level fluctuation, creating abundant aquatic plant, invertebrate, fishes, and other foods for birds, and also creating favorable habitat and food conditions for partial waders and other Waterfowls. Therefore, the population of these species of birds will increase.

(4) Beasts

1) Impacts during the construction period

The impacts of engineering construction upon the beasts mainly include the reduction of birds' activity space and food source due to the damage of surface vegetation caused by the borrow earth of the borrow area and cut and fill of the right bank embankment. The construction personnel activities, resident relocation activities, and construction machinery noises, will interfere and affect the normal life of beasts, forcing partial beasts to relocate to other places.

2) Impacts during the operation period

The beasts within the assessment area are mainly distributed at the grass land, water ditch, farmland, and other shallow water area, and forests, thickets nearby the village, whose distribution correlates to animals' dependence upon the environment. Most of the beasts are small beasts. After the water retaining and operation of Bazizui Navigation-Power Junction, partial farmlands, ditches and channels, grass lands, thickets, and forest vegetation will be inundated. Meanwhile, after the construction of reservoir, the change of climate and ecological environments will benefit the growth of bank vegetations. In case that the artificial interference factors are reduced, the vegetation around the reservoir will be quickly recovered. Besides, those beasts adapting to the habitat environments of grass land, water ditch, forest, thicket, and others, or selecting the aforesaid environment as the primary living conditions and food source, will be recovered accordingly.

(5) Impacts upon the protected rare animals

Within the assessment area, there are no national protected animals, but there are 16 Jiangxi Provincial protected animals, namely, Bufo bufo gargarizans, Rana nigromaculata, turtle, Elaphe rufodorsata, Sinonatrix annularis, Chinese Water Snake, Elaphe taeniura, Agkistrodonhalys, Egretta garzetta, Mallard, Spot-billed Duck, Eurasian Wigeon, Barn Swallow, Red-rumped Swallow, Hedgehog, mustela sibirica, and others. All of them are common animals within and around the assessment area. The construction will slightly decrease the population of the above mentioned animals. However, they have much stronger adaption ability to the local living conditions. Therefore, at the end of engineering construction, their population will be recovered accordingly.

5.3.4 Impacts upon farmland and agriculture

(1) Impacts upon the occupied farmland

As per the recommended plan of this project, the total area of occupied farmland is 75.59hm2. Except for the 52.11 Mu farmland of Bujinbu Town Zhuqiao Village, all the remaining farmlands occupied by the engineering belong to the state-owned land. The occupied farmland of Bujinbu Town Zhuqiao Village only accounts for 5.7% of its total farmland area. Therefore, the impact is relatively less.

As per the requirements of Regulations on the Protection of Basic Farmland and other related laws and regulations, the construction unit shall carry out the related procedures of basic farmland occupation at the national land use planning department that will modify the overall plan of land use, and add the basic farmland of the equivalent quantity and quality. The occupation unit shall be responsible to cultivate the basic farmland which shares the equivalent quantity and quality with the occupied farmland, as per the occupied area and cultivated area equivalent principle. In case that the cultivation conditions are not available, or the cultivated farmlands do not conform to the requirements, farmland cultivation cost shall be paid as per the provincial and city requirements, which is specially used for new farmland cultivation. The occupation unit shall apply the soil at the plough layer of the occupied basic farmlands to soil improvement of the newly cultivated farmland, bad quality farmland, or other farmlands. At present, the construction unit is carrying out the corresponding farmland and basic farmland occupation procedures at the national land management department. This project will balance the occupation and addition of basic land.

(2) Impacts upon the crops production

Impact upon the paddy field production: The local early season rice production is about 301kg/ Mu, while the late season rice production is about 306kg/ Mu. The total production in the entire year will be 607kg/ Mu.

Impact upon the dry land: As per the present status investigation, the dry land crops within the engineering involved area mainly include the beans, tubers, oil crops, vegetables, and others.

The lost production is estimated as follows:

Rice loss: 607kg/Mu×1136.82Mu＝690.0(t/a)

Bean loss: 68kg/Mu×1136.82Mu＝77.3(t/a)

Tuber loss: 264.9kg/Mu×1136.82Mu＝301.1(t/a)

Oil crop loss: 62.9kg/Mu×1136.82Mu＝71.5(t/a)

Vegetable loss: 1849kg/Mu×1136.82Mu＝2102.0(t/a)

At present, the existing partial farmland around the reservoir are frequently inundated and affected by the flood from Xinjiang River, while the annual crop production per Mu is relatively low. This engineering will construct the embankment on both banks of the main stream, and Zhiliu Bridge and Zhuhe River embankment, and other totally 11 nos. of protection areas, which improves the damaged and defected anti-flood device on both banks of Xinjiang River where the engineering locate, to occurrence for once in 20～30 years. The farmland elevation countermeasures will be taken, which will protect 652 Mu of farmlands. This will be favorable for the improvement of local farmland production per Mu.

Through the engineering's farmland elevation and vegetation restoration of the temporary construction occupation land, the agricultural loss caused by the engineering may be reimbursed to a certain degree.

5.3.5 Impact upon completeness of ecological system

(1) Production capacity change of natural system within the assessment area

The engineering changes the land use type of local sections where the biological population will be damaged, which is unavoidable during the construction process. It mainly occurs to the construction land occupation and reservoir inundation land. At the end of construction, the temporary land occupation will gradually restore its biological population through the artificial and natural vegetation restoration engineering. However, due to the change of land use pattern, the vegetation type will also change accordingly. Under the impact of permanent land occupation and inundation, the total vegetation and biological population within the assessment area may decrease. However, the production capacity of natural system will not be affected.

The production capacity of natural system mainly depends on the natural conditions of the natural region, mainly including water content, heat, soil nutrient, and other ecological factors. The engineering's impacts upon the production capacity of natural system is bearable. After the implementation of engineering, its impact upon the heterogeneity and resistance ability of landscape of regional natural system is not huge. Therefore, it will not affect the production capacity of regional natural system.

(2) Stability impact analysis of natural system within the assessment area

This engineering total covers 2710.83hm2 of land, including 2213.38hm2 of permanent occupied land and 497.45hm2 of temporary occupied land. Among the temporary occupied land, the forest land and grass land can be restored to forest land and dry land through the vegetation recovery. The biological population will be recovered accordingly, and may be increased. The occupied bottomland and farmland will be converted into the water area, while the vegetation biological population will decrease. The production capacity may also be recovered through improvement and development of aquaculture.

(3) Ecological completeness of plant community

The engineering construction will occupy the farmland, grass land, forest land, and other lands, which will decrease the biological population within the project area. During the engineering construction process, the slag yard, material yard, and construction temporary occupied land will also reduce the biological population. All the above mentioned factors will affect the ecological completeness of plant community, which will lower the average production capacity of natural system within the project area. The artificial vegetation restoration measures will be taken to relieve the engineering construction's impacts upon the natural ecological system, and reduce the engineering's impact upon the production capacity of natural system.

(4) Ecological completeness of landscape

The completeness of landscape pattern includes the continuity of landscape ecological process and pattern, the continuity of green life corridor, consistency of landscape overall structure, and others. The patch diversity and pattern diversity is the main form of its composition.

The engineering construction causes the habitat fragmentation within the Junction engineering area, the decrease of patch area, and the destruction of biological habitat whose area becomes narrowed and fragmented. The fragmented habitat will cause more impacts upon the species living in the original habitat, making it difficult for species spreading. The narrowed habitat and decreased species and population, will affect the landscape ecological functions, decreasing the biological diversity area.

The patch is divided into disturbance patch, remaining patch, environment resource patch, and imported patch. The patch type will cause obvious impact upon the species dynamic environments. It can affect the migration or disappearance of a certain species from the patch, to further affect its population and abundance in this patch, and even the diversity of species. The construction of dam, reservoir, and embankment, the excavation of earth and rock borrow area, abandoned slag stockpiling, will form the disturbance patch and imported patch, which will cause a certain impact upon the biological diversity.

The corridor is the linear or belt-shaped landscape factor with the passageway or barrier function, which is the significant bridge and link between communications of patches. To a great degree, the corridor will affect the connectivity, species, nutrient matter, energy communication and genetic exchange between patches. The construction of dam and reservoir, and stockpiling of abandoned slag and others destroy the corridor or change the biological property of path between patches, reducing the landscape connectivity to a certain degree.

5.3.6 Quality assessment of landscape ecological system within the assessment area

After the construction of engineering, the land utilization pattern changes. Among which, the significance of water block is improved due to the construction of navigation-power engineering. Its dominance value and the dominance value of building land will increase to a certain degree, while the dominance value of other blocks will be reduced accordingly. As per the topotype, the dominance value of water area will be increased to a relatively higher level. Therefore, the engineering implementation and operation will cause a much larger impact upon the landscape quality of natural system within the assessment area.

In summary, the engineering construction will cause the change of land use pattern, and cause the impact upon the natural system within the assessment area. Through the self-regulation of natural system within the engineering involved area, landscaping projects and vegetation restoration engineering carried out at the end of construction, the nature and function of natural system within the engineering involved area will be recovered within a certain period of engineering operation. Besides, during the engineering construction process, ecological system protection shall be noticed, to restore the natural productiveness of affected ecological system at the earliest. The project implementation will have a slight impact upon the stability of entire ecological system, while the engineering construction will have a slight impact upon the landscape heterogeneity of regional natural landscape ecological system. Therefore, the impact upon the regional natural landscape system is bearable.

5.4 Aquatic ecological EIA

5.4.1 Aquatic ecological impacts

5.4.1.1 Aquatic ecological impacts caused by the existing engineering

Jiebei Navigation-Power Junction engineering is constructed at the middle and lower reaches of Xinjiang River. It is about 49km away from the upstream of dam site of Bazizui Navigation-Power Junction. Its primary function is navigation, followed by the power generation, irrigation, and other functions. It is constructed much earlier, without considering the engineering dam’s isolation effects upon the aquatic habitat of Xinjiang River. Therefore, this engineering does not provide the fishway, fishery breeding station, and other measures to relieve the ecological impacts.

Therefore, Jiebei Navigation-Power Junction dam damages the continuity of aquatic habitat, resists the fish migration, and communication between fishery species, and changes the flow pattern, causing impacts upon oviposition and other existence activities of fishes with preference of running water environment.

5.4.1.2 Overview of aquatic ecological impacts caused by the engineering

Combined with the aquatic ecological impacts caused by the existing Jiebei Navigation-Power

Junction, the aquatic ecological impacts of Xinjiang River caused by Bazizui Navigation-Power Junction will mainly include:

(1) The dam will isolate the original continuous river ecological system into the disconnected environmental units, which will isolate the communication between fishery species;

(2) After water retaining, the water level within the reservoir area will rise, while the water area will expand. Some swift current and hazardous rapids in the original river will disappear due to reservoir inundation, forming the relatively static subcritical flow or static water environment. Besides, the flow velocity-flow regime and riverbed sediment within the reservoir area will also change due to reservoir inundation, which will cause impacts upon fishes which adapt to the running water environment and gravel river bed environment.

(3) After water retaining, due to the change of the flow velocity-flow regime and riverbed sediment within the reservoir river reaches, oviposition, feeding, and overwintering of fishes in Xinjiang River may be affected.

5.4.2 Impacts upon the preliminary productivity and benthos

5.4.2.1 Preliminary productivity

After the construction of Bazizui Navigation-Power Junction, the aquatic habitat changes from the original natural river to the slow reservoir habitat. Within the inundation area, the nutrient matters gradually accumulate, while the exogenous nutrients will also continuously flow into the reservoir together with the surface runoff. These changes of environmental conditions will benefit the growth of phytoplankton and zooplankton within the reservoir area. Meanwhile, the reservoir and other relatively static water body formed due to the water retaining will also provide better conditions for the growth and breeding of phytoplankton and zooplankton within the reservoir area. Therefore, the primary productivity within the reservoir area will improve.

With the environmental change, the dominance species of phytoplankton within the reservoir area will change accordingly. The dominant diatom in the original river will gradually be replaced by green algae. Meanwhile, the population and biomass of zooplankton within the reservoir area will also increase. The species composition of zooplankton will change as follows: the species and population of rotifer will have a better development potential; the cladocera and copepods with less species and population in river will increase in reservoir; the species and population of protozoa will increase in reservoir, and will form a larger group with the increase of reservoir age.

5.4.2.2 Benthos

Bazizui Navigation-Power Junction assessment area locates at the alluvial plains of middle and lower reaches of Xinjiang River, dominated with the river alluvial plain terrain and low and slow wave hilly terrain. The wide inundation and multistage terrace will be developed along the river, while its both banks are dominated by farmlands. After the water retaining, due to water level elevation, water body's flow velocity reduction, mud and sand sediment, nutrient matter accumulation, and other factors, the species composition of benthos will change accordingly. In front of the dam, at the middle reservoir, and at other locations, the species of benthos will be dominated by aspergillus glaugus Annelid, mollasc, chironomidae, and others. At reservoir tail water area, the variation of species composition of benthos is less. However, at the water-level-fluctuating zone nearby the reservoir bank, due to the abundant nutrient sources, the benthos grows well. In general, after the construction of Bazizui Navigation-Power Junction, it will benefit the growth of benthos within the reservoir area, while their biomass increases obviously compared with the biomass before the reservoir construction.

5.4.2.3 Aquatic vascular bundle plant

After the construction of Bazizui Navigation-Power Junction, the reservoir water level is widened, while the flow velocity is reduced. Besides, the Junction reservoir is regulated daily, while the water level variation amplitude is less. The change of above mentioned environmental conditions will benefit the growth of aquatic vascular bundle plant. The current population of aquatic vascular bundle plant at the shallow water area will increase, while their species are dominated by submerged plants and errantia plant community. At the water-level-fluctuating zone nearby the reservoir bank and low-lying waterlogged land, the emerged plants and wet plant community will dominate.

5.4.3 Impacts upon fishes

5.4.3.1 Impacts upon fishes

(1) Impacts during construction period

The impacts upon fishes caused by Bazizui Navigation-Power Junction engineering construction mainly come from the high concentration SS sewage drainage during the construction period.

The high concentration SS sewage drainage during the construction period will lower the transparency of water body of local reach of downstream of drain outlet, reducing the feeding biomass, such as plankton, zoobenthos, and others. Meanwhile, oxygen content of water body of this river reach and other living conditions for fishes will also be affected, which may cause a certain adverse impacts upon the fishes of the river reach within the construction area. Besides, the over high SS concentration will also affect the filtering and breathing functions of fishes due to mud and sand particles' accumulation at their parotid glands, and even claim death due to asphyxia. Except that the sewage in the base pit will be discharged after being settled and stayed for a while during the construction period, causing a slight increase of SS concentration of lower reach within the construction area, other sewage, such as the stone material processing sewage, concrete processing sewage and others will be recycled after treatment, which will not cause the obvious increase of SS concentration of lower reach within the construction area. Therefore, the engineering construction sewage will cause less adverse impact upon the fishes.

In summary, the engineering construction will cause a certain adverse impact upon the fishes of the construction river reach, but such impact will only limited to the water level within a certain range of construction river reach, mainly affecting their activities within such water area, and their feeding, but not affecting their species composition and population, and fish species resources protection.

(2) Impacts during operation period

The impacts upon fishes caused by Bazizui Navigation-Power Junction engineering operation mainly include:

1) Utilization of habitat space

After the completion and water retaining of Bazizui Navigation-Power Junction, the water depth of the river reach above the dam site will be deepened, while the flow will slow down, and the mud and sand sediment, and other environment will also change. As to the fishes growing at bottom and middle and lower layer, and preferring the habitat with a certain flow velocity, or pebble bottom, such as Hemibarbus labeo, Hemibarbus maculatus Bleeker, Hemibarbus maculatus Bleeker, Rhinogobio typus, Saurogobio dabryi, Parabotia fasciata, mystus macropterus, and other, they will greatly affected after water retaining. They will be forced to retreat to branches and other water level with a certain flow velocity and pebble bottom. Their existence space will be narrowed, and fish resources will be reduced after the construction of reservoir. As to the middle and lower layer fishes, such as pseudolaubuca sinensis, Sharpbelly, culter alburnus basilewsky, Mongolian Redfin, silver carp, aristichthys nobilis, siniperca chuatsi, Siniperca kneri, siniperca scherzeri, Siniperca obscura, and other, their existence space will increase accordingly due to the water area increase within the reservoir area after water retaining, which will benefit for their existence and resources increase, especially for those fishes preferring the open water area. However, as to the fishes living at the shallow area nearby the bank, water retaining will have slight impact upon them.

After the construction of Bazizui Navigation-Power Junction, the river regimen and aquatic habitat of river reaches under the Bazizui dam site have a slight change compared with that before the construction. Therefore, the river reaches under the dam site will have less impact upon the fishes at the respect of habitat space utilization after the construction of Bazizui Navigation-Power Junction.

2) Food habit of fishes

After the water retaining of Bazizui Navigation-Power Junction, the water area of the river reaches within the reservoir area will become widened, while their flow velocity will slow down, and their transparency will improve. Besides, the primary productivity of aquatic life will improve. It will provide more abundant feedings for fishes catching or filtering the plankton, benefit for the growth of fishes eating the plankton, such as silver carp, Aristichthys nobilis, and others.

After the construction of reservoir, the fish resources in the reservoir will improve to a certain degree compared to the river habitat, which will increase the population and resources of carnivorous fishes eating other small sized fishes, such as Ochetobibus elongates, Elopichthys bambusa, Culter alburnus, Mongolian Redfin, eel, Mandarin fish, Siniperca kneri, Siniperca scherzeri, Siniperca obscura, and others, due to the increase of food resources.

Bazizui reservoir does not belong to the large sized deep water reservoir. After the construction, the water area will increase, while the water-fluctuation-zone is less, and water depth is appropriate, which will benefit for the growth of benthos whose resources will increase obviously compared with the river habitat before the construction. However, it is predicted that community structure or fauna component will change to a certain degree. The increase of benthic biomass resources will provide relatively abundant feedings for fishes living at the bottom. Therefore, it benefits the fishes eats the zoobenthos at bottom, including Pelteobagrus fulvidraco, Leiocassis crassilabrus Giinther, carp, crucian carp, black carp, and others.

As to the fishes eating the periphytic algae, the slow flow within the reservoir area will benefit the existence of periphytic algae to a certain degree. Besides, the water is deepened, and inundates the original stone blocks or shallow shoals where a large quantity of periphytic algae grows. The bottom of newly inundated area mainly are mud, which will not benefit for the growth of periphytic algae, and cause adverse impacts upon the fishes with such food habits to a certain degree, such as Zacco platypus, Xenocypris argentea, Xenocypris davidi, Plagiognathops microlepis, and others.

As to the omnivorous feeding and phytophagous fishes, the organic matter of water body will be retained within the reservoir area after its construction, which will increase the feeding source of omnivorous feeding fishes. Meanwhile, the slow flow and increased transparency of water body will also benefit the growth of aquatic higher plants at the reservoir and bank, which will further increase the feeding source of phytophagous fishes mainly eating the aquatic higher plants. Therefore, it can be predicted that after the water retaining of Bazizui Reservoir, it will cause the positive impacts upon the above two kinds of fishes, including Grass Carp, White bream, black carp, Squaliobarbus curriculus, Pseudolaubuca sinensis, Sharpbelly, Megalobrama amblycephala, and others.

Bazizui Navigation-Power Junction belongs to the low-head power station without storage. The transparency, flow and other hydrological conditions of its discharged water will change slightly. After the completion of Bazizui Navigation-Power Junction, it will cause less impact upon the feeding resources of fishes of river reaches under the dam. Therefore, it will not cause larger impacts upon the fishes due to the fish feeding resources.

3) Water flow regime

After the operation of Bazizui reservoir, the original river habitat of the river reaches within the reservoir will disappear. As to the fishes which like the running water environment, such as Zacco platypus, Xenocypris argentea, Xenocypris davidi, Plagiognathops microlepis, Rhinogobio typus, Mystus macropterus, Siniperca kneri Garman, and others, due to the disappearance of their habitat, much greater adverse impact will be imposed to their species existence and population. Their population in the reservoir area will decrease, even disappear. They are forced to immigrate to branch running water area where a certain quantity of group and individuals will be kept. However, due to the restriction of small environmental capacity of branch water area, their species scale and population will not too large.

As to the fishes that like the slow flow-static water environment, such as carp, crucian, Pelteobagrus fulvidraco, and others, the construction of reservoir will benefit their existence and population increase. However, as to the fishes that will spawn in running water environment during their breeding season, such as black carp, Grass carp, Squaliobarbus curriculus, Elopichthys bambusa, Ochetobibus elongates, silver carp, Aristichthys nobilis, and others, after the river flow regime habitat changes, they cannot complete their normal breeding behaviors.

After the water retaining of Bazizui Navigation-Power Junction, it will have less impact upon the flow regime habitat of river reaches under the dam. Therefore, the change of river flow velocity or flow regime will have less impact upon the fishes of river reaches under the dam.

4) Breeding migration

After the construction of Bazizui Navigation-Power Junction, the dam isolation function will cause the resistance of fish migration, preventing the fishes with migration habits, such as black carp, grass carp, Squaliobarbus curriculus, Ochetobibus elongates, Elopichthys bambusa, Parabramis pekinensis, silver carp, Aristichthys nobilis, from completing their natural migration process.

As to the river-lake migratory fishes, river-river migratory fishes, river-sea migratory fishes, and others, the migration process takes a significant function during their natural breeding, feeding and fattening, genetic communication, and aspects. After the completion of Bazizui Navigation-Power

Junction, the breeding habitat for running water fishes within the river reaches of reservoir area of Bazizui Navigation-Power Junction, will disappear. Due to the mutual isolation of Jiebei Navigation-Power Junction and Bazizui Navigation-Power Junction, the impacts of Bazizui Navigation-Power Junction mainly exist in the fish feeding, fattening, genetic communication migration resistance.

The fishes that have river migration habits, such as Xenocypris argentea Gunther, Xenocypris davidi, Xenocypris microlepis, and others, are all small sized fishes. During their migration breeding, they have fewer requirements upon the length and flow of river. They may finish their migration breeding process in the branch river Batita, but the species population and scale will not too huge.

After the construction of Bazizui Navigation-Power Junction, the river reaches under the dam still keep the river habitat, so the migratory fishes' breeding migration demand will not affected. However, due to the narrowing of habitat, a certain adverse impact upon the breeding migratory fish resources will be caused.

5) Conclusion

As per the above impact analysis of different ecological requirements of fishes, the construction of Bazizui Navigation-Power Junction will mainly cause more impacts upon fishes living in the river reaches of the original reservoir area, but have less impact upon the ecological requirements of fishes living in the river reaches under the dam. Its impact upon the fishes living in the river reaches under the dam mainly refers to its isolation of back migration route of 8 types of fishes with long-distance migration habit, such as black carp, Grass Carp, Squaliobarbus curriculus, Ochetobibus elongates, Elopichthys bambusa, Parabramis pekinensis, silver carp, and Aristichthys nobilis, prevent them from completing their normal breeding at the original spawning place. However, it will cause less impact upon the fishes with other ecological requirements.

It will cause more impact upon the ecological requirements of fishes above the dam, mainly including the migratory fishes, fishes that like the running water environment, and rock shoal bottom, and fishes that spawn the drifting eggs. Please refer to Table 5.3-1 for analysis results. After the completion of Bazizui reservoir, the change of fishes within the reservoir area mainly includes the following four trends:

First, the resources will be decreased, while the impact is severe. The affected fishes are mainly the river-lake migratory fishes, including black carp, Grass Carp, Squaliobarbus curriculus, Ochetobibus elongates, Elopichthys bambusa, Parabramis pekinensis, silver carp, and Aristichthys nobilis, and others.

Second, the resources within the reservoir area will be decreased, while the branches will supply and maintain a certain species population. The affected fishes mainly include Zacco platypus, Opsariichthys bidens, Xenocypris argentea, Xenocypris davidi, Xenocypris microlepis, Hemibarbus labeo, Hemibarbus maculatus Bleeker, Rhinogobio typus, Saurogobio dabryi, catfish, batrachus, Pelteobagrus fulvidraco, Mystus macropterus, and others.

Third, the resources within the reservoir area will be decreased, while the branches will maintain a certain species population. The affected fishes mainly are the small sized fishes that like living in the stream and other branches, including Sarcocheilichthys nigripinnis nigripinnis, Parabotia fasciata, Odontobutis obscures, Mastacembelus aculeatus, and others.

Fourth, the resources will be increased. After the completion of Junction, the flow velocity will slow down, while the water surface will be widened, which will provide a much better existence conditions for the fishes, such as Pseudolaubuca sinensis, Sharpbelly, Culter alburnus, Mongolian Redfin, Megalobrama amblycephala, carp, crucian carp, Misgurnus anguillicaudatus, eel, Mandarin fish, Siniperca kneri, Siniperca scherzeri, Siniperca obscura, Northern snakehead, and others. Besides, their resources will be increased to a certain degree.

Table 5.3-1 Species forecast analysis of fishes distributed within the reservoir area after the completion of Bazizui Navigation-Power Junction

Species	Positive	Negative	Impact factors	Forecast analysis
1. Zacco platypus		+	BC	The resources within the reservoir area will be decreased, while the branches will supply and maintain a certain species population.
2. Opsariichthys bidens		+	BC	The resources within the reservoir area will be decreased, while the branches will supply and maintain a certain species population.
3. Black carp		+	AB	The resources will be decreased, while the impact is severe.
4. Grass Carp		+	AB	The resources will be decreased, while the impact is severe.
5. Squaliobarbus curriculus		+	A	The resources will be decreased, while the impact is severe.
6. Ochetobibus elongatus		+	AB	The resources will be decreased, while the impact is severe.
7. Elopichthys bambusa		+	AB	The resources will be decreased, while the impact is severe.
8. Aristichthys nobilis		+	AB	The resources will be decreased, while the impact is severe.
9. Silver carp		+	AB	The resources will be decreased, while the impact is severe.
10. Carp	+		E	The resources will be increased.
11. Carassius auratus	+		E	The resources will be increased.
12. Pseudolaubuca	+		E	The resources will be increased.

Species	Positive	Negative	Impact factors	Forecast analysis
sinensis				
13. Sharpbelly	+		E	The resources will be increased.
14. Culter alburnus	+		E	The resources will be increased.
15. Mongolian Redfin	+		E	The resources will be increased.
16. Parabramis pekinensis		+	AB	The resources will be decreased, while the impact is severe.
17. Megalobrama amblycephala	+		E	The resources will be increased.
18. Xenocypris argentea Gunther		+	ACD	The resources within the reservoir area will be decreased, while the branches will supply and maintain a certain species population.
19. Xenocypris davidi		+	ACD	The resources within the reservoir area will be decreased, while the branches will supply and maintain a certain species population.
20. Xenocypris microlepis		+	ACD	The resources within the reservoir area will be decreased, while the branches will supply and maintain a certain species population.
21 Spinibarbus caldwelli		+	B	The resources within the reservoir area will be decreased, while the branches will supply and maintain a certain species population.
22. Hemibarbus labeo		+	B	The resources within the reservoir area will be decreased, while the branches will supply and maintain a certain species population.
23. Hemibarbus maculates		+	B	The resources within the reservoir area will be decreased, while the branches will supply and maintain a certain species population.
24. Sarcocheilichthys nigripinnis		+	B	The resources within the reservoir area will be decreased, while the branches will maintain a certain species population.
25. Rhinogobio typus		+	C	The resources within the reservoir area will be decreased, while the branches will supply and maintain a certain species population.
26. Saurogobio dabryi		+	C	The resources within the reservoir area will be decreased, while the branches will supply and maintain a certain species population.
27. Parabotia fasciata		+	CD	The resources within the reservoir area will be decreased, while the branches will maintain a certain species population.
28. Misgurnus anguillicaudatus	+		E	The resources will be increased.
29 Crossostoma davidi		+	B	The resources within the reservoir area will be decreased, while the branches will maintain a certain species population.
30. Catfish		+	B	The resources within the reservoir area will be decreased, while the branches will maintain a certain species population.
31 Clarias fuscus		+	B	The resources within the reservoir area will be decreased, while the branches will maintain a certain species population.
32. Pelteobagrus fulvidraco		+	B	The resources within the reservoir area will be decreased, while the branches will maintain a certain species population.

Species	Positive	Negative	Impact factors	Forecast analysis
33 Leiocassis crassilabrus Giinther		+	B	The resources within the reservoir area will be decreased, while the branches will maintain a certain species population.
34. Mystus macropterus		+	BD	The resources within the reservoir area will be decreased, while the branches will maintain a certain species population.
35. Monopterus albus	+		E	The resources will be increased.
36. Mandarin fish	+		E	The resources will be increased.
37. Siniperca scherzeri	+		E	The resources will be increased.
38. Siniperca kneri Garman	+		E	The resources will be increased.
39. Snakehead fish	+		E	The resources will be increased.
40. Mastacembelus aculeatus		+	B	The resources within the reservoir area will be decreased, while the branches will maintain a certain species population.

Notes: A refers to migration passageway is blocked; B refers to loss of spawning conditions; C refers to hatching of fertilized eggs cannot be completed; D refers to loss of habitat environment; E refers to the increase of habitat space and food source.

5.4.3.2 Impacts upon fish spawning

After the water retaining of Bazizui reservoir, the water flow within the reservoir area will slow down, which will make the fishes which like to spawn in running water environment lose their spawning conditions, such as Zacco platypus, and Opsariichthys bidens. These fishes would like to spawn the adhesive or demersal eggs at the sand or gravel bottom, and under the running water environment. Besides, the “four major Chinese carps”, Xenocypris argentea Gunther, Rhinogobio typus, Botia almorhae, and others would like to spawn the pelagic eggs under the running water environment. These fishes cannot complete their breeding within the river reaches of reservoir area, which will cause relatively severe impacts upon these fishes. Although partial fishes will migrate to the branch water area with a certain flow velocity, due to the restriction of small ecological capacity of branch water level, its supplement to the species will be limited. Therefore, these types of breeding fishes will decrease within the reservoir area.

As to the fishes spawning in static water environment, due to the widening water surface after the completion of reservoir, their spawning environment is improved to a certain degree, which benefits their breeding within the reservoir area. These fishes include Pseudolaubuca sinensis, Sharpbelly, culter alburnus basilewsky, and others.

Bazizui Navigation-Power Junction belongs to the low-head power station without storage. After the water retaining and operation, the discharged water flow velocity, temperature, and other hydrological conditions will change slightly. Therefore, it will have less impact upon the hydrological regime of river reaches under the dam, and the fishes which spawn in running water under the dam and fishes with other spawning requirements.

5.4.3.3 Impact upon fish feeding and overwintering

After the completion and water retaining of Bazizui Navigation-Power Junction, the water level within the reservoir area will rise, while the flow velocity in front of the dam will slow down. The reservoir will form the relatively static water environment. The transparency of water body will increase, while the water surface area will also increase, which will benefit the Photosynthesis of aquatic plant. Besides, the surface water temperature will also rise. All the above changes will provide better conditions for the breeding of plankton within the reservoir area. The population of plankton within the reservoir area will greatly increase compared to that before the construction of reservoir, which will provide abundant feeding resources for the fishes within the reservoir area. The fish overwintering generally occurs to the main stream or deep trench. After the water retaining of Bazizui Navigation-Power Junction, the water depth will deepen, which provides better overwintering conditions for fishes in reservoir area and Baita river branch.

Bazizui Navigation-Power Junction belongs to the low-head power station without storage. The change of water flow, velocity, sand bearing content, and other conditions of its discharged water will vary slightly compared with that before the completion of reservoir. Therefore, it will cause less impact upon the feeding and overwintering of fishes in river reaches under the dam.

5.5 Ground water EIA

5.5.1 Impact upon ground water level

The regional ground water level change will be mainly caused by the seepage and inundation of dam area and reservoir area.

(1) Dam area seepage

The dam area seepage of Bazizui Navigation-Power Junction mainly refers to the bypass seepage of dam.

The left end of recommended dam site is connected with Daxiwei whose inner side is the relatively wide first grade river alluvial terrace with the width of 220~1300m, and general ground elevation of 17.7~19.3m. The formation structure is the typical dual structure. The upper part is the silty clay, with weak permeability and about 3m thick. The middle part is the fine sand, medium sand, coarse sand, and gravel, with strong permeability, and about 8~11m thick, which are widely distributed, and connected with the outer sand formation. The inner ground water level has a good correlation with the outer river water level. The lower part is the full-strong weathering phyllite. After the water retaining, the reservoir water can leak to the downstream through the sand formation of the inner terrace.

The right end of recommended dam site is connected with Zinianwei whose inner side is the relatively wide second grade river alluvial terrace with the width of 600~2500m, and general ground elevation of 17.0~19m. The formation structure is the typical dual structure. The upper part is the silty clay, with weak permeability and about 7.5m thick. The middle part is the fine sand, and coarse sand, with strong permeability, and about 4~11m thick, which are widely distributed, and connected with the outer sand formation. The inner ground water level has a good correlation with the outer river water level. The lower part is the full-strong weathering phyllite. After the water retaining, the reservoir water can leak to the downstream through the sand formation of the inner terrace.

With reference to the relevant formula of Hydropower Engineering Geology Manual (P225), the dam area seepage amount towards the downstream is estimated as follows:

$$Q = 0.336KB(H_1 + H_2)(H_1 - H_2)\frac{\lg B}{r_1}$$

In which, K refers to permeability coefficient at the seepage section, m/d; B refers to the length of by-pass seepage belt, m; H1 refers to water level in front of dam, m; H2 refers to water level under the dam, m; r1 refers to joint radius in the dam, m.

The calculation parameters and results are as shown in Table 5.5-1.

Table 5.5-1 Dam bypass seepage calculation parameter value table

<table>
<tr><th>Calculation Parameter</th><th>Unit</th><th>East Branch Zinianwei</th><th>West Branch Daxiwei</th></tr>
<tr><td>K</td><td>m/d</td><td>4.23</td><td>2.77</td></tr>
<tr><td>B</td><td>m</td><td>1071</td><td>910</td></tr>
<tr><td>H1</td><td>m</td><td>18</td><td>18</td></tr>
<tr><td>H2</td><td>m</td><td>12</td><td>12</td></tr>
<tr><td>r1</td><td>m</td><td>100</td><td>100</td></tr>
<tr><td rowspan="2">Q</td><td rowspan="2">m^3/d</td><td>8301</td><td>4511</td></tr>
<tr><td colspan="2">12812</td></tr>
</table>

The dam bypass seepage formula calculation schematic diagram is as shown in Figure 5.5-1. The calculated dam bypass seepage is 12812m3/d (or 0.15m3/s), which is less than 578m3/s of annual mean flow of river.

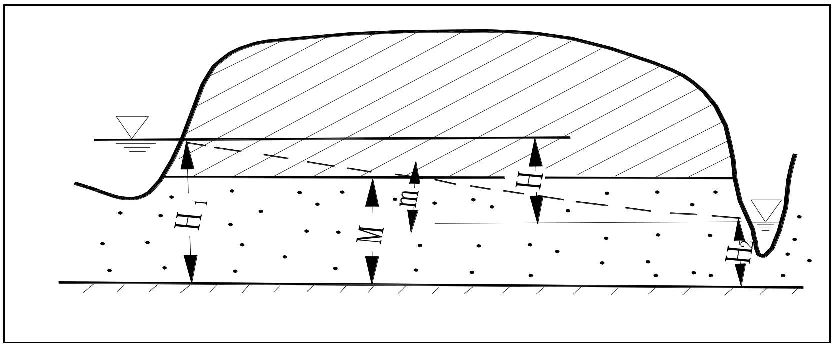


Figure 5.5-1 Dam bypass seepage formula calculation schematic diagram

(2) Dam area inundation

The geomorphological unit on both banks of dam area belongs to alluvial terrace. The Quaternary alluvium generally has double layer dual structure. The upper part is dominated by the silty clay, clay, and other relatively impermeable layer, while the lower part belongs to the better permeable sandy soil and gravel layer. Most of the ground water is under pressure, closely connected with the hydrology of Xinjiang River. The underlying stratum is dominated by phyllite, sandstone, and other non-soluble rocks. The inundation area on the left and right banks of dam area is similar to the inundation area of reservoir. The inundation possibility exists, while these areas are dominated by crop plantation.

(3) Reservoir area seepage

River reaches within the reservoir area belongs to the channel type reservoir. The terrain on both sides of the valley belongs to watershed. The terrain is imposing. However, the river reaches within the reservoir area basically belongs to the plain type river. Xinjing River belongs to the regional minimum drainage datum. On the alluvium terrace and along both banks of the river, the embankment which can fight against the 20～50 year flood is continuously distributed. The normal high water level of reservoir is almost in parallel to the dam foot. Therefore, the dam’s topographic sealing condition is better. The rocks on the reservoir banks are basically composed of impermeable rocks and relatively impermeable rocks, without the distribution of soluble rocks. The bedrock has good impermeable and sealing conditions. Although the regional fault Linchuan-Jinjiang Fault slants the reservoir area, communicating with both banks of reservoir, Xinjiang is the regional minimum drainage datum, and its water head will slightly elevated after normal water retaining of reservoir. Besides, the reservoir is not connected with any adjacent low valley. Therefore, the analysis believes that the reservoir water will not leak outside along the fault belt, namely, the fault belt will not form the seepage passageway within the reservoir area, and also not destroy the integrity of reservoir area. Therefore, the reservoir water will not cause the permanent seepage problems towards the adjacent valley.

(4) Reservoir area inundation

The reservoir area is basically located on the alluvium terrace of main stream and branch of Xinjiang River. The Quaternary alluvium generally has double layer dual structure. The upper part is dominated by the silty clay, clay, and other relatively impermeable layer, while the lower part belongs to the better permeable sandy soil and gravel layer. Most of the ground water is under pressure, closely connected with the hydrology of Xinjiang River. The underlying stratum is dominated by phyllite, sandstone, and other non-soluble rocks.

The embankment is located on both banks of Xinjiang River. The embankment top elevation from upstream to downstream varies from 31m to 24.5m. When the water retaining level is 18m, the water level is within the channel. The minimum ground elevation behind the embankment is about 17m (at Daxiwei). Behind the embankment, there are many drainage ditches and channels. The floor elevation of drainage ditches and channels are 15~16m, while the reservoir water level is generally 1~3m higher than the ground elevation behind the embankment. As per the engineering experiences, when the thickness of clay cover coat behind the embankment equals to or exceeds half of the water head outside the embankment, embankment foundation permeable stability problem generally will not exist. As per the exploration results, the thickness of clay cover coat behind the embankment is generally more than 3m, while 4.5~9.5m is prevailing, which exceeds the safety thickness. Therefore, seepage and permeable stability problems do not exist in the bund and embankment foundation of reservoir area.

After water retaining, due to the water level elevation, the ground water level within the embankment will abnormally rise. Different from the flood period before water retaining, after water retaining, the reservoir area will stay on the normal storage level for a long term. All embankments within the reservoir area are relatively independent, enclosed embankment. It is hilly area behind the embankment. After operation for a while, the ground water level under the static water pressure will almost equal to the reservoir water level, if there is no drainage device. In this case, inundation problem will easily occur.

① Inundation Standard

The inundation standard shall be determined with reference to the impact factors of ground water upon the local building foundation, agricultural, forest, and plants. Generally, the minimum ground water burial depth that will not cause adverse impact upon the stability and safety of local buildings, and crop growth, shall be used as the critical groundwater buried depth. The critical groundwater buried depth is the minimum allowable buried depth of ground water, and also the boundary condition to delineate the inundation scope.

As per the requirements of Code for Engineering Geological Investigation of Water Resources and Hyrdopower (GB50487-2008), critical groundwater buried depth of inundation shall be determined as per the local detailed hydrogeological conditions, field test observation data of agricultural scientific study unit, and local production practice experiences, and can also be calculated as per the formula below:

$Hcr=Hk+\Delta H$

In which,

Hcr refers to critical groundwater buried depth of inundation, m;

Hk refers to the soil capillary water fringe height above the ground water level, m;

ΔH refers to safety super high value, m. As to the crops, it means the root zone thickness. As to the buildings, it means the foundation burial depth.

The soil capillary water fringe height correlates to the soil structure, mineral composition, chemical elements of ground water, and others. The soil capillary water fringe height measured in field conditions and that measured in lab have great difference. As per the requirements of Code GB50487-2008, the soil capillary water fringe height above the ground water level may be selected as per the suitable soil water content in different growth phase of crops, and the field measured soil water content variation curve with depth. As per the water content test, and field measurement, and combined with engineering analogy, the capillary water fringe height of cohesive soil shall be about 0.3m~1.0m, while that of sandy soil shall be about 0.25m~0.8m.

The 70% roots of general crops are distributed within the soil which is 30cm below surface. The 90% roots of general crops are distributed within the soil which is 50cm below surface. As to the roots with the buried depth of more than 50cm, the inundation will only impose the severe impacts only in a certain stage of the crop growth and only to a certain degree, but will not threaten their lives.

Considering the soil capillary water fringe height, calculated as per the formula $Hcr=Hk+\Delta H$, and as per the reservoir inundation exploration results that most overburden is cohesive soil, it is concluded that Hcr=1.5m, by taking 1.0m fro Hk and 0.50m for ΔH. Therefore, as to the locations behind the embankment with the ground elevation closing to the reservoir water level, the inundation possibility exists. Especially, as to the locations behind the embankment with the ground elevation lower than normal storage level, the swampiness may be caused. The engineering practice shows that the forecast results for the channel type reservoir in southern China are obviously much larger.

The primary crops on both banks of reservoir include the rice, oilseed rape, sweet potato, mulberry sapling, and others. Generally, the buried depth of their roots is less than 0.5m. Considering the weather and soil features of Southern China, and water favorite habit of different crops, and also compared with the operation experiences of other same type engineering, the 1.0m ground water buried depth is determined as the inundation standard. Meanwhile, the hydrological structure, especially the permeable stratum distribution scope, will be comprehensively considered to determine the division standard.

② Inundation forecast

The terrace inundation within the reservoir area is caused when the banked up level of ground water formed due to the backwater effect of reservoir water exceeds the inundation elevation.

In this phase, the level of ground water behind the embankment will basically equal to the reservoir water level. The ground elevation is calculated by using the normal storage level of reservoir plus 1.0m. They will be adopted to control the plane inundation scope and make the preliminary inundation assessment. The inundation scope will be separately delineated in the 1: 10000 topographic map, by comparing different water levels. Besides, the inundation area of each embankment below each compared water level will be counted. The statistics results are as shown in Table 5.5-2.

Table 5.5-2 Reservoir area inundation scope statistics

Location		Inundation Area (Mu)
Left Bank	Daxiwei Embankment	13356.9
	Duanjiahuwei Embankment	310.5
	Loubuwei Embankment	0
	Jinbuwei Embankment	2241.5
	Jiangfangwei Embankment	0
	subtotal	15908.9
Right Bank	Zinianwei Embankment	7132.2
	Zhoujianongwei Embankment	800.1
	Nanyuanwei Embankment	0
	Yangbuwei Embankment	379.4
	Pingshangwei Embankment	170.4
	Shawowei~Shixiangwei Embankment	532.9
	Zhuqiaowei Embankment	1326.0
	Xiyanglijia Embankment	0
	Tuanhu Farmland Embankment	145.1
	Subtotal	10486.2
Total		26395.1

If the recommended normal storage water level is 18.0m, the reservoir inundation area will be 15908.9 Mu at the left bank, and 10486.2 Mu at the right bank, which equals to 26395.1 Mu in total.

5.5.2 Impact upon the ground water quality

This engineering dam is the low water head retaining structure. As per the reservoir operation method, the reservoir will not retain the water, until the upstream inflow quantity is less than 1100m3/s, and the downstream water level is less than 18.0m. Therefore, it has less impact upon the downstream water level of Xinjiang River. Generally, it will not cause the obvious adverse impact upon the groundwater on both banks of downstream Xinjiang River.

The groundwater of alluvial terrace front area surrounding Xinjiang River within the reservoir area has close hydrological connection and mutually supplementary functions with the water of Xinjiang River. After the engineering operation, the ground water quality will also have close connection with the reservoir water quality. Therefore, reservoir water quality directly affects the groundwater quality around the reservoir. After water retaining, the Xinjiang River reach within the reservoir area changes from the natural river channel to the channel type reservoir. As per the surface water quality analysis and forecast, the eutrophication possibility is less for the reservoir water body. During the operation period, the water quality can conform to the third level standard, while each water quality index will be almost the same with the water quality index of the original Xinjiang river reaches. However, if a large number of pollutants are discharged into the reservoir, the reservoir water quality will be worsened, which will indirectly affect the ground water quality, and may simultaneously decline the ground water quality.

5.5.3 Impacts upon sensitive points of ground water

As per the survey, ground water type concentrated drinking water source protection area is not found within the assessment area. The sensitive points of ground water environment are mainly distributed at the scattered civil wells of towns around the reservoir.

As per the impact analysis of engineering construction upon the ground water quality, engineering construction will not cause the obvious adverse impacts upon the surrounding ground water. Therefore, the water quality of civil wells of towns around the reservoir will not be obviously worsened due to the engineering construction.

5.6 Ambient air impact analysis

The impact of Bazizui Navigation-Power Junction upon ambient air quality mainly concentrates in construction period. During the operation period, Bazizui Navigation-Power Junction itself will not discharge pollutants, and will not cause adverse impacts. However, the indirect impact comes from the vent air emitted from the passing ships. Therefore, the impacts of engineering construction upon the ambient air quality shall be mainly analyzed.

5.6.1 Impacts upon ambient air during the construction period

As per multi-years of meteorological observation data within the engineering area, the prevailing wind direction of engineering affected area shall be north wind (17%). Besides, as per the engineering analysis, the adverse impact of this engineering upon the ambient air quality mainly comes from the dust material loading and unloading, sand and stone material processing, concrete mixing, dust and flying dust caused by earthworks and transportation, and vent gas caused by the fuel machinery, and others during the construction period. The primary pollutants include TSP, PM10, and NO2. In which, TSP pollutant dominates.

5.6.1.1 Ambient air impact analysis of sensitive points around the Junction during the construction period

The engineering analysis shows that TSP concentration at 150m away from the lower wind direction of concrete mixing point can conform to the daily mean value 0.30mg/m3 provided in Ambient Air Quality Standards (GB3095-2012). The major production facilities of this project are arranged in the river central island during the construction period. The boundary of construction site is about 200m away from the embankment of right bank of east river, and 600m away from the embankment of left bank of west river. Therefore, production facilities in the construction site have less impact upon the ambient air quality of sensitive points around the Junction area.

TSP concentration at 160m away from the lower wind direction of concrete mixing point can conform to requirements of concentration limit at fugitive emission reference point (5.0mg/m3) provided in Integrated Emission Standard of Air Pollutants (GB16297-1996). During the materials transportation process, it will cause a certain impact upon the sensitive points around the construction road within the Junction area. At the end of construction, the impact will disappear, as shown in Table 5.6-1.

5.6.1.2 EIA analysis upon the sensitive points of reservoir area during the construction period

The embankment strengthening projects and materials transportation within reservoir area of this project, will cause different level impacts upon the resident sensitive points distributed around and close to the embankment and planned utilized road. However, such impacts are temporary. At the end of construction, the pollution will disappear, as shown in Table 5.6-2.

Table 5.6-1 Ambient air impact analysis of sensitive points around the Junction during construction period

S.N.	Protected Object	Location & Distance	Scale & Feature	Impact Analysis
1	Waixiong Village	About 20m away from the right side of East River Dam Site and 20m away from 3# right bank construction road	About 120 households, 450 persons	It is about 230m away from the boundary of construction site. Therefore, the dust of vehicle transportation will cause a certain impact upon it.
2	Waiwang Village	400m away from the upstream at the right side of East River Dam Site	About 50 households, 200 persons	It is about 300m away from the boundary of construction site. Therefore, the dust of vehicle transportation will cause a certain impact upon it.
3	Zoujialong Village	400m away from the upstream of West River Dam Site	About 15 households, 50 persons	It is about 1400m away from the boundary of construction site. Therefore, the construction will almost have no impact upon the ambient air.
4	Bu Village	800m away from the downstream of West River Dam Site, 30m away from the planned Upper Dam Permanent Road at the left bank, and also about 80m away from the boundary of production base at the left bank.	About 120 households, 460 persons	It is about 900m away from the boundary of construction site. Therefore, the dust of vehicle transportation will cause a certain impact upon it.
5	Songfangliujia Village	About 60m away from the planned 1# left bank construction road	About 80 households, 300 persons	It is about 900m away from the boundary of construction site. Therefore, the dust of vehicle transportation will cause a certain impact upon it.
6	Xiongjia Village	About 20m away from the planned 3# right bank construction road, and about 150m away from the right bank production base	About 100 households, 400 persons	It is about 700m away from the boundary of construction site. Therefore, the dust of vehicle transportation will cause a certain impact upon it.
7	Sanbeishanlujia Village	About 20m away from the planned 3# right bank construction road	About 60 households, 240 persons	The dust of vehicle transportation will cause a certain impact upon it.
8	Yuantoulingzhangjia Village	About 20m away from the planned 3# right bank construction road	About 40 households, 160 persons	The dust of vehicle transportation will cause a certain impact upon it.
9	Hongyuandu Village	About 20m away from the planned 3# right bank construction road	About 40 households, 160 persons	The dust of vehicle transportation will cause a certain impact upon it.
10	Mabeizui Village	About 20m away from the planned 3# right bank construction road	About 50 households,	The dust of vehicle transportation will cause a certain impact upon it.

S.N.	Protected Object	Location & Distance	Scale & Feature	Impact Analysis
			200 persons	

Table 5.6-2 Ambient air impact analysis of sensitive points within the reservoir area during construction period

S.N.	Left/ Right Bank of Xinjiang River	Protected Object	Location & Distance	Scale & Feature	Impact Analysis
1	Left Bank of Xinjiang River	Caishuanglijia Village	About 20m away from Daxiwei levee line and planned road	About 40 households, 160 persons	The construction operation dust will cause a certain impact upon it.
2		Zheguzui Village	About 20m away from Daxiwei levee line and planned road	About 50 households, 200 persons	The construction operation dust will cause a certain impact upon it.
3		Xianchengjia Village	About 20m away from Daxiwei levee line and planned road	About 80 households, 300 persons	The construction operation dust will cause a certain impact upon it.
4		Daxi Village	About 20m away from Daxiwei levee line and planned road	About 200 households, 850 persons	The construction operation dust will cause a certain impact upon it.
5		Lijianong Village	About 20m away from Daxiwei levee line and planned road	About 180 households, 700 persons	The construction operation dust will cause a certain impact upon it.
6		Zoufang Village	About 35m away from Daxiwei levee line and planned road	About 300 households, 1000 persons	The construction operation dust will cause a certain impact upon it.
7		Duanjiahu Village	About 200m away from Duanjiahuwei levee line and planned road	About 25 households, 100 persons	The construction operation dust will cause less impact upon it.
8		Loubu Village	About 50m away from Loubu Village Water Gate and Power Pumping Station	About 50 households, 200 persons	The construction operation dust will cause a certain impact upon it.
9		Xiabu Village	About 50m away from Jinbuwei levee line and planned road	About 80 households, 320 persons	The construction operation dust will cause a certain impact upon it.
10		Tukufan Village	About 25m away from Jinbuwei levee line and planned road	About 60 households, 240 persons	The construction operation dust will cause a certain impact upon it.
11		Sifang Village	About 20m away from Jinbuwei levee line and planned road	About 40 households, 150 persons	The construction operation dust will cause a certain impact upon it.
12		Jinbu Village	About 20m away from Jinbuwei levee line and planned road	About 400 households, 1200 persons	The construction operation dust will cause a certain impact upon it.
13		Jinbu Primary	About 150m away from Jinbuwei levee line	10 teachers, and 180	The construction operation dust will cause less

S.N.	Left/ Right Bank of Xinjiang River	Protected Object	Location & Distance	Scale & Feature	Impact Analysis
		School	and planned road	students	impact upon it.

Table 5.6-2 Ambient air impact analysis of sensitive points within the reservoir area during construction period (Continued)

S.N.	Left/ Right Bank of Xinjiang River	Protected Object	Location & Distance	Scale & Feature	Impact Analysis
14	Right Bank of Xinjiang River	Waiwang Village	About 30m away from Zinianwei levee line and planned road	About 50 households, 200 persons	The construction operation dust will cause a certain impact upon it.
15		Tongkou Village	About 25m away from Zinianwei levee line and planned road	About 35 households, 140 persons	The construction operation dust will cause a certain impact upon it.
16		Chengjia Village	About 20m away from Zinianwei levee line and planned road	About 200 households, 800 persons	The construction operation dust will cause a certain impact upon it.
17		Yangbu Village	About 30m away from Yangbuwei Raised Protection Area	About 40 households, 200 persons	The construction operation dust will cause a certain impact upon it.
18		Hebu Village	About 50m away from Hebu Raised Protection Area	About 100 households, 400 persons	The construction operation dust will cause a certain impact upon it.
19		Fanjia Village	About 25m away from Shawowei levee line and planned road	About 40 households, 150 persons	The construction operation dust will cause a certain impact upon it.
20		Xiashan Village	About 25m away from Zijiangwei levee line and planned road	About 90 households, 350 persons	The construction operation dust will cause a certain impact upon it.
21		Caiziwan Village	About 20m away from Hegangwei levee line and planned road	About 55 households, 220 persons	The construction operation dust will cause a certain impact upon it.
22		Hegang Village	About 30m away from Hegangwei levee line and planned road	About 80 households, 320 persons	The construction operation dust will cause a certain impact upon it.
23		Hujiazhou Village	About 20m away from Zhuqiaowei levee line and planned road	About 100 households, 400 persons	The construction operation dust will cause a certain impact upon it.

24		Yujiazhou Village	About 25m away from Zhuqiaowei levee line and planned road	About 70 households, 280 persons	The construction operation dust will cause a certain impact upon it.
25		Tangbei Village	About 30m away from Zhuqiaowei levee line and planned road	About 300 households, 1200 persons	The construction operation dust will cause a certain impact upon it.
26		Laowudaijia Village	About 20m away from Zhuqiaowei levee line and planned road	About 50 households, 200 persons	The construction operation dust will cause a certain impact upon it.
27		Kengkou Village	About 20m away from Tuanhu Farmland levee line and planned road	About 80 households, 320 persons	The construction operation dust will cause a certain impact upon it.

5.6.2 Ambient air impact during operation period

After the construction of Bazizui Navigation-Power Junction, and during the operation period, itself will not discharge any pollutant, and will not cause adverse impacts upon environment. The indirect impact comes from the vent gas emitted by the passing ships. The impact will be analyzed by adopting the analogy analysis method.

(1) Primary pollution impact analysis

The ambient air pollution source within the navigation channel mainly comes from ship vent gas, which belongs to the fugitive emission source. The vent gas emission will cause a certain pollution impact upon the ambient air. However, such impact is only limited to the scope of 50m away from the emission point, and totally within the navigation channel. Therefore, it will impose no pollution impact upon residents living on both sides of the navigation channel.

(2) Positive benefits to ambient air quality after the treatment of navigation channel

After the construction of ship lock, the percentage of large -tonnage cargo ships passing through the navigation channel will gradually improved. Their power equipment and anti-pollution device will be obviously better than small sized ships. Under the same total annual cargo transportation, the total vent gas emitted from the ships will be obviously decreased compared with previous years.

With the implementation of bank protection works forest of Right Bank of dam site, and greening works around the reservoir, the ambient air quality along the navigation channel of Bazizui Navigation-Power Junction will be improved accordingly.

5.7 Noise impact analysis

5.7.1 Noise of fixed source

(1) Forecast model

As per the Technical Guidelines for Noise Impact Assessment, the following formula will be adopted to predict the noise of fixed source.

$$LA(r) = LAw - 20\lg(r) - \Delta L$$

In which, LA (r) refers to A-weighted sound level at the point with r distance away from noise source, dB;

LAw refers to refers to A-weighted sound level of noise source, dB;

r refers to the distance between measured point and noise source, m;

ΔL refers to noise attenuation quantity caused by other factors; free noise field will take the value of 11 dB, while the semi-free noise field will take the value of 8dB.

Then, sound energy superposition will be used to calculate the noise level of forecast point:

$$L_{总} = 10\lg(\sum_{i=1}^{n} 10^{0.1Li})$$

In which, Ltotal refers to predicted sound level, dB;

Li refers to each superposition sound level, dB;

N refers to n nos. of sound pressure level;

(2) Impact analysis

1) Noise impact caused by operation of construction machinery

During the construction period, excavator, bulldozer, air compressor, vibrating tamper, and other construction machinery have a much larger noise impact scope, while water pump, loader and other construction machinery have a much less impact scope.

The impact scope of major construction machinery used during the construction period of bank protection works, such as excavator, bulldozer, and others, are as shown in Table 5.7-1.

Table 5.7-1 Noise impact prediction table of major construction machinery within construction area

Noise source	Source strength dB	Noise prediction value with different distances from noise source (dB)										
		10m	20m	30m	40m	50m	60m	70m	80m	90m	100m	150m
Excavator	84	70	64	60	58	56	54	53	52	51	50	46
Bulldozer	86	72	66	62	60	58	56	55	54	53	52	48
Loader	89	75	69	65	63	61	59	58	57	56	55	51

Table 5.7-2 Noise superposition prediction value of different construction machinery

Noise source	Source strength dB	Noise prediction value with different distances from noise source (dB)											
		10m	20m	30m	40m	50m	60m	70m	80m	90m	100m	150m	200m
Excavator & Bulldozer	88	74	68	64	62	60	58	57	56	55	54	50	48
Excavator & Loader	90	77	71	67	65	63	61	60	59	58	57	53	51

As per the analysis on calculation results provided in Table 5.7-1 & 5.7-2, the impact scope of individual construction machinery is about 60m. If different machineries will work simultaneously, the impact scope will be about 100m.

2) Noise within the construction area

As per the engineering machinery activities and construction strength, and predicted with the analogy of the actually measured values of each domestic navigation-power junction, the noise source strength within the construction area of dam body of Bazizui Navigation-Power Junction, is determined to be 97dB (A). With reference to the analysis of actually measured noise value of concrete system in Geheyan Navigation-Power Junction, the noise source strength of sand stone concrete system is determined to be 112dB (A), while the noise source strength of stone quarry excavation is determined to be 95dB (A). Besides, the noise source strength of waste disposal area, metal structure processing plant, and comprehensive processing plant shall be 85dB (A), 95dB (A), and 90dB (A) respectively.

Due to the relatively scattered distribution of each noise source, every system is considered as a point pollution source. It will be considered that all the equipment will work simultaneously. The prediction is made by adopting the non-directional point source geometric spreading attenuation mode. The prediction results are as shown in Table 5.7-3.

Table 5.7-3 Noise impact prediction table within construction area

Noise source	Source strength dB	Noise prediction value with different distances from noise source dB (A)							
		30m	50m	100m	130m	150m	200m	250m	300m
Sand stone material processing system	112	71	67	61	59	57	55	53	51
Concrete mixing system	104	63	59	53	51	49	47	45	43
Metal structure processing plant	95	54	50	44	42	40	38	36	34
Comprehensive processing plant	90	49	45	39	37	35	33	31	29
Main construction area	97	56	52	46	44	42	40	38	36

(3) Noise sensitive target impact prediction

The second level standard of Environmental Quality Standard for Noise (GB 3096-2008) shall be executed around the engineering construction area.

The construction site of Bazizui Navigation-Power Junction is selected at the river central island. The boundary of construction site is more than 200m away from the sound sensitive targets of both the left and right bank. Therefore, during the construction period, the fixed noise source will have less impact upon the surrounding noise sensitive targets.

5.7.2 Traffic noise impact prediction

The traffic noise mainly occurs along the construction road. When the day and night traffic flow is much lower, it is the disconnected noise. During the construction period of navigation-power junction, the traffic and transportation are dominated by the large heavy trucks. The vehicle types on the traffic main road vary slightly. It plans to adopt the road traffic transportation noise prediction mode recommended in Technical Guidelines for Noise Impact Assessment (HJ2.4-2009) to predict the construction road traffic noise during the construction period of this engineering. The prediction mode is as shown below:

$$L_{eq}(h)_i = \left(\overline{L_{0E}}\right)_i + 10\lg\frac{N_i}{V_i T} + 10\lg\left(\frac{7.5}{r}\right) + 10\lg\left(\frac{\psi_1 + \psi_2}{\pi}\right) + \Delta L - 16$$

In which, $L_{eq}(h)_i$ refers to hourly equivalent sound level of type i vehicle, dB(A);

$\left(\overline{L_{0E}}\right)_i$ refers to A-weighted sound level of type i vehicle, when its speed is Vi, while its horizontal distance is 7.5m, dB(A);

N_i refers to the mean hourly traffic flow of Vi passing through a certain prediction point at day and night, vehicle/ h;

r refers to the distance from C/L of lane to the prediction point, m;

Vi refers to the average speed of type i vehicle, km/h;

T refers to the time for calculation of equivalent sound level, 1h;

ψ_1 & ψ_2 refers to the aperture angle and radian from the prediction point to both ends of a limited section of road;

△L refers to the correction caused due to other factors, dB(A);

Most construction vehicles are large-sized vehicles. Therefore, the average radiation sound level of vehicles will adopt the following formula:

Large-sized vehicles: $\left(\overline{L_{0E}}\right)_i$ =22.0+36.32lgVH

As per the construction organization design, the engineering will arrange construction road No.1 on the left bank, construction road No.3 on the right bank, and construction road No.2 on the river central island. These roads will be used as the permanent junction road. All these three roads shall be widened to 7m. As per the experiences from similar navigation power junction works, the construction vehicles are dominated by heavy trucks. The running speed will be 40km/h in day time, and 20km/h at night time. The traffic flow shall be 30 vehicle/h in day time, and 20 vehicle/h at night time. The predicted impact scope of noise on both sides of the construction road is shown in Table 5.7-4.

Table 5.7-4 Predicted impact scope of noise on both sides of the construction road

Interval	Traffic flow (vehicle/h)	Speed (m)	Noise prediction value with different distances from noise source dB (A)							
			10 m	20 m	50 m	70 m	80 m	100 m	150 m	200 m
Day-time	30	40	62.5	59.5	55.5	54.0	53.5	52.5	50.7	49.5
Night-time	20	20	55.7	52.7	48.7	47.3	46.7	45.7	44.0	42.7

The 4a type standard limit (70db(A) at day time, and 55db(A) at night time) of Environmental Quality Standard for Noise (GB 3096-2008) shall be executed on both sides of the construction road. The prediction results show that there is basically no limit exceeding phenomenon 10m away from both sides of construction road at day time, and 15m away from both sides of construction road at night time.

The noise sensitive targets within the junction area are more than 20m away from the construction road, while the noise sensitive targets within the reservoir area are more than 20m away from the embankment and planned road. Therefore, traffic noise will basically not cause the limit exceeding phenomenon of noise sensitive targets within the junction area and reservoir area.

Therefore, during the construction period, noise monitoring shall be strengthened to the noise sensitive targets within the junction area and reservoir area. If any limit exceeding phenomenon is found, countermeasures shall be timely taken to reduce the noise.

5.7.3 Navigation channel noise prediction

As per the engineering feasibility study report, the representative ship type of navigation lock design of Bazizui Navigation-Power Junction will be 1000t power-driven vessel, and 2000t power-driven vessel is also taken account of. Most transportation ships within the navigation channel and navigation lock are power-driven vessels, adopting the diesel generator as power. Therefore, the engine noise will be the primary noise source. The noise source of navigation channel includes the point source noise caused when the ships are within the navigation lock, and the mobile noise source when the ships are in navigation channel. The navigation channel noise prediction mainly relates to the ship type, type flow, navigation speed, topography, and other factors.

(1) Noise prediction of navigation lock point source

The navigation lock in this engineering adopts the concentrated water retaining system layout form with local dispersion of lock cell water inlet, while the water delivery system inlet adopts the vertical multi-hole water inlet on the guide wall layout form. After entering into the lock cell from the short corridor at both sides of the upper lock head, the lateral multi-hole corridor connection will be found. The lateral multi-hole outlets will be arranged on both sides of the corridor. The lower lock head water outlet will adopt the multi-hole layout form on the sill. During the water retaining process, the noise is less. The gates of both upper and lower lock head will adopt the miter gate, which is operated by the horizontal hydraulic hoist located on the lock top. The gate operation will cause less noise, which can be neglected during noise prediction. The point source noise of the navigation lock mainly comes from the engine noise made when the ships are waiting in the navigation lock. As per the requirements of Regulation on Noise Levels on Board Inland Ships (GB5980-2004), the maximum noise limit value in the on-duty machinery control compartment of third type ship shall be 90dB(A).

As per the requirements of Technical Guidelines for Noise Impact Assessment, the following formula will be adopted to predict the noise of fixed noise source.

LA（r）＝LAw－20lg（r）—ΔL

In which, LA (r) refers to A-weighted sound level at the point with r distance away from noise source, dB;

LAw refers to refers to A-weighted sound level of noise source, dB;

r refers to the distance between measured point and noise source, m;

ΔL refers to noise attenuation quantity caused by other factors.

The maximum high noise value caused when the ships enters into or leaves the navigation lock cell at the medium speed, and the machinery control compartment door is open, is selected as per the ship noise source strength. Considering the attenuation caused due to the surrounding topography and other conditions, the navigation lock noise point source impact prediction model is adopted to calculate the noise value attenuated by distance, as shown in Table 5.7-5.

Table 5.7-5 Navigation lock point source noise attenuation prediction value

Distance to the bank/m	10	20	30	40	50	60	70	80	90	100	130	200
Prediction value/dB（A）	62	56	52	50	48	46	45	44	43	42	40	36

As shown in Table 5.7-10, first class standard can be achieved at a distance of 30m away from the approach channel of navigation lock at day time, and 80m away from the approach channel of navigation lock at night time. As per the overall layout plan of junction, the navigation lock in this engineering is divided into the Hushanzui navigation lock of east river at the right bank, and Mopiling navigation lock of west river at the right bank. The navigation locks are respectively arranged at the left bank of east river and left bank of West River. There are no noise sensitive targets within 100m scope along the navigation lock of east and West River. The ship point source will have less noise impact upon the surrounding environment.

(2) Noise impact prediction of ship noise mobile source within the navigation channel

As per the river reach navigation plan of Bazizui Navigation-Power Junction, the 1000t power-driven vessel will be adopted as the annual design representative ship type, during the operation period. With reference to the actually measured data of same class navigation channel, its sound exposure level will be about 75dB (A) at a distance of 20m, while the sound attenuation value will be about 70dB (A) at a distance of 30m, and 55dB (A) at a distance of

169m.

After the construction of Bazizui Navigation-Power Junction, the distance between the residents on both banks and the C/L of navigation channel will be more than 200m. Therefore, the noise impact scope of navigation ships is mainly on the Xinjiang River. Besides, the ships are navigating at a low speed before entering into or leaving the navigation lock. Therefore, the noise value is much less than at the higher navigation speed. Therefore, it will basically not cause the limit exceeding impact upon the residents living along the navigation channel.

5.8 Solid waste

5.8.1Solid waste impact during the construction period

During the construction period, this engineering will produce the engineering waste slag, building waste material, domestic wastes of construction personnel, and other solid wastes.

(1) Waste slag

This engineering totally produces 757.8 ×104 m3 of waste slag. The engineering designs 1 no. of waste disposal area (junction waste disposal area), which is located on the river central island under the dam site, with a total area of 245×104 m2. Its current ground elevation is 19.0m, while the filling height is 3.5m, which can accommodate all waste slag in this engineering.

During the unloading and transportation process of waste slag produced in construction period will cause the secondary dust, which will cause a certain impact upon the ambient air. At the entrance and exit of the construction site, the transportation trucks will easily take the aggradation to the road through tires, affecting the environmental health. During the construction period, if the abandoned soil and slag are not stockpiled as per the requirements, they will also cause impact upon the surrounding environment under the scouring of rainwater. During the construction period, feasible and practical measures shall be taken to prevent from water and soil loss, which can avoid or relieve the pollution caused by abandoned soil and slag, and also control the soil and water loss within the minimum scope, and gradually reduce its adverse impact.

(2) Construction waste material

The construction waste materials mainly include the small amount of crushed bricks, waste rock materials, cement blocks, concrete slag and others produced during the construction period, as well as partial waste rebar, and other building waste materials. Most of these waste materials are inorganic matters, and will cause less direct impact upon the water quality and ambient air quality. If not being timely removed and transported, they will cause impact upon the landscape, traffic and ambient air. Therefore, these construction waste materials shall be timely handled, and recycled during the construction process if possible. If they cannot be recycled, they shall be stockpiled in a centralized manner in the waste disposal area.

(3) Domestic waste

During the construction period, the average total number of construction personnel will be about 2060 persons, while the labors will be about 170 ×104 m3 working days. If the daily domestic waste produced by one person is 1.0kg, the construction personnel will produce 2.06t of domestic waste every day, while the total amount during the construction period will be about 1700t.

If the waste in this engineering will be freely littered, they will pollute the air within the construction camp, and also damage the beauty. Besides, under a certain weather conditions, they will also cause the breeding of mosquitoes, flies, and mouse, increase the illness spreading chances, and directly affect the health of construction personnel. Besides, it will also cause the adverse impact upon the engineering construction. Meanwhile, the construction area is close to Xinjiang River. Once the organic pollutants and germs of domestic waste enter into Xinjiang River through the surface runoff or other manners, they will pollute the water quality of Xinjiang River. Therefore, attention shall be paid to the domestic waste disposal matter.

5.8.2 Solid waste during the operation period

(1) Domestic waste of administrative staffs

As per the engineering feasibility study report, the administrative staffs within the operation period of Bazizui Navigation-Power Junction, will be 191 persons. If the domestic waste production will be 1.5kg / (person·d), the domestic waste quantity of administrative staffs will be 286.5kg/d, while the total annual amount will be 104.6t/a. Waste containers will be provided within the Junction area to collect the domestic wastes of administrative staffs, which will be uniformly collected and treated by office of environment and sanitation in Yugan County, causing less impact upon the surrounding environment.

(2) Domestic waste of ships

The domestic waste of ships within the navigation channel of reservoir area will be collected by the garbage collection facility provided by the ships, and then handed over to the environmental protection ships, or transferred to the garbage receiving and treatment plant nearby the wharf. It is strictly forbidden to freely litter the domestic waste within the reservoir area.

(3) Waste oil sludge and other dangerous waste

During the operation process of power station, it will produce 80kg/a (HW09) of waste oil sludge, while maintenance of motor will produce 200kg/a (HW09) of oil bearing waste liquid. Both the waste oil sludge and oil bearing waste liquid belong to dangerous waste, which shall be collected, and timely delivered to the unit with dangerous waste disposal qualification for treatment, while free treatment is not allowed.

5.9 Land acquisition and resettlement

5.9.1 Land acquisition and resettlement plan

(1) Production resettlement

This engineering does not involve the relocation, and not provide the immigrant resettlement area. The engineering totally acquire 1136.82 Mu farmlands, which belongs to state-owned lands, without calculating the production resettlement population. The permanently occupied lands of protective works temporarily will not calculate the production resettlement population. The total area of farmlands requiring calculating the production resettlement population (reservoir inundation area) is 52.11Mu farmland of Huangjinbu Town Zhuqiao Village. As per the calculation, in the planned target year, the production resettlement population is 86 persons.

(2) Special works rehabilitation (reconstruction) plan

The special works affected by the engineering include 2 nos. of ford, 3 nos. of wharf, 1.05km of 10kV power line, 2.23km of communication line, 1 no. of Meigang Hydrological Station, 1 no. of Daxi Gauging Station, and 20 nos. of Sluice gate.

As per the plan, 2 nos. of ford and 3 nos. of wharf inundated by the reservoir will be raised to the elevation of 19m. The relocation length for the 10kV power line will be 1.26km, while the relocation length for the communication line will be 2.68km. The Meigang Hydrological Station and Daxi Gauging Station will be reconstructed to restore their functions. The affected sluice gates will be comprehensively considered together with the anti-seepage and flood drainage, and inundation treatment, which are listed into the protective works design contents of reservoir area. As per the plan, there will be 1 no. of newly built sluice gate, and 11 nos. of reconstructed sluice gate. Besides, there will also be 9 nos. of newly built and reconstructed electrical pumping station, including 5 nos. at the left bank, and 4 nos. at the right bank.

5.9.2 Environmental rationality analysis of production resettlement

(1) Impact upon the bearing capacity of land and farmland resources

The production resettlement in this engineering will only involve 52.11Mu farmland in Huangjinbu Town Zhuqiao Village, while the production resettlement population is 86 persons in the planned target year.

The production resettlement immigrants in this project are resettled through the agricultural manner. The immigrant environmental capacity analysis scope is Huangjinbu Town Zhuqiao Village. The engineering will permanently occupy 52.11Mu farmland of Zhuqiao Village, accounting for 5.7% of its total farmland area of 908 Mu. Therefore, the occupation scale is less, which will cause less impact upon the local social environment, production and living. The immigrant production resettlement problem can be solved through the adjustment of the farmlands in this village. The production resettlement population in this project is 86 persons. However, 223 immigrants may be resettled through the adjustment of the farmlands in this village, which is 2.6 times of resettlement population, conforming to the requirements of production resettlement capacity in this project.

Table 5.9-1 Environmental Capacity Analysis

Item	Zhuqiao Village, Huangjinbu Town, Yugan County
Annual report agricultural population (Person)	1407
Annual report farmland area (Mu)	908
Per capita farmland (Mu/ person)	0.64
Acquired farmland (Mu)	52.11
Acquisition proportion	5.7%
Production resettlement population in reference year (Person)	82
Adjustable farmland area (Mu)	128.38
Resettlement standard (Mu/ person)	0.58
Resettlement capacity (Person)	223
Production resettlement population in target year (Person)	86
Times of environmental capacity	2.6

(2) Impact upon immigrant living standard

The farmland area acquired by the engineering, only accounts for 5.7% of Zhuqiao Village's total farmland area of 908 Mu. It is only a small scale. The per capita farmland of agricultural population only decreases 0.04Mu. The production resettlement plan is to give the direct reimbursement to the village collective that will make the uniform adjustment. After the immigrant resettlement, the per capita farmland decreases. However, after the embankment is newly built and strengthened, the anti-flood standard improves, and the construction of farmland water conservancy projects will become perfect in the planned target year. Besides, the crop plantation will be optimized, while the forest and fruit industry, aquaculture, village owned enterprise, catering industry, and commercial and trading industry, and others will take shape. The per capita net income of immigrants will steadily increase. Therefore, if the proper resettlement measures are taken, and the production and domestic facility construction of immigrant can be well solved, the living standards of immigrant will reach and even exceed the original level. Meanwhile, it will cause slight impact upon the production and living standards of the original residents in the resettlement area.

In summary, the production resettlement plan of this engineering is generally reasonable.

5.10 Accumulated environmental impact

The primary plan of Xinjiang high-grade navigation channel construction consists of 3 cascades and 4 junctions, namely, Jiebei-Bazizui (including Hushanzui and Bazizui), -Shuanggang. At present, Jiebei Junction is completed, while technical reconstruction will be carried out in future. Meanwhile, Bazizui Junction and Shuanggang Junction are carrying out the preliminary works.

As to the individual works, the cascade engineering construction is a short-term action, with less impact. However, when time goes by, some impacts will become more severe due to the accumulated impact. Due to the similarity of these cascades engineering, many same environmental impacts are shared by these cascade engineering, which will accumulate. The accumulated impact of the planned engineering and Xinjiang high-grade navigation channel cascade development are as shown in Table 5.10-1.

Table 5.10-1 Engineering Accumulated Impact Matrix Table

Engineering	Accumulated Impact		
	Impact Factor	Impact Nature	Impact Degree
Bazizui Navigation-Power Junction	Ecological Environment	terrestrial organism, aquatic organism, and local ecological system	Severe
	Surface Water Environment	Water quality	Slight
	River Hydrology	change of river flow regime, and sediment of mud and sand	Medium

5.10.1 River hydrology and mud & sand accumulated impact analysis

With the gradual construction of the planned junction engineering, the original natural rivers will be divided into several sections. Each section will become a channel shaped reservoir, with slow flow velocity and less water level amplitude variation. Besides, the river flow also has obvious variation, especially in dry season. The river can maintain an artificial designed flow, which is more than the flow of natural channel in dry season. As shown in individual planned junction, when the gate will be lifted to discharge the flood in flood season, most mud and sand will be taken away by the flood, but partial mud and sand still exist in the reservoir area. After the construction of multi-cascade, although the gate will be lifted to discharge the flood, due to the existence of gate in the flood channel, the flood discharge passageway will be blocked accordingly, which will intercept some mud and sand in the reservoir area.

Bazizui Navigation-Power Junction is the runoff engineering. It only has the daily regulation function to the runoff in dry season. The operation mechanism of Bazizui Hydropower Station basically adopts the power generation discharged flow of the upstream Jiebei Junction plus the regional flow as the power generation flow of Bazizui Hydropower Station. The construction of Bazizui Navigation-Power Junction will cause less impact upon the downstream hydrological regime. The entire cascade development will have much stronger regulation function towards the runoff. Therefore, its impact upon the Xinjiang River mainly refers to the impact caused by all the cascade development.

5.10.2 Surface water environment accumulated impact analysis

After the construction of each cascade junction engineering on the main stream of Xinjiang River, the water flow velocity of each river reach will be obviously slower than before, which will reduce the river water degradation ability to the pollutants, and further worsen the local water quality. The forecast of single junction also reflects this point. When the same amount of pollutants come to the river before and after junction construction, the water quality of the latter is worse than that of the former. However, after the completion of multi-cascade construction, the inflow water quality from the last cascade is worse, after the accumulation of each cascade, the downstream cascade water quality will be much worse than that of the last cascade. Therefore, cascade construction will cause obvious accumulated impact, obviously worsening the downstream water quality. Especially when the river reach is shorter, this impact will be more obvious.

5.10.3 Ecological environment accumulated impact analysis

1) Terrestrial organism

The inundation scope of Xinjiang River main stream cascade development reservoir will destroy the habitat of terrestrial organism, forcing them to resettle in high-water level area or locations far away from the reservoir area. This will narrow down the existence space of terrestrial animals. However, as to the terrestrial plants, due to the sudden change of terrestrial and aquatic environment, a large scale of terrestrial plants will disappear. The loss in quantity is huge. However, from the viewpoint of biological species, the endangered animals and plants are not found within the reservoir area. Therefore, the species population of terrestrial organism will not decrease.

2) Aquatic organism

Generally, cascade construction development will cause a certain impact upon the aquatic animals. The resistance of junction lock dam will cause impact upon two types of fish, namely, migratory fishes and fishes with larger activity space. As to the former, cascade blocks their migratory passageway, make them fail to migrate. As to the resistance of single dam, these fishes can find the suitable habitat in downstream. However, as to the multi-cascade construction, due to the longer length of involved river reaches, and the too larger distance between the first cascade and the last cascade, the environmental variation will be much larger, which will make it difficult for their existence, and gradually decrease their population.

The primary adverse impact of Navigation-Power Project refers to its impact upon the aquatic organism, especially the migratory fishes, semi-migratory fishes, and spawning field. The cascade construction will make the floating and semi-floating fish eggs flows into the static water much earlier during their floating and hatching process.

As to the algae that like the deep water and slow flow, after the implementation of each junction engineering plan, the water flow of each river reach will slow down, while the water depth will deepen, and river surface will widen, which will promote the growth of this type of algae. Meanwhile, due to the lowered degradation ability towards organism, the reservoir will provide more abundant food for the plankton and increase their breeding ability. Therefore, the quantity and species of plankton will rise.

5.10.4 Conclusion to accumulated impact

As per the analysis of the above accumulated impact of Bazizui Junction and cascade construction, the accumulated impact of single cascade construction is less. However, as to the construction of multi-cascade, due to the accumulation of same impact and accumulation with time, its impact is obvious. The adverse impact mainly includes the impact upon the aquatic organism, especially the migratory fishes, semi-migratory fishes, and spawning field. The cascade construction will make the floating and semi-floating fish eggs flows into the static water much earlier during their floating and hatching process, affecting their growth.

The engineering construction will improve the grade of Xinjiang River navigation channel, and promote the economic development on both banks of Xinjiang. However, there are also many adverse environmental impacts. Therefore, during the plan and construction period of each junction, single project impact will be fully considered. Meanwhile, the accumulated impact of multi-project shall also be considered, to draw on advantages and avoid disadvantages, reduce the adverse impact to the minimum.

6. Environmental Protection Measures

6.1 Water environment protection

6.1.1 Construction period

Water environment protection of Bazi Navigation Power Hub Construction period during the construction is mainly to the aggregate processing waste water, irrigation machinery vehicle washing waste water and sewage pit drainage and other production and living sewage waste water treatment, wastewater treatment implementation of "integrated waste water discharge standard" (GB8978-1996) standard, the main pollutant concentration of suspended solids is controlled below 70mg/L and the pH value controls within 6 ~ 9 or less, oil control under 5mg/L and BOD5 controls in 20mg/L and COD control under 100mg/L. Among them, the recycling rate of sand stone washing wastewater treatment is 100%.

6.1.1.1 Sand washing wastewater

（1）Treatment scale and tail water discharge

According to the construction organization design, the project with the aggregate processing system in an island in the construction area, the production capacity of aggregate processing system in 500t/h, then the aggregate processing system of flushing water is about 320m3/h, which is 7680m3/d, the main pollutants of suspended solids SS.

The discharge mode of sand stone washing wastewater is intermittent discharge, and the discharge amount fluctuates greatly. According to the composition analysis of sand and gravel yard, the gravel content is 0.2% to 1.5%, and the average value is 0.6%. Based on this calculation, the SS concentration of the washing system of the sand concrete system is between 5000~37500mg/L, averaging about 15000mg/L, and the concentration is relatively high. During the construction period, the sand and gravel system is running 14 hours a day, which runs in two shifts. After washing, the waste water is washed back to the aggregate processing system to achieve zero discharge.

（2）Program Comparison

In view of the characteristics of sand and stone processing system wastewater, 3 programs are selected for comparison.

Program 1：Coagulation sedimentation，The processing flow is shown in figure 6.1-1.The wastewater is precipitated with coagulants in the initial sink and two sink, and the suspended substance with a diameter less than 0.035mm can be precipitated rapidly because of the addition of coagulant.

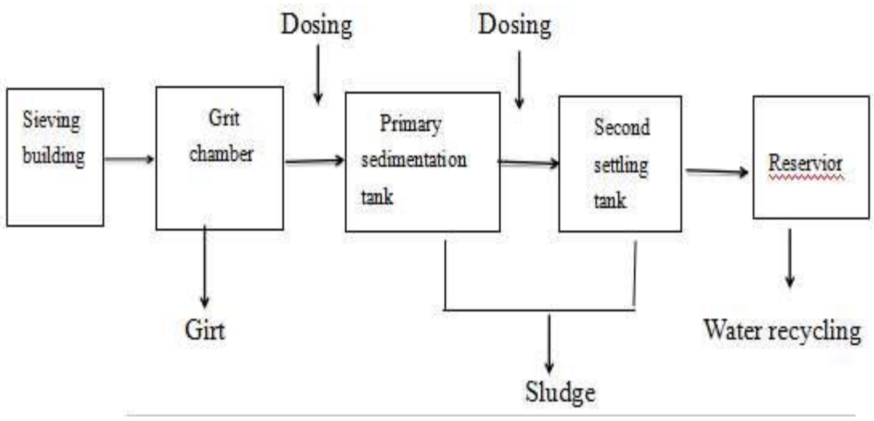


Figure 6.1-1 flow chart of coagulation sedimentation process

Program 2：Mechanical accelerated clarification method，The process is shown in figure 6.1-2.The mechanical acceleration clarification can combine the mixing pool and the sedimentation tank as a whole to save the space , less dosage of coagulant, and better treatment effect.

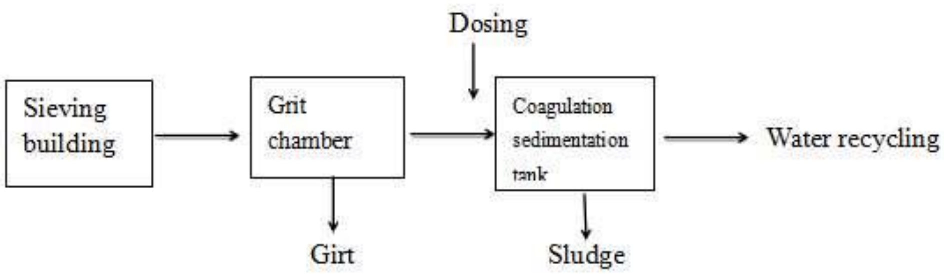


Figure 6.1-2 Mechanical accelerated clarification method

Program 3：high efficiency cyclone purification method.，The process is shown in figure 6.1-3。The technology utilizes combination and integration of new technologies to realize high-efficiency wastewater purification in multiple stages in a short period of time, with small area and good treatment effect. The wastewater can be treated once and achieved standardly, which is conducive to the resource utilization of wastewater.The program has the advantages of high efficiency, small area, fast sludge concentration, small equipment maintenance, low operation cost and unattended operation.Sewage SS can reach 5-70mg / L, due to the rapid purification of wastewater, effluent can be quickly reused, so as to achieve zero emissions. The Xiangjiaba hydropower station concrete system under construction adopts this method to treat the secondary screening wastewater, and the system runs stably, and the effluent can be steadily up to standard.

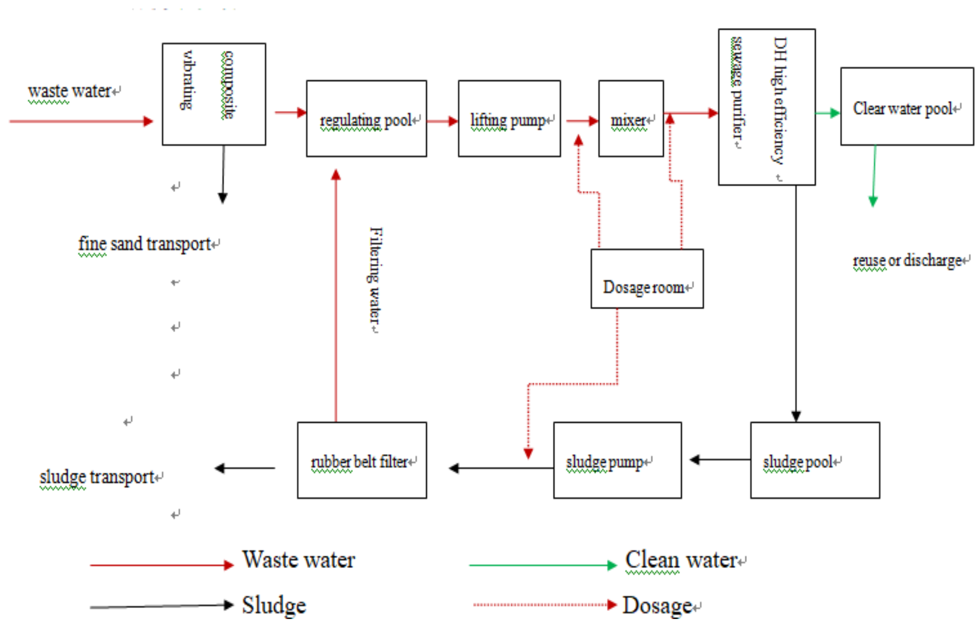


Figure 6.1-3 High efficiency cyclone purification method

Program 1 covers an area of large area, and the effect of treatment is difficult to be reused.; The area of Program 2 is less than Program 1, and the dosage of coagulant is small, but the cost of infrastructure, equipment and operation is higher than Program 1, and the operation and management is more complicated.; Program 3 covers the smallest area, stable water quality, easy operation and management, water can be quickly reused, to achieve zero emissions, but higher costs. According to the landform condition and wastewater characteristics of sand concrete system, following the concept of clean production and reclaimed water reuse, it is recommended that program 3 be used for washing waste water in this engineering.

（3）Recommended program design

①Wastewater treatment

Aggregate flushing wastewater generation is shown in Table 6.1-1。

Volume scale of wastewater Design and treatment: 320m3/h。

②Water quality

Water quality requirements SS：≤70mg/L

③process planning

High efficiency cyclone purification method consists of a dosing device, high efficiency cyclone purifier, coagulation mixer, wastewater pump, sludge pump, wastewater pretreatment device, belt conveyor, sludge tank, regulating tank, Rubber band filter and a set of electronic control system. The production wastewater firstly flows into the waste water pretreatment device through gravity flow to trap about 50% of the sludge in the wastewater, and the retained sludge is output to the sludge yard through the belt conveyer. The waste water from the wastewater pretreatment device overflows about 50% Of the sludge) to the regulation of the pool (designed to adjust the pool volume of about 1h of storage capacity, the use of mechanical stirring tank, to reduce the amount of manual cleaning), the wastewater pump upgrade to promote the efficient mixer, while mixing Coagulation mixer inlet pipe and outlet pipe were added coagulant and coagulant, waste water and pharmaceutical mixed with waste water to pump the power pump into the purifier, the flocculation reaction, centrifugal separation, gravity separation, sludge Concentration and other processes, the treated water from the top of the purifier flow into the pool, clear water pool can be used as process equipment for flushing water reuse.The treated sludge is filtered through a rubber belt filter to form a filter cake, which is transported to a sludge storage yard by a belt conveyor and cleaned regularly.

High efficiency cyclone purification method structure is shown in Figure 6.1-4.

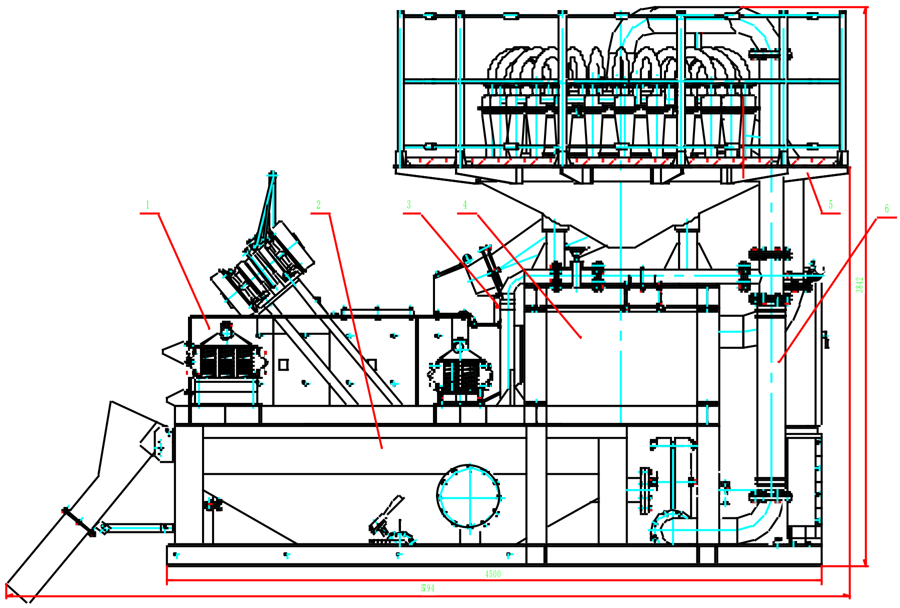


Figure 6.1-4 High efficiency cyclone purification method structure

（4）Sludge disposal

Aggregate flushing waste water treatment plant sludge transported to the nearest hub spoil yard, slag yard capacity to meet the corresponding sand aggregate processing system sludge storage requirements.

（5）Management and maintenance

①Strictly abide by the "Three Simultaneity" requirements, the construction and operation of wastewater treatment system as a contract clause into the project contract.

②Environmental management and environmental supervision departments shall regularly supervise and inspect the sand and gravel washing wastewater treatment plant, grasp the operation of the wastewater treatment plant and make oral and written comments on the rectification.

③The sand stone processing wastewater treatment system of workshop management staff of 4 people, 1 technician is responsible for the analysis and treatment effect monitoring, 1 mechanic is responsible for the mechanical equipment fault treatment and maintenance; 1 Instruments Division is responsible for the supervision and maintenance of instruments; 1 Electrical Division is responsible for management and maintenance of electrical equipment.

The management personnel should accept the pre-job special technical operation training of the equipment manufacturer, equipment manufacturers are responsible for the technical advice and Q & A .

The wastewater workshop should define a strict technical procedures, a clear scope of responsibility, management personnel must strictly abide by the rules of operation to punish illegal operations.

④The optimum dosage of coagulant is determined during the commissioning period to ensure the water quality to reach the standard and optimize the operation. Due to the high concentration of SS, large amount of water and large amount of sludge, the sewage sludge should be cleaned and treated in time.

（6）Analysis of treatment effect

Bazi Navigation Power Hub using high efficiency cyclone purification method can effectively remove sand and washing wastewater SS, effluent back to the aggregate flushing water and water spray dust.

The method covers a small area, good treatment effect, effluent can be stable compliance, high efficiency (wastewater treatment time will not exceed 30 minutes, the effluent can be reused)；The equipment has strong load resistance and can handle the wastewater with the concentration of 60000mg/L；The water treatment effect will not be affected Under the fluctuation of 120%；High automation, only regular inspection；The sludge is concentrated quickly, small amount of equipment maintenance, and the maintenance of the equipment is not necessary.

The process is short, the operation is stable and reliable, and the management operation is simple. The equipment operates safely and operates under no pressure state.；The water quality is stable, SS is less than 70mg/L, and no other backwashing procedures are required.The wastewater lifting pump and equipment discharge valve are made of wear-resistant material, long service life, stable and reliable.

6.1.1.2 foundation pit drainag

（1）Characteristics of wastewater

The drainage of foundation pit mainly consists of construction water such as precipitation, water seepage, concrete pouring and maintenance wastewater. The main pollutants are suspended solids, whose concentration is about 2000mg/L, pH9~11 is slightly alkaline.

（2）Scheme design

According to the implementation of the current domestic hydropower projects in dealing with the drainage of foundation pit, the sedimentation tank is generally placed in the foundation pit, flocculants and neutralizer are added to the foundation pit. After settling 4h, it is drained to the downstream water body. The sludge is regularly removed manually. The process is shown in Figure 6.1-5.This method only needs to add flocculant and neutralizer periodically to deal with the drainage of foundation pit, which is economical and can effectively reduce the concentration and alkalinity of the suspended matter in the drainage of the foundation pit. Due to the large amount of concrete curing wastewater contained in the drainage of foundation pit, to prevent desilting difficulty is increased because of the consolidation of concrete in sediment, the peak of concrete construction should be dredged once in 2 days and 3 to 5 days in off-peak period.

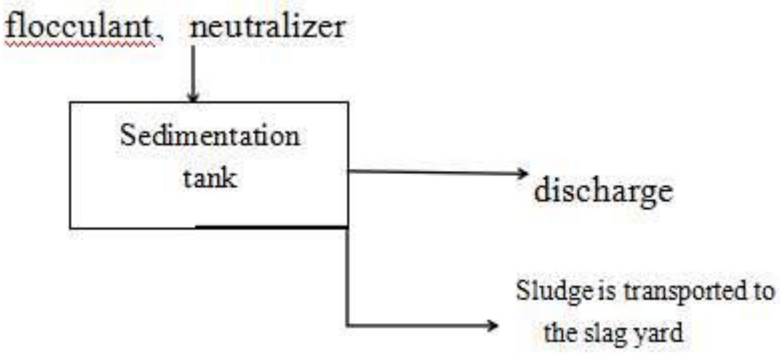


Figure 6.1-5 Design flow chart of drainage treatment of foundation pit

（3）Evaluation of treatment effect

The process is simple, the maintenance cost is low, and the drainage can meet the discharge standard after treatment.。

6.1.1.3 Treatment of wastewater from concrete tank

According to the design of construction organization, the wastewater from the left bank and right bank concrete system is about 32m3 every day. The construction area of the project about mixing system of bank aggregate processing system and concrete are arranged together, tank washing water and sand washing wastewater main pollutants are SS, the same as tank washing water quantity is small, can be transported to the tank washing wastewater by sand stone wastewater treatment system of flushing pipe together.

6.1.1.4 Treatment of mechanical oily wastewater

（1）Characteristics of wastewater

The project will set up machinery repair shop and mechanical parking lot. The mechanical oil-containing wastewater will be produced during mechanical repair and cleaning. The main pollutant is oil, with the concentration of about 30-150 mg / L, which has the characteristics of intermittent discharge. Therefore, it is not necessary to adopt Complex large-scale processing facilities, simple and effective processing is appropriate.

（2）Treatment scheme

According to the current construction of hydropower project on mechanical oil wastewater treatment implementation and effectiveness，this project machinery oil wastewater treatment program is：Drainage grooves are laid around mechanical repair shops and mechanical parking lots to collect construction machinery flushing wastewater. The oil filter tank is set at the end of the drainage ditch. The size of the oil filter pool is determined according to the mechanical washing water volume.The plastic ball is used as the filter material to separate the oil and water，and the mechanical flushing wastewater is used for water and dust reduction after precipitation and filtration. The treated oil contamination is returned to the qualified unit for recycling.

（3）Evaluation of treatment effect

After the oily wastewater of mechanical vehicle is treated by oil filter tank, the concentration of petroleum after effluent can be greatly reduced, which can be used for watering site and can meet the requirements of environmental protection.

6.1.1.5 Ship oil sewage treatment

The bilge oil from the construction ship shall be separated and returned to the oil-water separation plant provided by the ship, and the oil from the ship (HW08) and the oil-contaminated land (HW08) of the land-based machinery and equipment shall be recycled by a qualified unit.

6**.1.1.6 Domestic sewage treatment**

（1)）Characteristics of wastewater

The peak construction period

The number of people is 1,500. The main pollutants of domestic sewage of construction workers are COD, BOD5 and so on. The concentrations are about 300mg / L and 200mg / L, respectively.

During the construction period, considering the water consumption is 120L/ (human d), the amount of sewage is 80% of the amount of water used, then the daily discharge of domestic sewage is about 144m3 at the peak period of construction.

（2）Program comparison

——Program 1：Septic tank

Septic tank has low cost and low operation cost, easy to manage, but with poor effluent water quality,which is suitable for pretreatment of engineering and domestic sewage with small amount of sewage and low emission standards.——

——Program 2：Biogas pool for sewage purification

Domestic sewage purification digesters is a recent eco-type domestic sewage biochemical treatment technology. Domestic sewage purification Digester effluent quality indicators generally reach the first grade standard of the "Integrated Wastewater Discharge Standard" (GB8978-1996). The main features of this process are the flexible layout, low cost of construction and operation, the shortage is effluent water quality is not stable.

——Program3：Complete set of equipment for domestic sewage treatment

The domestic sewage treatment equipment has good effect in treating sewage. The quality of the effluent can reach GB8978-1996 first level standard. The main equipment is buried underground, and it can be used as greening land and parking lot on the ground.；The operation and maintenance of the equipment is convenient, long service life, continuous operation for more than 10 years. The shortage is that limited processing scale and high investment.The buried sewage treatment facilities are mainly applicable to the areas with small sewage and high requirements for the discharge of water after the treatment of sewage.

Program 1, Septic tank is low cost ,low operating cost ,but the treatment effect is relatively poor. Program 2, investment is less than Program 3, but the effluent water quality is not stable enough. There will be excessive situation.；Program 3, investment of complete set of equipment is the highest, but with high processing efficiency, small occupied area,simple operation , and can be used repeatedly. Considering the construction area is located in the rural areas, at the perspective of reducing the arable land occupation and the stability requirement of the effluent quality, recommend Program 3 for the construction of living camps and owners of domestic sewage treatment program.

（3）Process and design of recommended program

The domestic sewage treatment process in the construction area is shown in Figure 6.1-6。

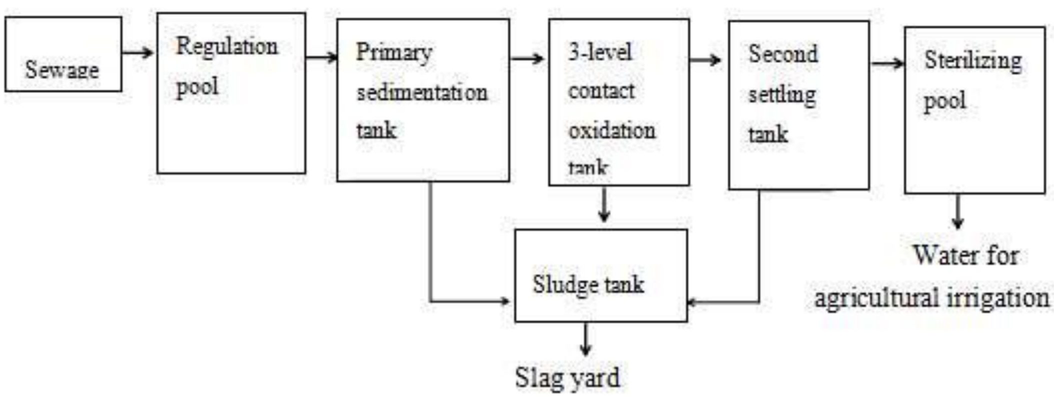


Figure 6.1-6 Flow chart of sewage treatment of Bazi Navigation Power Hub

①Preprocessing

Grille ditches：The grille ditches are determined according to the height of the sewage pipe, and the grille slag is cleaned regularly.

Regulation pool：The effective capacity of regulation tank is designed 6 times of the average capacity. And the built-in sewage pump and reflux measures are applied to ensure a certain rated flow rate to the sewage treatment equipment system, which is made of reinforced concrete.

Primary sedimentation pond：It is used to precipitate large particles and inorganic sundries, so as to ensure that the subsequent regulating tank and submersible sewage pump are not blocked by sludge and stuck, and prolong the service life of the submersible sewage pump。The design residence time is 1.5 hours, and made of reinforced concrete.

②Secondary treatment

Contact oxidation pond：After primary sedimentation , the sewage re-enters the contact oxidation pond. The oxidation pond is a multi-grid push flow type. The microorganisms attached to the packings in each grid are in an acclimatized state, and the biological phase and the load are suitable. The total residence time of 1.5h, air-water ratio of 1: 6, packing organic load: 2.7kgBOD5 / m3 • d.Second settling tank：Using a vertical flow sedimentation tank, the surface load is 1.0m3/m2.hr, and the precipitation time is 2 hours.

③Tertiary treatment

Sterilizing pool: Using solid chlorine tablets to dissolve the disinfected disinfectant method, the hydraulic retention time of the disinfection pool is 0.5 hours, and the effluent after disinfection can reach the standard discharge.

（4）Treatment effect and the water destination

According to the monitoring results, the complete equipment for domestic sewage can remove 80% -90% of BOD5 and COD and 70% -75% of SS, the indicators of effluent quality can be controlled at the following concentrations Value range: BOD5 ≤ 20mg / L, COD ≤ 60mg / L, SS ≤ 70 mg / L.

After the domestic sewage in the construction area is treated with complete sets of equipment, its effluent can be used for farmland irrigation, and also can be used as watering and dusting and greening water for construction roads.

6.1.1.7 Environmental Protection Measures Summary Of construction period

Table 6.1-1Summary of treatment measures for waste Water during Construction period of Bazui Navigation and Power Hub Project

The aggregate wastewater treatment measures during the construction are summarized in Table 6.1-1。 Project content	**Characteristic pollutants**	**Treatment measures**	**Number**	**Implementation site**	**discharge direction**
Sand washing wastewater	SS	high efficiency cyclone purification method	1	the sand and gravel system	Reuse, zero discharge
Drainage of foundation pit	SS、pH	Neutralize sedimentation tank	2	Within first phase cofferdam	Xin river
				Within second phase cofferdam	
Treatment of mechanical oily wastewater	Oil	simply filter pool	2	machinery repair shop	used for water and dust reduction，Do not discharge outside
				mechanical parking lot	
domestic sewage	BOD、COD	Complete set of equipment	2	Owners camp	Farmland irrigation / greening water
				Construction camp	

6.1.2 Water environment protection during operation

6.1.2.1 Management personnel domestic sewage and marine sewage

（1）Management personnel domestic sewage

There are fewer management staff in the operation of the Bazi Navigation Power Hub，base on 191 management personnel and water consumption 150L/ (human d), the sewage discharge amount is 80% of the water consumption, the discharge amount of domestic sewage is about 22.9m3/d during operation. The domestic sewage of the management staff shall be reused greening in the irrigation or hub management area after being treated by the complete set of domestic sewage treatment equipment. （2）Marine sewage

Domestic sewage comes from the daily life of the crew of the fleet, the discharge is small. The discharge of domestic sewage and bilge oil from ships in the waterway of the reservoir area shall not be allowed. The sewage from the ships shall be collected by domestic sewage collection devices and oil-water collection devices provided by the ship and shall be sent to the qualified terminals for recycling or environmental protection Receiving ship unified reception processing.

6.1.2.2 Protection measures for water environment in reservoir area

（1）Reservoir bottom cleaning

According to the workable report, no resettlement is involved in this project.reservoir bottom cleaning mainly sporadic fruit trees and the grave, but to prevent prevent the dissolution of organic matter and various harmful substances, it will become the secondary pollution source causing secondary pollution to the reservoir. Before impoundment, it is necessary to strictly abide by the requirements of clean-up of reservoir bottom and fully implement the clear work of all kinds of contaminants in the inundated area so as to prevent the deterioration of water quality in the early stage of reservoir impoundment.

（2）Pollution control measures in reservoir area

after the construction of the reservoir of Bazi Navigation Power Hub，The water environmental protection should be mainly to reduce the pollution load in the reservoir area. In addition to support the construction of wastewater treatment plants of the corresponding sizes and the corresponding sewer networks in the Yugan Industrial Park in the Huangjin Bund and reducing the discharge of pollutants in the Yugan Industrial Park in the Jinbu Bu depot, measures were taken to reduce pollutants in urban domestic sewage in the reservoir area, chemical fertilizers and pesticides Pollutants, livestock and aquaculture pollutants and rural life pollutants into the reservoir area is an important measure to protect the water quality of the Bazi Navigation Power Hub reservoir.

①Scientifically measure soil and fertilize, and reduce the load of pesticide and chemical fertilizer

Excessive reservoir area and irrational application of chemical fertilizer and pesticide is an important source of agricultural pollution.。It is suggested that the agricultural department in the reservoir area should test the soil physical and chemical properties of agricultural land and formulate scientific fertilization methods, based on the test and crop growth requirements to improve the pesticide fertilizer efficiency, control the loss of chemical pesticides and reduce the pollution load of the reservoir.

②Popularizing the use of biogas digesters to reduce the pollution of rural life

Meanwhile, combined with the migration and resettlement of Bazi Navigation Power Hub, the biogas pool will be constructed in the resettlement. In addition to solve the rural life of fuel, Biogas digesters can also reduce waste and sewage production to improve the environment, also biogas slurry and biogas residue can be used as fertilizer for recycling, it is multi-effects environmental protection measure.

③Promoting ecological agriculture

In the reservoir area, we should popularize the eco agriculture, extend the food chain of livestock breeding and aquaculture, and reduce the intermediate pollution links, such as livestock and poultry manure entering the biogas digester, biogas slurry for aquaculture, etc., and increase the intermediate utilization way, and reduce pollutants from livestock breeding and aquaculture into the reservoir.

（3）Protection measures for the protection areas of drinking water sources

During the construction period and the initial water storage, water intake in the reservoir area, setting up respectively a water quality monitoring section, regular sampling and monitoring of water quality at Daxi village tap water factory Shen Ling Yang BU Xiang resources tap water plant water intake, Huangjinbu Town Industrial Park tap water plant water intake, Mei Xiang middle tap water plant water intake port The monitoring results show that when the concentration of COD and SS in water continues to rise, it should be timely notified to stop the construction or storage of water.；

Once the monitoring results show that the water quality exceeds the standard, it should be immediately notified the water intake to strengthen monitoring and take appropriate measures to stop construction or water storage at the hub, analyze and solve the problems that cause excessive emissions, and make timely compensate the related waterworks for disposal.

Setting signs to remind the passing of ships to protect water sources in the reservoir area Daxi Township Shenling waterworks intake, Yangbu Township Caiyuan waterworks intake, gold Buzhen Industrial Park waterworks intake, Mei Gangxiang middle-aged waterworks intake and other drinking water intake and water Protected areas ; to remind the past vessels to enhance safety awareness; prohibit ships anchored in the drinking water source protection areas, barges.

6.1.3 Measures for protecting ecological flow

During the construction period, the water storage of the reservoir can be overflowing through the river directly. In the initial impoundment period, the discharge of the East River and West River can be controlled by the numbers and flow rate of Xiniiang West River Mopiling 20 hole sluice gates and XinJiang East river Huzui 12 sluice gates. The short time of water storage initially, no hydrological station near the downstream of the dam, and the change factors of the water level in the water storage period make it difficult to do on-site monitoring. In order to ensure the discharge to meet the downstream ecological flow requirements, before the storage water in the reservoir, the automatic online monitoring system should be built on Xinjiang East river Hushanzui Hub and Xinjiang West River Mopiling Hub respectively, then to ensure the ecological flow of 32.0m3/s of Xinjiang East river Hushanzui Hub and 35.6m3/s of Xinjiang West River Mopiling Hub.

On site of Xinjiang East river Hushanzui Hub and Xinjiang West River Mopiling Hub, Two turbines are installed respectively, The rated flow rate of single water turbine is 142.5m3/s and 178.1m3/s respectively, larger than the requirement of the ecological flow rate of 32.0m3/s of Xinjiang East river Hushanzui Hub and 35.6m3/s of Xinjiang West River Mopiling Hub. Therefore, the operation period, the requirement of ecological flow of Xinjiang Esat River and Xinjiang West River can be fulfilled by operating one turbine on Hushanzui hub and Mopiling Hub. When the water head is too low, the power plant can not generate electricity normally (because of the low water level caused by the water supply to the downstream), the ecological flow can be ensured by the opening numbers of discharge gates and adjusting flow rate of gate. 32.0m3/s of the ecological flow discharged for Xinjiang East Huzuishan Hub and 35.6m3/s of the ecological flow discharged for Xinjiang West River Mopiling Hub, can meet the needs of the downstream and water (including ecological water). The hub will set up a dispatching center to co-ordinate water for power generation, navigation, flood control, ecological and other water use. In the future, the optimal operation of the river basin should be strengthened to ensure the efficient operation of the high grade channel of Xinjiang, at the same time, the benefits of power generation, water supply, flood control and ecology are maximized.

6.2 Terrestrial ecological protection

6.2.1 Vegetation protection

(1) Strictly define the scope of construction activities, and strengthen management and supervision to reduce the destruction of land vegetation by construction activities.

(2) After the completion of the project, the vegetation restoration or reclamation of the temporary construction area and the vegetation disturbed area should be taken to minimize the adverse effects of construction land on plants.

(3) Strengthening ecological energy construction in rural emigrant resettlement area, application of marsh gas pool and orange bar gas making technology, Reducing the demand for vegetation in rural living energy.

(4) Ecological restoration scheme for temporary land occupation and construction sites: ① Take up the principle: In the construction of soil collection, the cultivated soil which can not be used for construction, should be piled up after the construction site is excavated, after the late completion of the project, used as a surface covering soil vegetation restoration and soil. ② Strengthening the field dynamic management of temporary occupying area, In particular, to avoid the enlargement of the disturbance area, the construction operation mode with partitioned segments is taken. At the same time, in order to ensure the stability of the slope of the site, the slope rate in controlled to combine the actual terrain. ③ Perfect site drainage facilities: The key part is a range of water retaining within the site outside the upper slope shoulder. At the same time, the water retaining ridge are arranged at the outer side of the drainage ditch interception for the water from the top to both sides then approaches to ditches or rivers. ④ The leveling of the site and the construction of the overlying soil, At the same time, in order to ensure the survival of greening plants in the later stage of vegetation restoration, the cultivated soil should be timely covered as the green surface soil after the site leveling treatment, and the thickness must be above 30 cm. ⑤ Vegetation restoration： In accordance with the local actual conditions, we should focus on ensuring the pertinence of vegetation restoration. We should take full consideration of site conditions, slope position, slope orientation and ecological characteristics in the selection of tree species for revegetation. We should select suitable native trees and grass species scientifically and rationally, and focus on evergreen and fast-growing priority trees, while paying attention to combination of trees and shrubs. ⑥ Strengthening the management of tending, After the restoration of the afforestation of the temporary land area and the construction sites, the nursing management should be strengthened in time.

(5) In the design stage, the occupancy of the land, such as the construction camp, the construction road, the material yard and the dumping ground, should also be considered in order to reduce the number of temporary occupancy, especially the amount of land occupied. The selection of construction camp should make use of the existing houses and sites on both sides of the embankment as far as possible, and strictly implement the measures of soil and water conservation.

(6) Before the construction of protection project, field lifting project, abandoned soil field, temporary construction site and so on should be protected by the fertile soil of the tillage layer so as to facilitate the greening of the site and the restoration of vegetation at the later stage of construction. During the excavation and clean-up, soil should be stripping and temporary storage at the same time of clearing vegetation on the soil surface. In the design documents, topsoil stripping, stockpiling and protection work according to the above principle should be presented or refined. and put forward the corresponding environmental protection requirements for the construction activities.

(7) Measures to restore and save arable land:

The layout of the construction camps in each unit is based on the principle of convenient construction. The construction camp is based on the near rental housing, reducing the temporary area and avoiding the occupation of cultivated land, Soil and water conservation measures should be strictly implemented during the construction process. After the completion of the project, all greening in the permanent land should be greening. The construction of temporary land should be given priority to rehabilitation, rehabilitation of vegetation restoration must be done.

6.2.2 Terrestrial animal protection

Strictly define the scope of the construction activities to reduce the destruction of the habitat of the wild animals by the construction activities. Strengthening the publicity and education of wildlife protection, and the awareness of wildlife protection in order to prevent the occurrence of wild animals and effectively protect wild animal resources.

6.2.3 Protection of ancient trees

(1) The overview of conservation measures for ancient trees

The protection of ancient trees mainly adopts the measures of tracking monitoring, in-situ protection and relocation protection to mitigate and avoid the impact of engineering construction on ancient trees.

1) **Tracking & monitoring**

In the outside of the reservoir area, the storage of the reservoir does not affect the effective root of the ancient tree. Generally, the reservoir can be tracked and monitored. If its growth is bad, the other protective measures will be taken in time.

i. **In-situ protection,**

The height difference of reservoir water level is greater than 1m and above, and no transplanting is carried out. According to the growth status of trees, it is needed to decide whether to take measures of rejuvenation. According to the nudity of the root system and the topographic and soil collapse conditions within 6m around the trunk, it is necessary to decide whether to recover soil and to protect the soil (retaining wall). When the height difference is 0.5~1m, the protection measures should be taken all in the place, such as masonry wall enclosure, the implementation of root pruning, fertilization, soil complex and so on.

ii. Ex-situ conservation

When the height difference is less than 0.5m, transplanting is carried out and a reasonable and comprehensive transplantation technique is adopted to improve the survival rate of transplantation.

（2）Protection measures of ancient trees in this project

According to the survey and analysis, 3 camphor ancient trees in this project are not within the scope of the reservoir inundation. The storage of the reservoir does not affect its effective root system, however, 3 camphor trees are close to the construction of protective embankment in the reservoir area. It is suggested that it should be protected and tracked and monitored so as to strengthen the management of personnel during the construction period.

If the construction site changes during the construction period, the ancient trees need to be transplanted in the scope of construction, the construction unit shall apply to the forestry and urban greening administrative department in accordance with the relevant provisions of the regulations on protection of ancient and famous trees in Jiangxi before the construction of the project. The first and two levels of protection of ancient trees and famous trees are transferred to the administrative departments of forestry and urban greening of the people's Government of Shangrao. Transfer three levels of protection of ancient trees and apply to the administrative departments of forestry and urban greening of the people's Government of Yugan County.

In the course of construction, it is suggested to take the management area of the project of the Bazizui navigation power project as the site for the transplantation of ancient trees. When implementing, the construction units should fully communicate with and consult with the Yugan County People's government and Shangrao Forestry Bureau, so as to determine the best place to transplant.

The main construction procedures and requirements for local protection and ex situ conservation of ancient trees are as follows:

i. In-situ protection

In the first year, to promote the growth of trees or tree rejuvenation, mainly includes: ① fertilizer: Combination of surface application, furrow and foliar spraying, ② Trunks inject active substances such as "tree power" or "plant vitality" to promote the growth of trees, ③ Prevent diseases and insect pests.

In the second years, cutting processing, In the trunk from about 5 m in the spring and autumn two section time circular furrow cutting, The depth of the ditch is 80 cm, and the incision is smooth. The large root of 5 cm is not broken but in the inner section of the ditch, the ringed skin is peeled, and the ABT rooting powder solution is irrigated after the backfill.

Third years, doing masonry retaining wall and pruning: the trunk as the center, to the section within the root groove outward 1m circular masonry retaining wall, The retaining wall is higher than the original ground 0.6~0.8 m (if the root of the tree is exposed to serious exposure is increased). Several PVC drainage pipes are evenly distributed at different heights around the retaining wall. Then fill in the retaining wall with 0.4~0.6 m planting soil and uniform 4~5 vertical ventilation pipe. Ventilation tube of 60~80 cm, a top 10 cm in soil.

Pruning on canopy from April to May in replanting year, the removal of dead and diseased branches, thinning dense branches, to retain the main retraction, To reduce the crown of the tree 1/3~1/2 and to sterilize the wound.

Every year, professional technicians regularly check the growth of trees and solve the problem in time. Every 2-3 years, to carry out fertilization treatment on trees, root.

ii. Ex-situ conservation

1) Time and place of transplantation

Try to choose at the end of February to mid March, cloudy or sunny weather, transplantation sites arranged in the right bank site owners in the camp.

2) Before transplantation rejuvenation measures

Root fertilization: early spring in the position of the tree crown drip line, ringed and fertilized, wide and deep 30~40cm, Each tree cake fertilizer 10~15 kg, compound fertilizer 3~5 kg, and soil mix backfill and soil compaction.

Foliar fertilization: April to June, foliar fertilization on canopy with high pressure sprayer, the concentration of urea 0.1%, KH2PO4 0.2%, once every half a month, alternating application.

Cleaning of tree holes and prevention and control of diseases and pests: If the local trunk rot, slightly dead phenomenon, the need for scraping rotten wood, with a wire brush or brush to clean up, and then use the water copper sulfate solution 0.3% spraying tree inside the cave 2 times at intervals of 30 min, coated with water tar (wood tar) antiseptic or polyamine and polysulfide sealant to repair the tree body after drying. It can also be filled with masonry and cement mortar directly. Some pest insects, such as moth moths or Stella, can be treated with dichlorvos or 4O% dimethoate oil and water with l000 times.

3) Root treatment

1 ~ 2 years before transplantation to root treatment, In the spring of first, the circle around the trunk was 2~3 times of the diameter of the tree diameter (about 100 to 220cm), and then the

circle was divided into four equal parts, Select two arc relatively, outward ditching deep ditch excavation, 70 ~ 120cm, and in section truncated root ditch, section hsiuping. A rough lateral root (above 5cm) without truncation but a ring peeling at the inner section, then the wound and girdling of root smear 0.1% NAA solution to soil compaction. In the autumn of the year or in the spring of the following year, the same method was used to break the roots and back to the earth at the other two arc circles.

4) Pruning and wound treatment

The first third years after the root treatment, transplantation is taken in the spring. It was pruned before transplantation, and the height of trunk is 6 ~ 8.1m, keep in different directions to extend the 3~5 main branches and a small amount of sub-branches, the length of main branches remains 1 ~ 1.8m, sub-branches of 0.5 to 1.3m, Cut rough branches to avoid splitting and trim the wound, then apply "wound patch", or "callus coating", etc.

5) Excavation and protection of roots

A circular trench is mined with a radius of 40~70cm from a tree trunk. The depth is below the main root distribution layer, usually 50~70cm. In the process of mining, in case of coarse roots with sawn cut should not be hard to shovel ripping, all have to mend the root section. The tree fell, as far as possible with the old territory (support, use wet sack and subsoil) and then use the rope wrapped package.

6) Shipments and trunk protection

The trunk and retention of the branch of dug camphor should be timely rope wingding, kept the wet straw tree in water as far as possible. At the same time prevent the damage of the bark at the time of loading and planting. Wound after loading the code and canopy cover.

In the process of shipment, attention should be paid to:

Spraying transpiration inhibitor to the tree body before loading to reduce the loss of water. ② To be bound and jute rope at the sling and ligation, and nail the guard plate, the center of gravity of the tree body at the bottom of the earth ball. ③ Fix the ball on both sides of the ball with a sandbag, contact the trunk with the soft material to prevent the wear of the bark and fix the trunk in the carriage. ④ Try to shorten transit time as far as possible.

7) Plant

The site of the transplant is as high as possible without water, but it is convenient for irrigation. Trees should be planted in a determinant way, with a good drainage ditch around it. The planting hole width and height is greater than the soil bulb above 20~30cm, base on the bottom of the first maturity.

First the root power or plant vitality and root rot is used to spray the roots and roots around the bottom and surrounding areas. (other water solution can be used as root water for irrigation too).

The tree is placed in the hole, the root is stretched, and then the planting soil is filled into the tree hole. Root gap should pay special attention to fill. To fill in half, gently lift the trunk or shaking, the planting soil and root contact, tamp after watering. After the water is completely infiltrated and then added to the soil, the cofferdam can be irrigated after the 10~15cm is added to the ground.

2)Later maintenance

Planted immediately after pouring, after 2~3 days after water second times, a week after the water third times, the soil moisture should be clear and do "after watering, dry and water again", timely infusion of tree body infusion at the end of the planting work. For trees above 5.0m higher than 5.0m, the drilled bag infusion in the trunk of the tree trunk is 2 ~ 2.5m. Other maintenance and management should be cooperated with the infusion of tree body.

In the summer high temperature season should also often to the tree and winding rope surrounding water, 4~5 times a day, prevent water from dropping water without water and preventing root accumulation. The summer temperature is high and the tree body transpiration is strong. In order to reduce the water loss of the tree body, the shade shed should be set up. Shed body must maintain a distance of more than 50cm and tree body, ensure the greenhouse air flow.

After planting, pay attention to the growth of the trees, check frequently, insist on preventing the main, do the prevention work. At the same time, diseases and pests should be prevented and treated. According to the characteristics of tree species and the law of disease and insect pests, it is necessary to prevent and cure the disease in time.

6.2.4 Protective measures for alien invasive plants

(1) Strengthen management to prevent the entry of invasive plants and prevent and control from the source. When soil is removed, the soil should be stripped and stored. For the areas with small white wine grass, Canadian yellow flower and other plants, mechanical clearance is carried out before taking soil.

(2) Strengthening vegetation restoration in secondary bare land, During the construction process, the vegetation on the ground of the ground and the lamp of the construction camp was destroyed. The bare land in the pioneer stage of natural succession tends to be easy for invasive plants to invade, and the vegetation should be restored to bare land in time.

(3) Selection of green grass species and tree species should choose native species, in greening, the native tree species with strong growth force can be used to form an ecological barrier to prevent the proliferation of invasive plants. At the same time, the old road as the construction road should be chosen, and the monitoring of the alien invasive plants should be strengthened.

6.3 Aquatic ecological protection

6.3.1 Fish artificial restocking

Fish artificial restocking is an important means to restore natural fishery resources. The planned artificial breeding seedling, Through the planned artificial breeding seedling, it can increase the number of low and young fishes in the fish population structure and expand the scale of the population and reserve sufficient breeding reserves to solve the problem of the shortage of natural fish resources. A multiplication station is a basic measure to solve the fish multiplication. the goals and the main task of the discharge station is to carry fish wild fishing, transportation, domestication, the implementation of artificial breeding and fry rearing. The fish artificial restocking of fish resources can reach the purpose of curbing the recession of the fish in Bazizui Navigation and Power Hub and the downstream of the dam.

6.3.2.1 Proliferating and releasing object

The principle of selection of proliferating and releasing objects is firstly to consider rare and endemic fish, Secondly, to consider the major economic fish affected by the construction of the project. From the point of view of importance, the selection is usually performed in the following order: Fish listed on the national or provincial list of protected animals, fish listed in the Red Book of Endangered Animals, endemic regional fish, key species in aquatic ecosystems, and important economic fish. From the point of view of the fish life history, the life history is complex, the migration distance is long, the breeding conditions are high, the growth and breeding are slow, the age of sexual maturity and the reproductive cycle, and the fish with low reproductive ability are preferred. From the technical point of view, the proliferative release should be carried out according to the principle of "easy first and then difficult", at the same time, according to the monitoring results of fish resources and the status of reservoir fish resources, the proliferating and releasing objects should be adjusted step by step.

Evaluation of the distribution of non-endemic fish in the river segment: The distribution of rare fish are Acipenser sinensis, Acipenser albino, shad, shad, cochineal fish, mandarin chuatsi and so on. The Chinese Sturgeon and Acipenser sinensis are protected wild animals in the first class of the country, and the cochineal fish are protected wild animals in the second class of the country. Cochineal Fish is the National Class II protected Wildlife. The Chinese Sturgeon, the White Sturgeon, the shad, the Shad, the cochineal Fish and the Siniperca Roul are listed in the Red Book of Endangered Animals in China.

Acipenser sinensis and Acipenser sinensis were found in the Xinjiang section of Poyang County, near the Poyang Lake region from 1954 to 1983, but in small numbers and relatively small individuals. Poyang County of Xinjiang was found no record of the above. According to the historical records of fishery station in Yujiang County, thousands of jins (half kg) of shad were captured in Yujiang County before 1980s, and the catch of cochineal fish was also high. However, since 1980s, no shad and cochineal have been collected during the investigation of fish resources in Xinjiang river. In the evaluation of the catch in recent years, Luciobrama microcephalus and the long body Siniperca Roul were rarely caught and almost extinct. To sum up, the rare fish, such as Chinese Sturgeon, White Sturgeon, Reeves shad and cochineal fish, have lost their distribution in the evaluation of the river segment, Luciobrama microcephalus and the long body of Siniperca Roul are basically hard to see.

Therefore, considering the distribution of species, the quantity and importance of the river in this section, and so on, the fish that need to be considered in order to determine the engineering proliferation and release are listed in Table 6.3-1:

Table 6.3-1 The Bazizui navigation and power hub gives priority to fish protection.

Type	Country/province level	China red list of endangered animal species of fish	Commercial fishes	Current situation and influence
Chinese Sturgeon	Country	danger		Historical record species, no longer distributed
White Sturgeon	Country	be in imminent danger		Same above
Hilsa Herring	Province	be in imminent danger		Historical record species, now largely extinct
Mullet		danger		Historical records, which are rarely distributed at present
Luciobrama microcephalus		danger		Same above
Siniperca Roul		danger		At present, the distribution is very small, and its habitat will be improved after the construction of the reservoir.
Four major Chinese carps			Yes	Laying drifted eggs and less habitat
Sharp			Yes	Same above
Ochetobius Elongatus			Yes	Same above
Bream			Yes	Same above
Squaliobarbus Curriculus			Yes	Same above

Chinese Sturgeon, White Sturgeon, Mullet, and Luciobrama microcephalus have basically no distribution in this section of the river. The resources of Siniperca Roul in this section are very limited, and the catch of wild parents is very limited. So far, no systematic research has been reported on the breeding technology of Siniperca Roul. The habitat will be improved after the construction of the project, so we can consider to carry out the multiplication and release according to the monitoring of further resources. The " Four major Chinese carps " is an important river - lake migratory economic fish in this section of the river, and the engineering barrier and the runoff of spawning grounds will have a great impact on the amount of resources. The artificial breeding technology of " Four major Chinese carps " has been very mature, and there is no technical difficulty in carrying out multiplication and releasing. Analogy of Jiangxi

Province Ganjiang River basin related cascade fish proliferation and release object is mainly four major Chinese carps principle. The selection of " Four major Chinese carps " in Bazizui Navigation and Power Hub meets the requirements of Water Ecological Protection measures in Environmental impact Assessment. Therefore, from the point of view of the restoration of fish population resources, the feasibility of proliferating and releasing technology and the overall plan of fish protection measures, the "four major Chinese carps" should be selected as the release species of the Bazizui navigation and power hub.

Sharp, Ochetobius Elongatus, Bream , Squaliobarbus Curriculus were affected by the project to a similar extent to the "four major Chinese carps ". The artificial breeding technology of Sharp is very mature , and the proliferation and discharge does not exist in the prior art , and the proliferation and discharge can be considered in the near term . Ochetobius Elongatus was once the main economic fish in the river segment in history. Recently, its resources are very small, it is very difficult to collect wild parent fish. Therefore, consideration could be given to proliferating and releasing based on further resource monitoring. To sum up, the project can be divided into short-term and long-term fish release planning, the short-term release object is considered as: Herring fish, grass carp, silver carp, bighead carp "four major Chinese carps " mainly, red-eyed trout, supplemented by bream. The long-term discharge object can be adjusted reasonably according to the monitoring situation.

6.3.2.2 Standard, size and specifications for Seedling release

(1) Standard for proliferation and release of seedlings

Referring to the "Management methods for Seedling species of Aquatic products", the young fish released must be the offspring of artificial breeding by wild parents, and the seeding species must be free of disability and disease, with a strong physique.

(2) Size and specification of proliferative discharge

Discharge scale: The size of proliferating and releasing scale is generally related to the target of proliferating and releasing, natural environment, hydroclimate, physical and chemical properties, and food biological resources. The present situation of fish resources, the characteristics of population structure, the biological characteristics of releasing objects, the size and quality of fish, the frequency and time of release are related. The proliferating and releasing protection measures implemented after the construction of the navigation and power hub project are compensatory discharge measures. Therefore, in addition to the above factors, the determination of the quantity of proliferating and releasing is closely related to the scope and extent of the impact of engineering construction and operation on fish resources. Due to the complexity of the factors to be considered in the determination of the quantity of proliferative discharge and the more uncertain factors, it is very difficult to determine the reasonable quantity of the open natural water body. So far, there is no uniform standard method.

According to the investigation of fishery resources, the area of water area and the relative empirical parameters of reservoir fishery productivity after the operation of the project, the scale of proliferation and discharge of other navigation and power hub projects is referred to. It was preliminarily determined that 3 million seedlings were released annually.

Discharge specification: The size of seeding seedlings has a great influence on the release effect. The seeding species are too small, the ability to resist the influence of the natural environment such as wind and waves is poor, the dynamic force is weak, and it is easy to be preyed by ferocious fish, so the survival rate is low, which directly affects the releasing effect. However, if the seeding is too big, more investment will be needed. Generally speaking, release species should be based on the scale of the formation period, this stage of the species of eye, fin, mouth and digestive tract functions have been fully formed, has been converted from endogenous nutrition to actively eat food from the outside. And formed their own way of life. At the same time, after the formation of scales, the various functions of the skin have been improved, the mucus secreted by the skin can reduce the resistance of the water to the fish body, and ensure the swimming speed of the fish body in the water. To make the fish more efficient prey and better escape from the prey of other fish; The mucus secreted by the skin forms a protective film in vitro, which can effectively resist the invasion of various bacteria in the water and maintain the health of the body. The mucus can also accelerate the sedimentation of suspended matter in the water around the fish body and maintain the stability of the water body in which it is located. In addition, during the scale forming stage, most of the pigments in the epidermal cells of fish were formed and adapted to the background of the water bodies, so that the fish could better hide themselves in the water environment, so that they could more effectively predation and avoid other fish's predation.

There is a strong seasonality in fishery production, and fish species have their stages and seasonality. The general fishery production is divided into "water flower", "summer flower", "winter film". "Water Flower" is a fish fry that does not feed; Summer Flower is a small species with just full scales; and "Winter Film" is a large size fish species that has been cultivated for one year. Their specifications are 0.8 cm, 1.0 cm, 3 cm, 8 cm, 10 cm, 15 cm, respectively. The determination of Seedling specifications should take into account the reality of Seedling production. According to the fishery production experience and the present situation of fish resources, the large and ferocious fish are few in the fish composition of this section. Therefore, the main fish release specification of this project is 3-8 cm species, which can meet the requirement of autumn release time. Some of the seedling species can be cultivated to the 1st instar fish with specifications of more than 15cm, and then released in the spring of the next year.

Discharge ratio: In the near future, the proportion of silver carp (30), bighead carp (30), grass carp (20), herring (10) and other economic fish (such as bareeyed trout, Heng, bream, carp, crucian carp, etc.) is controlled by 10%. It is necessary to evaluate the effect of multiplication and release, monitor and analyze the habitat conditions, fish resources and so on for future discharge ratio.

6.3.2.3 Discharge period and discharge region

Discharge period: from the year of diversion channel closure, the annual discharge period should choose spring, autumn two seasons.

Release area: fish release area is divided into reservoir area and three sections of Xinjiang east river, Xinjiang river, Xinjiang west river, and 60% of the total amount of fish released according to the reservoir area. 20% of the total amount of fish released from the Xinjiang East river and the Xinjiang West river under the dam. Among them, the main releasing areas of fish in the reservoir area can be selected in the waters of Kuwan, Baita River, a tributary, etc.

6.3.2.4 Construction scale of proliferating and releasing stations

Proliferating and releasing station is the basic measure to solve the problem of proliferating and releasing. The aim and main task of the station are to catch, transport and domesticate wild parents of fish; to carry out artificial breeding and seedling breeding; to provide seed species for release, etc. The proliferating and releasing station is arranged in the project management area, and the proliferating and releasing station should meet the requirements of fish breeding, hatching and breeding, including the fish pond and artificial hatching workshop. Nursery culture pool, production and living complex, factory road and other supporting facilities such as drainage canal and so on. According to the total amount of 3 million fish released each year, combined with the existing "four Chinese main carps" and other kinds of breeding and breeding technology, the size and composition of the proliferating and discharging station are planned and designed.

Proliferating and releasing station technological process

According to the existing breeding techniques of "four Chinese main carps ", the technological process of proliferating and releasing station mainly includes parent fish breeding, artificial procreation, fertilized egg hatching, seedling breeding and so on. Artificial hatching is used for large-scale propagation. The whole process of seedling production is shown in Fig. 6.3-1.

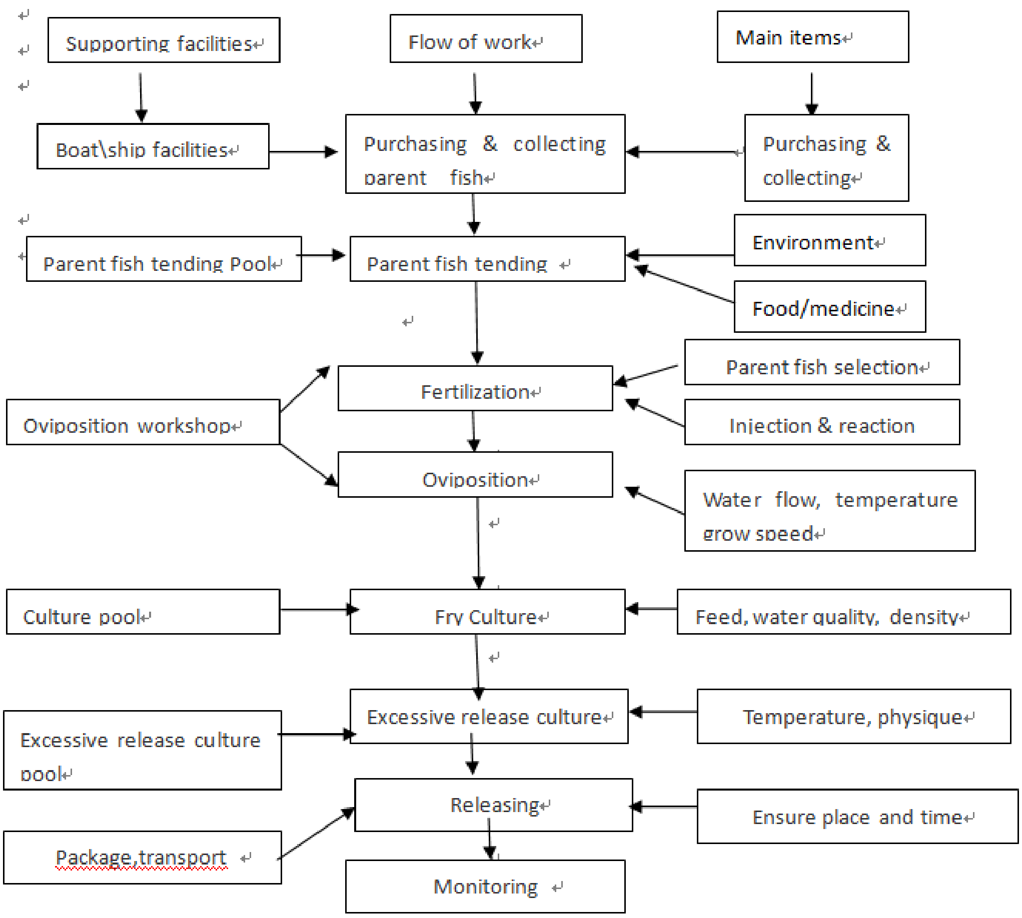


Fig. 6.3-1 production process of proliferating and releasing station

(1) Multiplication station scale

The proliferating and releasing station includes fish breeding pond, artificial induction and hatching workshop, seedling breeding pool, production and living complex building, factory road and drainage canal, etc. According to the requirement of 125kg / mu (667m2) for raising parent fish in the "four Chinese main carps " breeding pond, the yield of 500kg per mu in the seedling breeding pond of 10cm or so, and the demand of 500,000 seeds / m3 of hatching ring channel. The total area of the designed multiplication station is about 23.3 mu (see Table 6.3-2).

Table 6.3-2 content and scale of construction of proliferating station

Project	Square (mu)(667m2)
Fish pond	8
Fish fry breeding pond	12
Induction and incubation workshop	1.5
In-station roads and greening area	1.5
Production living area	0.3
Total	23.3

(2) The equipment to be equipped is pumping equipment, multi-function water quality analyzer, microscope, anatomical mirror, refrigerator, feed processing equipment, fish maintenance system, digital camera, camera, seeding transport vehicle (including water tank). Facilities such as SUVs to meet the needs of daily production of water quality monitoring, fish and seedling development observation, biological sampling and normal operation of proliferation stations.

(3) Before the completion of the second phase of the Bazizui Navigation and Power Project, the civil construction and installation of the equipment at the station will be completed. After the completion of civil engineering, the related multiplication technology is studied and the proliferating and releasing work is carried out. When the main project is completed, the proliferating station should give play to its function and be completed at the same time as the main project.

(4) The general layout of the proliferating discharge station is shown in figure 6.3-2.

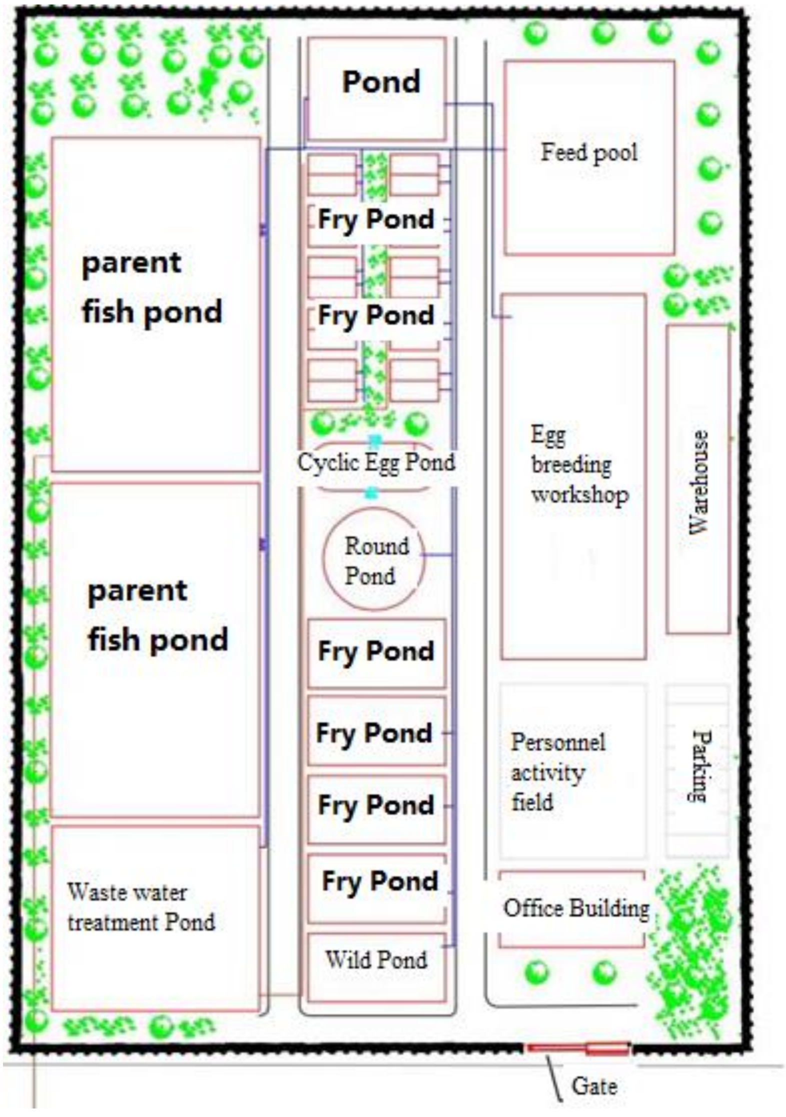


Fig. 6.3-2 schematic diagram of general layout of proliferating and releasing stations

6.3.2.5 Effect monitoring, operation management and supervision

In order to achieve the desired effect, the artificial multiplication and release of all species must be evaluated, that is, some or all markers or markers must be carried out for the artificial proliferation and release of all species. At the same time, artificial populations should establish genetic archives and monitor genetic diversity per generation. This part of the work should be undertaken by the corresponding scientific research units. The main contents of this work include: to study the marker releasing technology of fish and to establish high efficient marking techniques and methods suitable to the biological habits of released species; Carry out the research of marker discharge technology to obtain the best biological effect of artificial release methods, including the appropriate release specifications, quantity, location and timing, and so on. The effects of artificial release and proliferation is to be monitoring, a sample recovery and monitoring network is established, the behavioral ecological difference of artificial proliferating population, and the contribution rate to natural population, etc should be studied. the effect of proliferating and releasing is evaluated then to provide scientific basis for species protection decision.

The owner of the Bazizui navigation and power project is responsible for the management and operation of the artificial multiplication station of fish, equipped with sufficient technical strength, and strengthening the construction of business and management train. The relevant technical and scientific and technological projects are subject to project bidding, and the owner of the aviation and power hub shall contract out to the units with corresponding qualifications and capabilities to carry out the project. The related expenses shall be taken care of by the owner. The supervision work may be directly responsible by the environmental protection department.

6.3.3 Construction of fish facilities

The construction of water conservancy projects not only blocks the passage of the migratory fish, but also has a strong barrier effect on the semi-migratory fish and the non-migratory fish. Studies have shown that because of the dam barrier, the complete river environment is divided into different segments, and the fragmentation and fragmentation of fish habitat lead to the formation of heterogeneous populations of different sizes, and the gene exchange between populations is not possible. Reduce the genetic diversity of each population and increase the probability of population extinction.

According to Article 32th of Chapter 4th of the Fisheries Law of the people's Republic of China, "the construction of gates and dams in the migratory passage of fish, shrimp and crab will have a serious impact on fishery resources." The construction unit shall build fish facilities or take other remedial measures. "

On January 9th 2006, the General Office of the State Environmental Protection Administration issued the "letter on issuing the Summary of the Symposium on Water Environment and Aquatic Ecological Protection Technology of Hydropower and Water Conservancy Construction Project" No. Huan Office [2006]11 . The minutes of the meeting require that "in the rare and protected, unique, important economic value fish migration channel gate construction, dam building, must take fish measures." For the dam with lower water head and river sluice, it is advisable to build fish tunnel, fish ladder, sluice and other permanent fish crossing structures; "for large reservoirs of high dams, it is advisable to set up fish hoisting machines, equipped with fish pumps, fishing vessels, and artificial net fishing measures." After the construction of the Bazizui Navigation and Power Hub, the original hydrological conditions of the reservoir area and the lower part of the river will be changed, and the upstream channel of the migratory fish will be blocked, resulting in the fish habitat being broken and the exchange mechanism of the fish decreasing or disappearing. The construction of fish facilities is conducive to the completion of the life cycle of some fish, the migration of fish baits, the genetic exchange of fish in the upper and lower reaches of the dam, and the protection of biodiversity and genetic diversity of species in rivers.

6.3.3.1Comparison of fish crossing facilities

At present, the main ways of fish passing at home and abroad include sluice, hoist, collecting and transporting fish system, imitation natural passage, fish path and so on.

Sluice

The operation of the sluice is similar to that of the boat lock. The fish can cross the dam without going back to the dam by virtue of the rising water level in the lock chamber. The sluice is suitable for medium and high head dams. The advantage of the sluice is that it can maintain a certain water system connectivity, less land, less investment, fish do not need to overcome the flow resistance to be able to cross the dam. Its shortcoming is that the sluice can not go through the fish continuously, the engineering difficulty is big, need to carry on the mechanical operation, so the fish quantity is not much, in addition, need more mechanical and electrical equipment, the maintenance cost is higher. The history of the sluice is much shorter than the fishway. The disadvantage of the sluice is that it is only suitable for the hub with a small amount of fish.

Bazizui Navigation and Power Hub is a low head dam. If it is suitable for middle and high water head dam, its late operation economy will be poor. The main passage of the Bazizui navigation terminal is that the fish object is "four main Chinese carps " , the quantity of the fish passing is large , and the fish gate has a lower efficiency and can not meet the requirement of continuous fish passing through the fish object in the river .

Hoist

The fish hoist can be used to lift fish by mechanical and transport facilities, which can be used in high dam and large water level change hub fish, but also can be used for long distance transport fish, suitable for high dam crossing fish. This method has the characteristics of less investment, less occupation, good flexibility, and is convenient to arrange in the water conservancy project. It can catch the parent fish in the breeding season of the important fish and place them in the area suitable for life. The drawback is that the water system can not be connected, the fish can not be continuously crossed, and the transportation time is long, which is not conducive to a large number of fish crossing the dam, the structure of mechanical facilities is complex, the possibility of failure is great, and the running and management costs are on the high side.

Bazizui Navigation and Power Hub is a low water head dam. If it is suitable for the fish hoist with high dam and large water level fluctuation, its late operation economy will be poor. Bazizui navigation and electricity hub has strong swimming ability of fish object, more kinds of fish, larger number of fish, and lower efficiency of fish crossing machine, which can not maintain water system connectivity and continuous fish crossing. It can not satisfy the continuous fish demand of the fish object in this section of the river.

collecting and transporting fish system

The fish collecting and transporting system mainly includes fish collecting facilities and transportation facilities, its adaptability is wide, but it is mainly used for navigation high dam large storage. The scheme of fish collecting system can be used to realize the bidirectional crossing of the dam, and the project is not involved in the main project at the same time, the quantity of the project is relatively small, and the implementation of the scheme has strong maneuverability. The collecting and transporting fishing vessel is flexible and can vary the velocity of fishing in a wide range. It is suitable for the replacement of fish facilities in the hub with sluice. Its shortcoming is that the collecting and transporting fish system belongs to the transportation measure, can not pass the fish continuously, the operation management needs the specialized technical team, and is restricted greatly by the fish lure effect, especially the trap bottom fish is more difficult, the noise. Vibration and oil pollution also affect the fish collecting effect and can not keep the water system connected. The system of collecting and transporting fish is still in the research and groping stage in our country, and the owners' units and scientific research institutes are actively studying and practicing. The Research Institute of Water Engineering Ecology of the Chinese Academy of Water Resources of the Ministry of Water Resources is deeply studied in this field. The institute is carrying out the research and practice of collecting and transporting fish system at Pengshui Hydropower Station in Wujiang, and has achieved the results of stage research. The technical level is leading in China. The relevant experimental data of the collecting and transporting system are being tested, and it is expected that more obvious results will be obtained through further test and adjustment.

Bazizui navigation and power hub is equipped with sluice, channel navigation, with the use of the fishing system to collect fish over the conditions, but the collection of fish system is mainly used for navigation of the large dam. The system of collecting and transporting fish can not solve the problem of water system connectivity in the current reach. Bazizui navigation and power hub is a low-head dam, which has relatively strong new swimming ability, so other measures (such as fish track) which can keep the river channel connectivity are adopted.) will be more favorable to meet the need of fish crossing dam in the river segment. At the same time, if the collecting and transporting fish system is adopted, the economy will be poor in the later stage, and the trapping effect of the collecting and transporting fish system on these fishes will be poor, and the fish crossing efficiency will also be lower.

Imitation natural passage

The simulated natural passage is another form of the fish channel, which is constructed by simulating the shape and structure of the natural river to bypass the obstacles such as the dam. The characteristic of the simulated natural channel is to imitate the appearance of the natural river and take the form of the natural waterway. The aim of energy dissipation is to slow down the velocity of the flow through the friction of the obstacles formed by the accumulation of rocks at the bottom of the river. The Imitation -natural passage is mainly suitable for low-head dams. A common schematic diagram of natural channels is shown in figure 6.3-3.

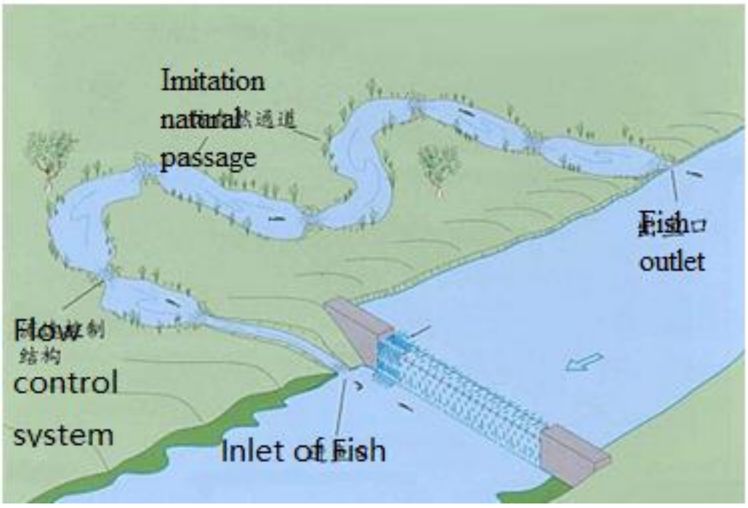


Fig. 6.3-3 schematic diagram of simulated natural channels

Similar to the artificial fish channel, there are also three types of commonly used structures in the imitation natural channel.

① Tiled stone type: the bottom of a natural passage is paved with stones of different sizes, with the aim of dissipating energy and reducing the velocity of flow along the bottom by friction. According to the size of the paving stones, there are two types of stones, as shown in Fig. 6.3-4.

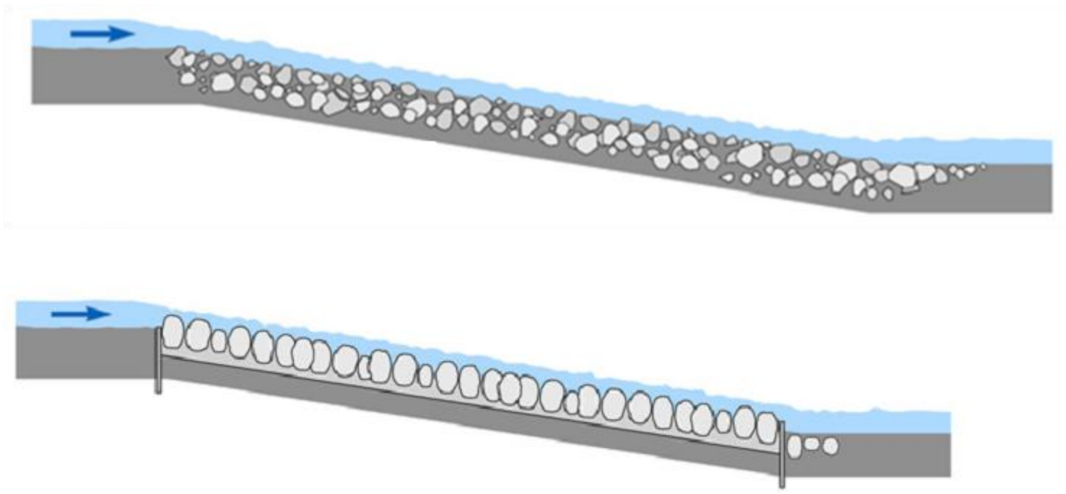


Fig. 6.3-4 A schematic diagram of two types of tiled stones mimicking natural passageways.

Staggered stone type: at the same time of laying broken stones at the bottom of the simulated natural passage, large stones are arranged in different places along the course, which narrow the section of water, resulting in local water fall and water flow hedging to eliminate energy and slow down the flow velocity. Figure 6.3-5.

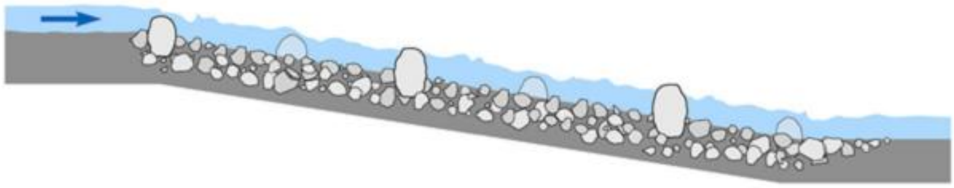


Fig. 6.3-5 staggered stone mimic natural passage diagram

Pool Weir: use stones to separate the passage into small pools in a simulated natural passage, dissipating energy through local water and reducing the flow rate, as shown in Fig. 6.3-6.

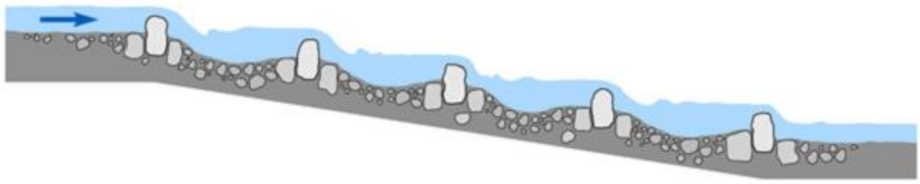


Fig. 6.3-6 Pond Weir mimic natural passage

The width of the simulated natural channel is 5 ~ 12 m. The length of tank is closely related to the energy dissipation effect of water flow and the rest conditions of fish. The longer pool room, the better the water flow condition, the bigger rest water area, the more favorable for the fish, At the same time, the larger the fish object is, the larger the length of the pond chamber should be. The length of the pond chamber is generally 715m, and the depth of the natural passage in foreign countries is generally 1.0 ~ 2.5m.

In order to overcome the water level difference and adjust the flow velocity and flow pattern, the simulated natural channel selects the appropriate position according to the form of the natural tributary of the general river, and sets the isolated stone, isolated island or part of the shoreline to the proper part of the river in order to overcome the difference of water level and adjust the flow velocity, etc. The minimum of each cross section is the velocity control section in the simulated natural passage, the drop of the control section is about 0.1 ~ 0.2m, and the longitudinal slope of the simulated natural passage is about 0.8%.

Take into account the need to set up a certain resting place on the way of fish upstream. In the simulated natural passage, the rest pool has no bottom slope, its shape is not fixed, it can be round or elliptical, the radius is not less than the length of the pond chamber, and it can be excavated according to the topography. The recess pool provides fish with temporary rest and recovery of physical strength, which is beneficial to the continuous upstream of fish. The requirement of fish entry and exit is higher in the mimic natural channel, so it is necessary to set up effective fishing inducement measures.

The effect of the fish passing through the simulated natural passage is better, and it can also provide a certain habitat for the fish. The main fish crossing object is the "four Chinese major carps" in the eight-character beak navigation and electricity hub. The individuals of these fishes are large, and they require high water flow conditions. If they are constructed to meet the simulated natural channels of these fish, the water flow conditions and the area of land will be large.

Fishway

By breaking the height of the crossing dam into a series of pools, the fish channel has a bayonet or a partition between which the adjacent ponds overflow through the surface or are located in the holes, grooves or seams on the partition plate. The pool has two functions: on the one hand, the flow is hedged and diffused to dissipate energy to improve the flow state and reduce the flow velocity; On the other hand, it also provides a place to rest for fish. According to the structure, the fish path can be divided into pond, slot and traverse (ladder fish lane).

The situation in which the pond fish channel is close to the natural channel, The rest conditions of fish in the pond are good, but the suitable water head is very small, the position in the plane is large, and the suitable terrain is required. At the same time, in the case of no bottom hole income, the main object of the fish crossing is the fish with certain jumping ability, and the fish crossing object is limited, while the bottom hole is easy to be blocked and the maintenance cost is high in the running of the fish tunnel with the opening of the bottom hole. Therefore, its practicability is limited to some extent.

The aqueduct is divided into two types: simple channel and Daniel type. Simple trough is a sink connecting upstream and downstream, which does not have any energy dissipation facilities, only by extending the flow path and groove roughness to eliminate energy, this type of fish channel slope is very slow, the length is very long, suitable water head is very small. Therefore, it is seldom used in practice. The Daniel type fish road is provided with a spaced baffle and baffle on the trough wall and bottom, which is generally suitable for stronger fish and places where the water level is not far from that of the water level.

The horizontal plate fish tunnel is used to divide the total water level of the upper and lower reaches of the fish track into many steps by using the horizontal diaphragm, and by using water cushion, friction along the course and the hedge of water flow, the energy is dissipated to achieve the requirements of improving the flow pattern and reducing the flow velocity through the fish hole. The water flow condition of the plate fish tunnel is easy to control and can be used in the place where the water level is large. The water pool at all levels is a good place for the fish to rest and the type and position of the fish hole can be adjusted. Size to adapt to the upstream requirements of different habits of fish, all fish adapted to it; Because of its simple structure and convenient maintenance, this type of fishway is mostly used in recent years. The plate fish track has been widely used in low head dam and has been successful in fish design and operation, and has relatively rich experience in the design and operation of fish track.

Plan comparison and selection

Fish Hoist, fish Sluice and fish collecting and transport system

The hoist, sluice and collecting and transporting fish system are mainly used in the large reservoir of high dam, to solve the problem of fish crossing when the dam body is too high, the water level is too large or can't meet the requirements of fish tunnel, imitation natural passage and so on. The common disadvantages of these three types of fish crossing facilities are that the operation period is expensive, the fish can not be crossed continuously, and the connectivity of the original reach can not be maintained.

Bazizui Navigation and Power Hub is a low-head dam with a maximum head of 5.64m and a minimum of 1.20m. It does not belong to a high dam. If a fish hoist, a sluice or a fish collecting system is used, the late operation economy will be poor. With the adoption of the above three fish measures , the water system connectivity and the over - fish continuity cannot be maintained , the follow - up operation efficiency is low , and the requirement on the continuous fish passing through the fish objects in the river section can not be met. Therefore, the use of the above three fish facilities is not recommended.

Imitation natural passage

From left to right, Bazizui Navigation and electricity Hub is followed by Mo Piling left bank earth dam, Mo Piling lock, Mo Pilling menku dam section, Mo Piling 20 hole discharge sluice, Mo piling riverbed workshop, and earth dam connection between the two hubs. Hushanzui Ship lock, Hushanzui Gate Dam Section, Hushanzui 12-hole sluice, Hushanzui River bed Workshop, Hushanzui right Bank Earth Dam. It is divided into the East river and west river of Xin Jiang, and the fish facilities should be set up in the east river of the Xin Jiang and the west river.

The area required for the simulated natural passage is large, while the left and right bank of the Bazizui Navigation and Power Hub is arranged as the levee of the Xinjiang River, and the central river center island is set up with the hub management area, and there is no suitable location for the arrangement of the simulated natural passage. Although the natural passage has a good effect, there are few examples in our country at present. The operation effect of this scheme is uncertain, and the later operation needs long-term maintenance and adjustment. Technical support is also weak.

Fishway

The fish track is widely used in the low head dam, and there have been successful cases of fish effect. It has relatively rich experience in the design and operation of the fish track. There are the following favorable factors for the layout of fish roads on this hub:

From the analysis of location of fishway, fishway space and ground is relatively small. Under the condition that the water flow on the left and right bank is restricted, the fish track can be arranged in the proper position of the dam body. If it is arranged in the normal discharge area next to the power station, this area can use the constant discharge water to form an effective fishing in come condition and improve the effect of fish crossing. In addition, due to the relatively small demand for space and venue for fish lane layout, local location adjustment has some flexibility. The fish inlet of the fish channel can be adjusted according to the water flow field condition of the dam in time. By changing the position of the fish inlet, the effective fishing flow condition can be used.

If the fishway is arranged between the power station and the earth-rock dam, there is no influence on the shiplock operation during the fish-crossing period, and there is no effect on the operation of the main project of the power station and the safety of flood control.

In conclusion, from the point of view of feasibility of engineering layout, there are obvious restrictions on the layout of the simulated natural passage, while the restriction of the layout of the fish-track scheme is less than that of the simulated natural passage. From the aspects of reliability and safety of engineering operation, such as the arrangement of simulated natural passage, there may be some problems affecting the operation of lock or the safety of flood control. From the aspects of operation effect and maneuverability, the fish tunnel scheme can use the constant discharge area beside the powerhouse of the dam site to form an effective fishing water flow condition, guide the fish into the fish tunnel, and ensure the fish effect. Besides, at present, there are few examples of simulated natural channels running in China, the technical support for adopting this scheme is also relatively weak, and the operation effect is uncertain. Therefore, considering the above factors fish facilities is recommended in the project of fish way scheme.

6.3.3.2 The feasibility of the construction of fish way

The research, design and construction of fishway have taken many years, some of which have good effect, and the technology of fish tunnel design is mature at present. The construction of fish roads in Europe has a history of more than 300 years, with regulations issued in 1662 by the province of Bearne, south-west of France. There were some simple tunnels at that time that required the passage of fish up and down the Weir dam. According to incomplete statistics, by the beginning of 1960s, the United States and Canada had more than 200 fish facilities, more than 100 fish facilities in Western Europe and more than 18 in the former Soviet Union. In the late last century, the number of fish lanes increased markedly, with nearly 400 in North America and more than 1,400 in Japan.

The history of the construction and research of the crossing road in China is relatively short, mainly from the end of 1950s to the beginning of 80s. In 1958, when the Qililong Hydropower Station of Fuchun River was planned and developed, the fish way was mentioned for the first time, and the ecological environment investigation and the scientific test of hydraulic model were carried out. In 1960, the newly opened fish road near Xingkai Lake, Heilongjiang Province was first built, the Li Yu Harbor Fish Road was built in 1962, and the Dafeng Dou Longgang Fish Road in Jiangsu Province was completed on 1966. The last century in 80s, habitat factors of fish and fish facilities were studied and have built more than 40 fish ways.

Since 21th century, with the development of water conservancy and hydropower resources in

China, the natural fishery resources have been degraded seriously, even endangering the rare and unique fish in the national nature reserve. The research and construction of fish-crossing facilities have been paid attention again. According to the relevant data statistics, in the fish crossing facilities built after 2000, the vertical severed fish road accounted for about 75%. The combination of holes and seams fish way had Changzhou, Lidi, Xijiang, Shihutang and so on, Simulated natural access to 15% of fish road built. A lot of fish facilities have been completed or are in the process of being planned and constructed. For example, fish road of Chaohu Lake in Anhui, fish road of Shangzhuang reservoir in Beijing, fish road of Shiquan River in Tibet, fish road of Laolongkou dam in Hunchun, Jilin Province, fish road of big sluice of Cao'e River, fish road of Pearl River Changzhou junction, fish road of small South China Sea of Yangtze River, etc. Especially in the Changzhou fish road, the width of the fish road is 5 m, the water head is more than 15 m, and the auxiliary facilities such as spraying and trapping fish and electric blocking and guiding fish are adopted. The preliminary operation shows that the effect of fish crossing is better. A total of 30 species of fish have been accumulated through the channel.

In addition, according to Jiangxi Province Ganjiang River cascade development of fish passage settings, Ganjiang River trunk has been completed Shihutang, Xiajiang hub, the construction of Jinggang Mountain, Xingan, Longtou Hill hub and other construction or planning for the construction of partition type fish road. The fish crossing facilities of the Bazizui Navigation and Power Hub are consistent with the development steps of the Ganjiang River main stream, and the relevant technologies can be shared during the operation. The existing problems, improvement schemes, fish trapping effects, fishing measures and other related achievements of the completed Shihutang, Xiajiang hub and the completed fish road can be used as technical references for Bazizui navigation and power hub. It is more helpful to ensure the effective operation of the project.

To sum up, the fish resources and their biological characteristics in the river reach were investigated by the Bazizui navigation and power hub owner, and the design parameters of the navigation and power hub project were discussed in order to design the fish channel. It can effectively reduce the barriers of dam construction on the river, and the communication between fish up and down. The construction of fish facilities is feasible.

6.3.3.3 Fishway design

(1) Fish

According to the field investigation and references, the main migratory fishes in Xinjiang River are herring fish, grass carp, silver carp and bighead carp, and other economic fishes, such as red-eyed trout, caterpillar, croaker, bream, etc. Therefore, after the completion of the Bazizui navigation and electricity hub, the main fish objects to be considered are herring fish, grass carp, silver carp, bighead carp, "four main Chinese carps" and red-eyed trout, caterpillar, croaker, bream and other economic fish.

（2） Season

The fish season mainly considered the breeding season of fish spawning objects, the earliest time of the main fish object in late March, the latest spawning time in mid July, taking into account the juvenile or adult and back down the river fish and other factors, to determine the time from March to August.

(5) The upstream and downstream water levels in the main fish channels during the fish season

The running water level of the upper and lower reaches of the fish channel has a direct impact on the proper conditions of the fish crossing in the fish crossing season. The fluctuation of the water level in the upper and lower reaches of the fish channel affect the flow conditions of fishway import and export surface convergence and pool room and prevent fish from reaching the outlet from entering the reservoir or from the fish near the downstream entrance. The design water level of the exit is 18.0m and the design water level of the entrance of the fishway , Mopiling is 14.64m (full operation) (13.85m)(one operation. Hushanzui is 14.91m (full operation) and 13.82m (one machine operation).

(6) Design velocity of fish channel diaphragm through fish hole

The design velocity of the fish tunnel refers to the maximum velocity of the fish tunnel diaphragm passing through the fish hole under the condition of the difference of the design water level. The factors influencing the design velocity are: fish object, geographical location, water flow condition of pond room, etc. According to the design parameters of "four Chinese main carps" and red-eyed trout, caterpillar, croaker , bream, etc. in our country and Jiangxi province. The design velocity of fish hole design is 0.7 m/s to 1.2 m/s.

(7) Fish lane layout design

The Mopiling Fish Road in the West River of Bazizui Navigation and Power Hub Project is located between the house of Mopiling Power Plant and the earth dam connected by the two hubs. The fish road of Hushanzui in the east river is arranged between the house of the Hushanzui power plant and the earth dam on the right bank. The two main entrances are arranged on the right side of the tailwater channel of the powerhouse and are connected to the fish collecting system arranged on the tail water platform of the power station. The upstream water enters the water supply system through a special water supply channel, and then enters the fish collecting system through the filling hole in the partition wall between the water supply system and the fish collecting system, and induces the fish by dropping water. There are four entry holes at different heights on the fish collection system to allow fish to enter. Fish that swim into the fish collection system and fish from the main entrance of the fish lane enter the fish path upstream through the rendezvous pool. Fish Road goes downstream along the right bank of the powerhouse tailwater channel and turns 90 °at the tail end of the retaining wall to the shore. The vertical dam axis passes through the earth dam, and the exit of Hushanzui and Mo Piling Fish Road are arranged at the upstream 350 m and 430 m upstream at the junction between the earth dam and the connecting section, respectively. The total length is 775 m and

850 m, respectively. It is far away from the inlet passage of the power station, and the velocity of flow is relatively small, so that the fish can continue to go back up.

In the selection of fishway, the recommended traverse type is recommended, and the design water level of the exit is 18.0m during the fishing season. The design water level of the entrance of the fishway is 14.64m(full operation) -13.85m(one machine operation) and 14.91m for the Hushanzi (one operation) and 13.82m (full operation). The design velocity of the fish duct partition through the fish hole is 0.7 m/s or 1.2 m/s. Total length of Fish Road is 850m (Mo Pi Ling / 775 m). The slope is 1 / 60, the width of the fish track is 3 m, the length of the pond is 3.6 m, and the water depth is designed 2 m. Rest ponds are set at the corners, the entrance elevation of the fish road is 11.8 m, the exit height is 16.0 m, the entrance and exit of the fish road are all equipped with overhaul gates, and the floodgates are set up at the place through the earth dam.

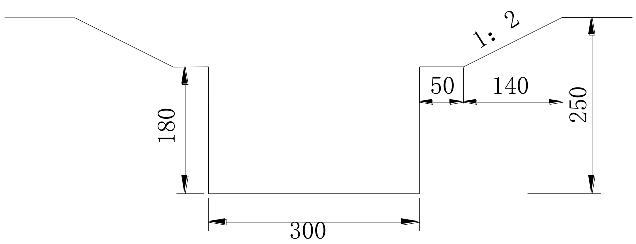
(8) Fish track structure design

1) Structure arrangement of fishway

Total length of Fish Road is 850m (Mo Pi Ling / 775 m). The slope is 1 / 60, the width of the fish track is 3 m, the length of the pond is 3.6 m, and the water depth is designed 2 m. Rest ponds are set at the corners, the entrance elevation of the fish road is 11.8 m, the exit height is 16.0 m, the entrance and exit of the fish road are all equipped with overhaul gates, and the floodgates are set up at the place through the earth dam.

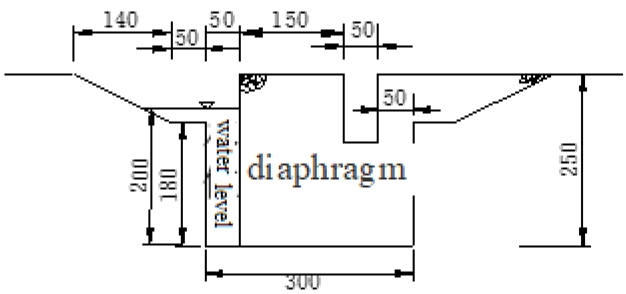
2) Fish channel section type

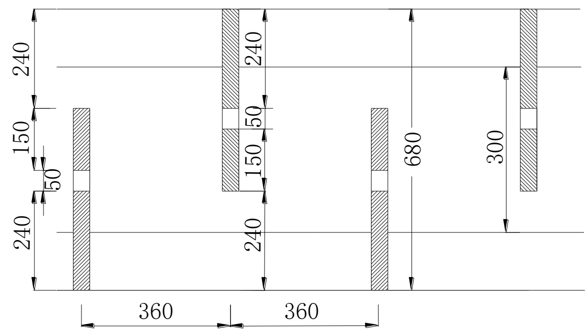
According to the comprehensive comparison of the habits, water level difference and water level variation of the main fish crossing objects (herring, grass carp, silver carp, bighead and shad), the bottom width of the fish channel is 3 m, and the side wall is 1.8 m high. Up 1: 2 slope is 0.7m high, so it is 2.5m high. The shape is as follows:



3)Type of diaphragm through fish hole

It is recommended to choose the combined diaphragm with vertical hole-slope hole on one side and overflow Weir hole on the other side.





The velocity values of the different parts of the fish hole in the combined diaphragm can vary greatly. The fish passage has more objects and different specifications. This continuous variation of water flow conditions provides a very good condition for fish with different swimming ability.

(9) Model test

Because of the complexity of fishway design, the next step should be combined with the model test to do further research.

1) By simulating the environmental flow field of the upstream and downstream of the hub, the water flow conditions suitable for fish migration and convergence in the upstream and downstream of the hub are understood, and the location of the entrance and exit of the fish channel is determined.
2) In order to find out the swimming ability of the over-designed fish, the experiment was carried out to provide the basis for the selection of the design velocity of the fish channel.
3) Through the study of the velocity and flow pattern of the entrance of the fishway and the chamber of the pond, the length, the bottom slope and the shape of the transverse baffle of the fish tunnel crossing the fish pond and the rest pond are determined, which provides the basis for the optimum design of the structure.

6.3.3.4 Fishway operation management

After the completion of the construction of the fish tunnel and before it is formally operated, it is necessary to conduct a trial operation to monitor the flow velocity, water depth, inlet velocity of the fish crossing facilities, and other important indicators. If the situation is found to be unfavorable to the fish, the structure of the fish should be modified and perfected immediately to create the best fish crossing conditions. Due to the change of water level on the upstream and downstream, the influent and operation water level of the fishing facilities is needed to control, so as to keep the flow and flow pattern in the channel stable and meet the requirements of fish tracking. Under various water level conditions, the water intake of the fish channel can be controlled through the opening and closing of the upstream working gate. The overwater area of the fishway entrance is controlled by the opening and closing degree of the downstream entrance overhaul gate to avoid the flow velocity of the fishway inlet is not too small.

After the fish tunnel is put into operation, it is necessary to monitor the effect of fish crossing, and the monitoring cost is included in the operation cost of the power station. At the same time, it is necessary to strengthen the repair and maintenance of fish roads. Many fish crossing facilities are abandoned because of poor management or inadequate late maintenance. Runtime management needs to pay attention to the following aspects: ① Fishing and dumping of wastes and sewage in fish channels are strictly prohibited, ② It is strictly prohibited to dock ships and dump waste and sewage at the exit of the passage. ③ Often check the gate valve machine hoist, to ensure that it can be opened and closed at any time ④ Often clear the passage of floating objects, prevent blockage; ⑤Regularly clear the silt or mollusk shells in the passage to ensure the smooth flow inside the passage ⑥ Scrub the observation window of the observation room at any time to maintain a certain degree of transparency⑦ All observation instruments and equipment should be moisture-proof and ready for use.

6.3.4 Habitat restoration

In the reservoir area and Zhuqiao River, the Baita River used as a substitute for habitat, artificial fish nests are set up in the reservoir area, and seeds of the aquatic plants such as Hydraria, goldfish, black algae and so on are planted in shallow water areas with water depth less than 2m. Speed up the recovery of aquatic plants in the reservoir area. In addition, some other octopus plants seeds can be sown, such as cattail, water oat, silvergrass, etc. The spread area is 15 mu(667m2/mu).

6.3.5 Carrying out Monitoring and Research on Aquatic Ecology

(1) Aquatic ecological monitoring

The monitoring of habitat environment, aquatic organisms, fish and fish crossing facilities is described in section 8.3.4.3.

(2) Research on aquatic ecological science

At present, fish resources are relatively abundant, and it is necessary to carry out relevant research in order to effectively protect and utilize their fish resources. Aquatic ecological scientific research can be carried out in the following areas:

① Study on the effect of hub operation on fish;

②Research on reservoir ecological regulation technology for fish natural reproduction;

③ study on the marker of proliferating and releasing fish and its effect evaluation technique;

④study on the variation of fish population in reservoir.

6.3.6 Preventive and protective measures

(1) Strengthen propaganda, draw up ecological environment protection manual, set up aquatic organism protection warning sign, in engineering construction and operation and other links should seriously consider and correctly treat the resources and environment factors. Adhere to the principle of "three simultaneous" between engineering construction and resource protection measures, strengthen the management of construction personnel, and prohibit any fishing activities in the construction area.

(2) To establish a timely rescue mechanism for fish. Catch fish in cofferdam in time, store or release fish temporarily, arrange the storage period of sluice rationally, avoid the main breeding period of fish as far as possible; During the initial period of water storage, the amount of water in the reach under the dam will be reduced, and measures should be taken to increase the discharge of water at the initial stage of storage and prolong the time of initial storage, so as to slow down the effect of initial storage on fish.

(3) Strengthen fishery administration management. The engineering environmental management department should actively assist the local fishery administration department to do well the protection and propaganda work of fish in the reservoir area and under the dam, strengthen the law enforcement, strengthen the patrol and inspection, strictly prohibit the explosion and electricity. Illegal fishing activities such as poisonous fish.

6.4 Ambient air protection

(1) Design criteria

The ambient air quality in the construction area was controlled according to the second class standard (GB3095-2012). Implementation of the second Class Standard of Integrated Atmospheric Pollutant Emission by Construction waste Gas GB16267-1996. Emission limits and Measurement methods for Diesel engine exhaust pollutants for Off-Road moving Machinery (China Stage I Ⅱ) > GB20891-2007)) for all fuel machinery and vehicle exhaust emissions. and the Standard of Emission of Atmospheric Pollutant transported by gasoline (GB20951-2007).

(2) Sensitive point protection

Arrange the route of construction vehicle reasonably, avoid the residents' concentration area as far as possible, and set up deceleration sign in the section of centralized residents' concentration area; Near the dam site, near the construction road, near Waixiong village, Bucun village, Songfang Liujia road and other residential areas, as well as protection areas near residential areas should be set up temporary sound barrier. Increase the frequency of sprinkling, reduce the environmental air impact of construction.

(3) Earth-rock excavation

In the period of earthwork excavation, during the non-rainy days sprinkler measures (mainly for excavation, slag, loading site) is applied to reduce the construction site dust. Sprinkler frequency and water consumption are determined according to the weather and dust generation.

(4) Concrete mixing dust

In the production of concrete mixing building, the dust emission concentration should be controlled within the standard specified in the Integrated Emission Standard for Atmospheric pollutants (GB16297-1996). For the concrete mixing building, the dust removal facilities should be operated at the same time as the mixing building, and the maintenance of the dust collector should be strengthened to make it always in good working condition.

(5) Dust prevention during transportation

Care should be taken to prevent air pollution during the transportation of materials. When loading dusty materials, the materials should be wetted properly or covered with canvas, Tanks carrying bulk cement vehicles should be kept in good sealed condition and often cleaned. In the section with sensitive points, the speed should be reduced, and the speed should not exceed 30 km/h to reduce the amount of dust.

The construction area is equipped with a sprinkler to sprinkle water and remove dust on a non-rainy day. The main sprinkler road is the approach road with high traffic and close to the centralized residential area. Sprinkler frequency and water consumption are determined according to the weather conditions and road dust generation, important main roads not less than 3 times a day sprinkle water. The contractor should strengthen the maintenance of the construction road within the scope of responsibility, and determine that the special personnel shall be responsible for the timely cleaning of the residual soil on the road surface, so as to keep the road clean and in good condition.

(6) Dustproof when material accumulates

In the process of soil material accumulation, the angle of the pile slope should not be too large, and the dump site should be tamped in time; the bulk cement should be avoided as far as possible from being stacked in the open air. Sunny and windy weather should properly humidify the soil temporarily stacked in the open air to reduce the amount of dust generated by wind.

(7) Waste gas control of fuel construction machinery

Strengthen the management of large-scale construction machinery and vehicles. Implementation of the I/M system (i.e. periodic inspection and maintenance system). Contractor all fuel machinery and vehicle exhaust emissions shall be subject to the emission limits and measurement methods for diesel engines for off-road moving machinery (China Stage I II) (GB20891-2007) and the Standard for the discharge of Air pollutants from gasoline Transport, GB20951-2007. If the tail gas can not reach the standard discharge, the smoke and dust removal equipment must be equipped, and the construction machinery uses high quality fuel at the same time. Strict implementation of the "in-use vehicle scrapping standards", the implementation of mandatory updating of the scrapping system. Especially for the old vehicles which consume more fuel, have low efficiency and exhaust emissions exceed the standard seriously, it should be renewed.

6.5 Noise Environment

(1) Design standard

Noise belongs to the instantaneous impact, while the sound energy will not accumulate with time. Therefore, the control target of noise environmental protection is to ensure that noise environment quality will conform to the regional environmental requirements. The noise impact of engineering upon the surrounding sensitive targets mainly concentrates in construction period, while the impact duration will be within 2-4 years within the construction period. At the end of engineering construction, noise impact will also disappear.

The noise control around the construction site shall execute the requirements of Emission Standard of Environment Noise for Boundary of Construction Site (GB12523-2011), while the engineering involved residential area shall execute the second level standard of Environmental Quality Standard for Noise (GB3096-2008). The noise at day time and night time shall be controlled within 60dB(A) and 50dB(A).

(2) Protective plan

1) Traffic noise control

At present, the countermeasures for traffic noise pollution will generally adopt three manners, namely, the noise source control, noise transmission route, and noise receiving point protection. The noise source control road will adopt the low noise pavement, set the speed control signs, and adopt other measures. The noise transmission route control will set the noise barrier, plant the greening belt, and adopt other measures. The noise receiving point protection will set the sound insulation window, and adopt the environmental protection resettlement, and other measures. The comparison results of normal noise reduction measures are as shown in Table 6.5-1.

Table 6.5-1 The comparison results of normal noise reduction measures

Measure Name	Major Applicable Scope	Effect	Advantage	Disadvantage	Whether to adopt
Modified asphalt pavement	Sensitive targets where the noise is 3～6dB more than the standard value, and permanent road	The noise will be about 3dB less than that of the ordinary pavement	It will only apply to the road itself, and will cause no impact upon the surrounding landscapes.	The investment is much higher.	All the road in this project belong to the construction road. Therefore, it will not be adopted.
Set the speed control and No honking	Sensitive targets where the noise exceeds the standard	3～5dB	Investment will basically not increase, but the	It applies to sensitive targets where the noise exceeds the	Adopt

signs	value for no more than 3dB.		driving safety will increase.	standard value for no more than 3dB.	
Acoustic ventilation window	Sensitive targets that are distributed dispersively, with more noise than the standard value.	10～15dB	The effects are better, while the cost is medium, and application is much stronger.	It is more difficult to be implemented, compared with noise barrier.	In this engineering, residents live in a much more concentrated manner. Therefore, it will not be adopted.
Noise barrier	The concentrated sensitive targets with more exceeding noise, and less distance to the road.	15～20dB	The effect is better, while it is easy to implement, and with more benefited population.	The investment is much higher, which will have impact upon the landscape, and cause troubles for the daily life of residents.	Adopt
Noise reduction forest	The concentrated villages with less exceeding noise, and plantation conditions	About 5dB（30m forest belt）	It can also purify the air, beautify the road, and improve the ecological environment.	It will spend a much longer period to achiever the target effect, while the investment will be much higher, and its application is restricted.	Due to the tense land use in this project. It will not be adopted.
Environmental protection resettlement	Individual residential area where the noise greatly exceeds the standard value.	Good	Completely eliminate the noise impact.	The cost is much higher, while it will also cause impact upon the residential life.	This project has no seriously exceeding limit resident. Therefore, it will not be adopted.

As to each sensitive target in the noise impact forecast, the construction production facilities are arranged on the river central island, with a distance of more than 200m than the sensitive targets. Therefore, the noise sensitive targets are mainly affected by the traffic noise of construction road. After comprehensively considering the economic, technical, topographical, and other factors, the following noise control measures and requirements are taken for the exceeding limit sensitive targets:

① When the vehicles run into the construction road, they shall reduce the velocity and not use the high - pitched horn. The hourly speed within the construction area shall be controlled within 25km/ h. At the sensitive target section of construction road No.1 and 3 within the construction area, and the road intersections of construction areas, the warning sign and speed control sign shall be respectively provided, reminding the outside personnel and local residents entering into the construction area to notice the traffic safety and self-protection, protecting the safety of construction personnel and local residents.

② The traffic transportation management shall be strengthened for road accessible to the construction site. In order to prevent the traffic noise on the road from disturbing the nearby residents at night time during the operation period (mainly occurred when the external materials enters into the construction area), the traffic control shall be conducted during the engineering construction period. The large-and-medium-sized vehicles are strictly prohibited from entering to the construction road at night. Meanwhile, the small-sized vehicles will be controlled to enter into the construction road as per the design speed (40km/h at day time, and 30km/h at night time), and traffic flow.

③ The road maintenance during operation period and the vehicle maintenance shall be strengthened to reduce the noise source.

④ The used vehicles must conform to the requirements of Limits of Noise Emitted by Stationary Road Vehicles (GB16170-1996), and Allowable Noise Limits for Motor Vehicle (GB1495-79), and try to select the low noise vehicles.

⑤ The construction fences combined with noise barrier countermeasures shall be taken to reduce the noise at the residential concentration area nearby the primary construction road No.1 &No.3, and construction roads within the reservoir area.

3) Noise control within construction area

The batching plant of concrete batching system, air compressor, cooling compressor and other workshops shall try to use the multi-hole noise absorption material to establish the noise insulation screen, hood, and room. As per the actual measured results in the ▽98.7 batching plant of the Three Gorges Project, the actual measured noise is 93～97 dB(A), before the countermeasure is taken. The actual measured noise is 71～75 dB(A), after the countermeasure is taken. Therefore, the noise reduction effect is obvious. Within the boundary scope of construction plant and warehouse, the machinery equipment with more noise will be arranged at the side which is far away from the residential area and construction camp. Meanwhile, the other side adjacent to the residential area and construction camp shall be used to store the materials and equipment.

4) Construction management measures

① Prior to the construction, during the engineering bidding period, the management measures of building construction noise shall be listed as the construction organization design contents, while the engineering construction period shall be scientifically regulated. Prior to the start of engineering, the building construction site noise application and registration procedures must be handled at the local environmental protection bureau where the engineering is located.

② The environmental protection plate of the construction site shall be hanged at the eye-catching locations of the construction site, indicating the field environmental protection director and field telephone number, to facilitate the public supervision. During the construction process, the building construction noises emitted towards the surroundings shall conform to the national emission standards.

③ As to the construction around the residential area, medical area, and scientific and cultural district, and other noise sensitive target concentration area, it must control the operation time, and prohibit the strong noise operation at night (22:00 pm to 6:00am of next day). As to the continuous operation at night due to the construction process requirements or special requirements, the application must be raised in advance. It shall not be implemented until the application is approved by the local district environmental protection burea.

④ The artificial noise shall be strictly controlled. None shall be allowed to shout, beating the template without reason, and whistle. Besides, the use of loud voice horn is restricted. In this manner, the noise disturbance act will be reduced at most.

⑤ The low noise construction machinery or the machinery equipped with the noise reduction devices shall be selected if possible. The strong noise construction machinery on the construction site (such as mixer, electrical saw, grinding machine, and others) shall be provided with the enclosed workshop, to prevent from the noise transmission.

⑥ The finished product, semi-finished product and manufacturing operation (such as prefabricated structure, wood door and window, and etc.) involved with the strong noise, shall be finished in factory and workshop if possible, reducing the occurrence of noise due to the processing and fabrication on the construction site.

⑦ During the construction noise management process, the combined prevention and treatment, and prevention dominance principle shall be stuck to. The propaganda and education of relevant environmental protection policies and laws towards the construction unit shall be strengthened. The environmental protection awareness of construction enterprise shall also be improved. Therefore, they will adopt every possible noise reduction measure during the works, consciously treat the noise, and reduce the construction noise pollution to the minimum level.

⑧ The noise monitoring during the construction period shall be strengthened, especially to the sensitive targets around the construction road No.1 & No.3 within the junction area. During the construction period, triple monitoring shall be made every year. Once the noise exceeding phenomenon is found, treatment shall be carried out timely.

5) Navigation channel noise protection

① The ship management shall be strengthened. As to the ships whose equipment noise cannot conform to the inspection requirements, they shall be prohibited from entering into the navigation channel to carry out the transportation activities. Besides, the ship traffic noise impact upon the normal production and living of residents living along the navigation channel shall be reduced to the minimum level.

② The greening shall be carried out to reduce the noise. The engineering provides the embankment reinforcement engineering on the left and right bank above the Xinjiang River dam site. The protection forest shall be planted as per the embankment’s actual conditions. Meanwhile, the implementation of greening engineering around the reservoir shall be strengthened, to reduce the ship noise impact.

③ At the approach channel of dam upstream and downstream of navigation lock, 2 nos. of No horn signs shall be provided separately, with 4 nos. in total, to restrict the sudden high noise occurring in the navigation channel.

6.6 Solid waste treatment

6.6.1 Solid waste treatment during the construction period

(1) Waste slag

This engineering totally produces 757.8 ×104 m3 of waste slag. The engineering designs 1 no. of waste disposal area (junction waste disposal area), which is located on the river central island under the dam site, with a total area of 245×104 m2. Its current ground elevation is 19.0m, while the filling height is 3.5m, which can accommodate all waste slag in this engineering.

(2) Domestic waste

The special enclosed garbage container shall be provided on the site of engineering construction area. Yugan county environmental and hygiene management office will uniformly collect the domestic waste within the construction area and client camp, and transport to the Yugan county urban domestic waste hygiene landfill for filling treatment.

(3) Waste cleaning at the reservoir bottom

During the reservoir bottom cleaning process, the woods shall be recycled at most. The building waste removed from the building and structures shall be transported to the Wanan county urban domestic waste hygiene landfill for filling treatment. If they are close to the waste disposal area, they shall be transported to the waste disposal area.

Prior to water retaining, the engineering must strictly follow the requirements of reservoir bottom cleaning regulations, fully implement the removal works of all sorts of pollutants within the inundation area, to prevent from the occurrence of water quality worsening phenomenon during the initial water retaining stage.

6.6.2 Solid waste treatment during the operation period

(1) Domestic waste of administrative staffs

Waste containers will be provided within the Junction area to collect the domestic wastes of administrative staffs, which will be uniformly collected and treated by office of environment and sanitation in Yugan County, causing less impact upon the surrounding environment.

(2) Domestic waste of ships

The domestic waste of ships within the navigation channel of reservoir area will be collected by the garbage collection facility provided by the ships, and then handed over to the environmental protection ships, or transferred to the garbage receiving and treatment plant nearby the wharf. It is strictly forbidden to freely litter the domestic waste within the reservoir area.

(3) Waste oil sludge and other dangerous waste

During the operation process of power station, it will produce 80kg/a (HW09) of waste oil sludge, while maintenance of motor will produce 200kg/a (HW09) of oil bearing waste liquid. Both the waste oil sludge and oil bearing waste liquid belong to dangerous waste, which shall be collected, and timely delivered to the unit with dangerous waste disposal qualification for treatment, while free treatment is not allowed.

6.7 Ground water environment protection

(1) In order to reduce the dam area and reservoir area seepage and inundation impact, the plan and design in the engineering feasibility report will provide the embankment anti-inundation and anti-seepage treatment for 11 nos. of embankments where inundation will be likely to occur, such as Daxiwei embankment, Duanjiahuwei embankment, Jinbuwei embankment, Zinianwei embankment, Zhoujianongwei embankment, Shawowei embankment, Zijiangwei embankment, Hegangwei embankment, Shixiangwei embankment, Zhuqiaowei embankment, Tuanhu Farmland embankment. The embankment vertical anti-seepage will adopt the water injection method to build the concrete anti-seepage wall, while the pressure relief well and seepage interception ditch shall be provided behind the embankment. Farmland raise protection measures are taken for the 4 nos. of much lower low-lying land, such as Yangbuwei, Hebu, Pingshangwei, and Zhuqiaowei. As to the 9 nos. of drainage area within the reservoir area which cannot be treated with local farmland raise method, will be treated with the electrical pumping station drainage plan. In order to reduce the waterlogging impact within the reservoir area, the new water gate will be built, while the sluice gate which cannot conform to the drainage design requirements shall be rechecked and redesigned.

(2) The engineering design will take the slope protection, off-load, treatment, reconstruction and necessary plant protection and other countermeasures to protect the embankment slope where the damage may occur (such as collapse and landslide).

(3) In order to better protect the ground water resources, the ground water quality damaged by the emergency accidents shall be avoided if possible. It shall formulate the ground water risk accident emergency plan, and take the enclosure, interception and other measures at the upstream sewage seepage point of the reservoir, to collectively collect and treat the sewage, and prevent the sewage from entering into the reservoir, and spreading to pollute the ground water.

(4) During the operation period of reservoir, the entire year observation of ground water level and quality around the reservoir shall be performed. Once any problem is found, measures shall be timely taken.

(5) During the next-phase design process, detailed inundation impact research and study shall be made for each protection zone. Besides, the engineering design shall be detailed as per the research and study stage, while the layout of electrical pumping station, water gate and other engineering measures shall be optimized, and the farmland raise scope and height shall be reasonably determined, so as to reduce the engineering inundation impact to the minimum level.

6.8 Reservoir inundation environmental protection measures

6.8.1 Production resettlement and special works reconstruction environmental protection measures

The engineering totally acquire 1136.82 Mu farmlands, including 1084.71Mu of state-owned lands and 52.11Mu of Huangjinbu Town Zhuqiao Village. It does not involve the immigrant, and not provide the immigrant resettlement area. In the planned target year, there will be 86 persons of production resettlement population. The special works rehabilitation (reconstruction) plan includes the rehabilitation (reconstruction) of ford, wharf, power line, communication line, Hydrological Station, Gauging Station, and Sluice gate.

The special works rehabilitation (reconstruction) plan made for the main engineering will implement the rehabilitation (reconstruction) measures to all public facilities as per their original scale and standard, to restore their functions. These measures can ensure that the public facilities within the area will be effectively restored.

Production resettlement shall follow the resettlement first and land acquisition second principle, to avoid the impacts upon agricultural production. The special works rehabilitation (reconstruction) plan shall follow the construction first and removal second principle, to avoid the impacts upon the local communication, power supply, water intaking, flood drainage, and irrigation.

6.8.2 Reservoir bottom cleaning

6.8.2.1 Reservoir bottom cleaning scope

The reservoir bottom cleaning includes two parts, namely, general cleaning and special cleaning. The scope and contents of general cleaning includes the removal and cleaning of all sorts of building and structure below the resident relocation line, forest cutting, slash disposal, and health and epidemic prevention cleaning below the reservoir normal storage level, the cleaning of large sized buildings and structures (bridge pier, monument, and line pole) residues, and forest land within the 2m scope below the normal storage level and dead water level (ultimate dead water level). The scope of special cleaning refers to special facility location cleaning carried out by each department or unit themselves, as per the department requirements.

6.8.2.2 Building cleaning

(1) The houses and auxiliary buildings within the cleaning scope shall be removed, while the fencing wall, chimneys, and walls shall be pushed and leveled. As to the unutilized and floatable wastes shall be transferred outside the reservoir and burned locally.

(2) As to the road, power transmission, telecommunication, industrial and mining enterprises, hydraulic and electric engineering, and other ground buildings and auxiliary facilities within the inundation area, if they interfere the operation, development and utilization of reservoir, they must be removed. The equipment and old material shall be transferred outside the reservoir. Bridge pier, gate dam, and other larger obstacles must be exploded. Their remaining height shall

generally not exceed 0.5m above the ground.

(3) As to the underground buildings within the water-fluctuation-zone of reservoir, blocking, plugging, sealing or other measures shall be taken as per the geological conditions and reservoir impounding requirements.

6.8.2.3 Hygienic cleaning

(1) The hygienic cleaning shall be done to all the pollutant sources within the reservoir area. As to pollutants from toilet, cesspit, pen, garbage, and others, shall be transferred outside the reservoir. If it is hard to transfer, exposure and disinfection treatment shall be adopted. The 0.5～1kg/m2 raw lime disinfection treatment shall be applied to their pits. The sewage pit shall be blocked with clean soil.

(2) As to the industrial & mining enterprises, hospitals, veterinary station, and other toxic locations with serious pollution source, and grave yard to bury the people and animals dying due to infectious diseases, the cleaning or disposal works shall be performed under the instruction of environmental and hygienic departments.

(3) As to the graves with the burial years of more than 15 years, they shall be determined whether to relocate outside the reservoir as per the local customs. However, as to the graves with the burial years of less than 15 years, they must be relocated outside the reservoir or be locally disposed of. 0.5～1kg bleaching powder shall be applied to each pit for disinfection treatment.

6.8.2.4 Forest cleaning

(1) As to the special and high-valued tree species and transplantable young trees within the cleaning scope, they shall be transplanted outside the reservoir area.

(2) As to the trees which are not transplantable, they shall be cut across the ground and cleaned outside the reservoir, while the remaining stump shall not exceed 0.3m above the ground.

(3) The residue limbs, dead wood, shrub, straw, peat and other floatable substances after the forest cutting, shall be transferred outside the reservoir or locally burned before water retaining.

6.8.2.5 Reservoir bottom material quantity

As per the reservoir bottom cleaning scope and requirements, surveys have been made to the buildings resisting the navigation on the reservoir main stream or tributary, unutilized and burnt house waste, and floating materials and pollutants affecting the water quality of power station junction and reservoir area.

6.9 Environmental protection measure summary and environmental protection “three simultaneous” acceptance

Please refer to Table 6.9-1 for the environmental protection measure summary of Bazizui

Navigation-Power Junction, and Table 6.9-2 for the environmental protection “three simultaneous” list.

Table 6.9-1 Environmental Protection Measures Summary Of Bazi Navigation Power Hub

No	Environmental Factor	Environmental Protection Measures	Anticipate Result
1	Water Environment	Construction period: Sand washing wastewater was treated with high efficiency cyclone purification method. The drainage of foundation pit wastewater is neutralized and precipitated, mechanical oily wastewater is treated by oil and water separation through simple filter tank, and then is used for watering and dust reduction; Domestic sewage is discharged after the septic tanks and disposal of complete sets of equipment. Operation Period: Measures such as scientific soil testing and fertilization, promotion of biogas pool use and promotion of ecological agriculture were taken, The automatic monitoring system of water released online was built at the Dahehu hill hub of east of Xin River and Baiqiling Hub of west Xin River, Optimal scheduling scheme to guarantee the best ecological flow.	After the sewage treatment, the discharge reaches the first level standard of "comprehensive wastewater discharge standard" (GB8978-1996), Water quality control in surface water environmental quality standard (GB3838-2002) class III water standard, meet the requirements of regional water environment function zoning, The minimum ecological flow of the river under the dam of Jiangdong River $31.6m^3/s$. The minimum ecological base flow of Dahe River in Jiangxi 35.3 m^3/s.
2	Terrestrial Ecology	Vegetation protection: Strictly define the scope of construction activities, and strengthen management and supervision, After the completion of the project, vegetation restoration or reclamation was carried out in the temporary occupied area and vegetation disturbed area, combined with the climate and soil characteristics of the project area, the vegetation restoration and reconstruction were carried out, Selection of fast growing herbaceous plants with strong coverage, Strengthen the ecological energy construction	Reducing the damage of construction activities to land vegetation, Reduce the adverse effects on the engineering construction area of land plants, reduce the demand of rural life energy on vegetation. Stop killing wild animals. Eliminate the ancient trees and rare value of the number of

		in rural resettlement area, and promote the application of biogas pool and orange pole gas energy technology. Terrestrial animal protection: Strictly define the scope of construction activities, and reduce the destruction of wildlife habitat by construction activities; Strengthen the publicity and education of wildlife protection, Enhance the awareness of wildlife protection. Protection of ancient trees: 3 camphor trees in the reservoir area are suggested to be listed for protection and tracking monitoring. If the construction site changes, the old trees in the reservoir area should take local protection, ex situ protection and tracking monitoring measures. apply to the relevant departments, and pay attention to the conservation and conservation of ancient trees and rare plants.	reduced.
3	Aquatic ecology	Artificial releasing value: The recent release for grass carp, black carp, silver carp and Bighead Carp four fish. The long-term and reasonable adjustment according to the monitoring object. Fry restocking standard reference "measures" management of aquatic fingerlings. The early operation of the releasing number 3 million / year, and specifications to 3-8cm species. Part of the fry can be cultured to 1 year old fish, and the specifications can reach above 15cm. Put the proportion of silver carp and Bighead Carp 30% temporary Zanan 30%, grass carp 20%, 10% black carp and other economic fish (such as Squaliobarbus, bream, carp, crucian carp, elopichthys Bambusa etc.) 10%, the releasing time for the annual spring and Autumn, Layout of multiplication station in project management area. Fish crossing facilities: The main consideration for fish fish of black carp, silver carp and bighead carp, grass carp four fish and Squaliobarbus, Guan, elopichthys Bambusa, bream etc. The main fish passing season is from March to August, Fish passing scheme recommended the use of diaphragm plate fishway. Xin River Mo PI Ling fishway	It provides conditions for the short distance reproductive migration of fishes in the mouth of the reservoir, so that they can maintain their population survival and reproduction. Increase the amount of water resources, conserve aquatic resources, protect biodiversity, improve the water ecological environment and promote sustainable development of Fisheries. Building fish facilities is beneficial for some fish to complete their life history, which is beneficial to fish bait migration, and is beneficial to fish gene exchange between upper and lower dams. protection of biodiversity

		arranged in Mo PI Ling power plant and the two hub connection between earth dam. Xin river mouth channel is arranged between the Hushan fishway powerhouse and dam on the right bank of tiger mouth, length of fishway respectively is 775m and 850m. Habitat remediation: Artificial fish nests were set up in the reservoir area, the Pearl River Bridge and the Baita River as alternative habitats, Aquatic plant, Ceratophyllum demersum, Hydrilla verticillata and Vallisneria sow seeds and aquatic plants, water bamboo, reed, cattail are seed in the shallow water depth of less than 2m, and spread area of 15 acres. To carry out aquatic ecological monitoring and research, to strengthen fishery management, to strengthen patrols and inspections, and to strengthen publicity and education.	and species genetic diversity in rivers.
4	Construction area environment	Water quality protection: The waste water of sand and stone washing is treated with high efficiency cyclone purification method, and the waste water of pit is discharged by neutralization sedimentation method. The oily wastewater is treated by oil and water separation through a simple filter tank, and then is used for watering and dust reduction. The domestic sewage is discharged after the treatment of the septic tank and the complete set of equipment. Environmental air quality protection: Concrete mixing dust with dust collector; in the process of material transportation, attention should be paid to prevent air pollution; in the transportation of multi dust materials, the material should be properly humidified or covered with canvas. The storage tanks of bulk cement vehicles should be kept in good sealing condition, and the vehicles should be cleaned regularly. Sprinkle and dust down the approach roads without rain. In the process of soil accumulation, the angle of accumulated slope should not be too large, the spoil site should be compacted in time; bulk cement should avoid	The sewage and wastewater discharged from the construction area reached the first level standard of the comprehensive wastewater discharge standard (GB8978-1996). The ambient air quality in the construction area has reached the two level standard of ambient air quality standard (GB3095-2012). Construction waste gas performs the two level standard of comprehensive emission standard for air pollutants (GB16267-1996); All machinery and fuel vehicle emissions "implementation of diesel exhaust emission of non road mobile machinery

		open-air stacking as much as possible. The weather is sunny and windy to open temporary stacking of soil material proper humidification. Noise protection: Traffic noise is controlled by setting speed limit, forbidden singing sign and sound barrier. During the construction period, the workshop uses porous sound-absorbing materials as far as possible to establish sound insulation barrier, sound insulation cover and sound insulation room, optimize the plane layout, and make the mechanical equipment with more noise influence as far away from the sensitive point as far as possible. Low noise equipment and process are adopted to strengthen the maintenance and repair of construction machinery, vibration equipment is equipped with vibration reduction equipment; reasonable arrangement of construction period; economic compensation measures for over standard residential areas. Solid waste treatment: The waste residue was abandoned to the hub waste dump, and the domestic waste was collected and collected by Yugan Environmental Sanitation Management Institute.	limits and measurement methods (China stages I and II)" (GB20891-2007) and "gasoline transport air pollutant emission standards" (GB 20951-2007). Noise control around the construction site to implement emission standard for environmental noise in construction site (GB12523-2011). The surrounding area residents according to "sound environmental quality standards" 2 standards (GB3096-2012).
5	Water and soil conservation	Soil erosion control is carried out in the key project area, reservoir protection project area, soil material yard area, waste residue area, construction production and living area and road engineering area. Through block, drainage and land remediation engineering measures, vegetation protection, vegetation restoration and afforestation plant measures on each partition to the prevention and control of soil erosion.	After the implementation of soil and water conservation measures, the land consolidation rate of the project area reached 95%. Within the scope of prevention and control responsibility, the total degree of soil and water loss reached 97%, the soil erosion control ratio reached 1, and the slag retention rate was more than 95%, The recovery rate of forest and grass vegetation was 99%, and the coverage rate of forest and grass was more than

			27%.
6	Environmental monitoring	Surface water environment: (1) water quality monitoring during construction period: 1). Wastewater monitoring: Monitoring the water quality at the inlet and outlet of the processing system and living area treatment facilities of the gravel processing system respectively, The waste water of sand and stone processing is monitored 2 times a year. The peak year of construction and the normal construction year are monitored every year, and the domestic sewage is monitored every quarter. The construction period is 5 years. 2）2.0KM downstream of the monitored section in the dam upstream 1.0KM and tiger mouth, Mo PI Ling dam, the construction period is 5 years, 3 times the annual monitoring.（2） Water quality monitoring during operation:， In the storage section (Baita river fork), Mei Gang Xiang middle-aged tap water plant water intake, Huangjinbu Town Industrial Park tap water plant water intake, tap water plant water intake sources Yang Town, Daxi village shen Ling tap water plant water intake, the dam upstream and downstream river channel 1.0KM 1.0KM, West river East river dam the river downstream of the dam and the white horse 1.0KM Bridge Township tap water plant water intake and Baita River into the estuary channel at 500m upstream monitoring section were set up. 1 years before reservoir storage, second years after reservoir storage and 2 years after completion and acceptance, the monitoring time was annual, wet and dry season. Groundwater environment: Each set of 1 groundwater monitoring points are set up in Daxi village, Hebu village, Pingshang village, Tangbei vallage Yu Jia Lao Wu River. The groundwater level changes in the reservoir affected areas were observed irregularly, and the water quality monitoring frequency was continuously monitored for 2 years from first to second years after the reservoir was impounded.Every year during the	To master the dynamic change process of main hub project area, reservoir inundation area and resettlement area, and provide scientific basis for environmental pollution control and environmental management during construction and operation period. Timely grasp the implementation effect of environmental protection measures to prevent the environmental damage caused by sudden accidents, and provide the basis for environmental protection acceptance of completed projects

		period of flood, flat and dry periods, sampling and monitoring are carried out, and the groundwater level changes in the reservoir affected areas are observed irregularly, The frequency of water quality monitoring was monitored continuously for 2 years from first to second years after impoundment. Terrestrial biology-monitoring: The investigation was carried out in the construction area, reservoir area and reservoir area (the extension range of submerged line of reservoir) 2km, 1 investigations were carried out before the closure of the reservoir, and 1 times were observed in the year after the completion of the project. The reservoir was surveyed 1 times in fifth years after the completion of the reservoir, a total of 3 times. Aquatic ecological monitoring: In the Bazui reservoir and dam site, Hukou Mo Pi Ling dam site downstream are set an aquatic ecological monitoring section. From the first year before reservoir impoundment, 3 aquatic ecological environment monitoring were carried out every year in April, July and December, and 5 years were monitored continuously. Atmospheric environmental monitoring: There are 1 monitoring points in the outer Bear Village (right bank of the dam site) and the upper bank of the dam (the left bank of the dam. Two monitoring stations were monitored 1 times a year during construction. NO_2, TSP and PM10 were monitored continuously for 7 days, Monitoring is not less than 18 hours per day. Acoustic environment monitoring: (1) regional noise: in the Bear Village (dam bank), Zhouban (on the left bank site) and Lou Bu Cun (dianpaizhan position) the 1 monitoring points. During the construction period, 4 years were monitored, and 3 times were monitored annually. 1 monitoring points on the temporary sidewalk beside the East River construction. During the construction period, 4 years were	

		monitored, and 3 times were monitored annually, Record vehicle flow at the same time.	

Table 6.9-2 Bazizui navigation-power environment protection engineering

Serial No.	Project name and main environment protection measures	1	2	3	4	5	Operation period	Planned completion time
Part 1	environment protection measures							
一	Water environment protection							
1	Reservoir water quality protection							
1.1	Treatment of waste water from sand and stone, High efficiency cyclone purification method is used for treatment and then reuse	→	→	→	→	→		Construction period
1.2	Drainage treatment of foundation pit, After precipitation treatment, the effluent is discharged	→	→	→	→	→		Construction period
1.3	Oily wastewater treatment of mechanical vehicles; Oil and water separation is performed by oil separation tank, and then is reused.	→	→	→	→	→		Construction period
1.4	Domestic sewage discharged after treatment of septic tanks and complete sets of equipment	→	→	→	→	→		Construction period
二	Terrestrial ecological protection							
1	Vegetation restoration							
1.1	Vegetation restoration or reclamation of temporary occupied area and disturbed vegetation area are carried out.				→	→	→	
1.2	Strengthen ecological				→	→	→	Construction

	energy construction in rural resettlement areas; promote the application of biogas digester and orange rod gasification technology; Reduce the demand for vegetation in rural life			→				period
2	Terrestrial animal protection							
2.1	Strictly define the scope of construction activities, and reduce the destruction of wildlife habitat by construction activities	→	→	→	→	→		Construction
2.2	Strengthen the publicity and education of wildlife protection, strengthen the awareness of wildlife protection, in order to prevent killing wild animal, and effectively protect wildlife resources.	→	→	→	→	→		Construction
3	protection of ancient trees and rare plants							
3.1	Tracking and monitoring 3 camphor trees in the reservoir area, and strengthening the protection work during construction period	→	→	→	→	→		Construction period
三	Aquatic ecological protection							
1	Breeding and releasing station is fixed up in project management area	→	→	→	→	→		Construction period
2	Building fish pass facilities		→	→	→	→		Construction period
3	Artificial fish nest is set up for habitat restoration		→	→	→	→		Construction period
4	Monitoring and Research on aquatic ecology						→	Construction period

(Continued) Table 6.9-2 Bazizui navigation-power environment protection engineering

Serial	Project name and main environment	1	2	3	4	5	Operation	Planned

No.	protection measures						period	completion time
Part 2	environment protection temporary measures							
一	Water environment protection measures							
1	Waste water treatment of sand stone processing system							
1.1	Treatment of wastewater by high efficiency cyclone purification method	→	→	→	→	→		Construction period
2	Drainage of foundation pit							
2.1	Treatment of wastewater by neutralization precipitation method	→	→	→	→	→		Construction period
3	Washing wastewater by mechanical vehicles							
3.1	Reuse of oil and water separation by simple filter	→	→	→	→	→		Construction period
4	Domestic sewage treatment							
4.1	Domestic sewage treatment in construction area is treated by septic tank and complete set of domestic sewage treatment equipment. One set of the equipment is respectively in owner camp, left and right rock construction camp	→	→	→	→	→		Construction period
二	Atmospheric environmental protection							
1	Dustproof measures							
1.1	concrete mixing and dust is removed by dust collector. air pollution prevention is aware of during the process of material transportation. In the transportation of dusty materials, the material should be properly humidified or covered with canvas. and the storage tank of bulk cement vehicles should be kept in good sealing state. The vehicles should be cleaned regularly, and the speed of the vehicles should be appropriately reduced in the way of centralized sections of the residents. Sprinkle and dust down the approach roads on no	→	→	→	→	→		

	rainy days. In the process of soil accumulation, the angle of accumulated slope should not be too large, the spoil site should be compacted in time; bulk cement should avoid open-air stacking as much as possible. Properly humidify the temporary stacking of soil material in the open air on sunny or windy days.							
2	Exhaust gas control of fuel construction machinery							
2.1	Strengthen the management of large construction machinery and vehicles. Implement I/M system (regular inspection and maintenance system)	→	→	→	→	→		Construction period
三	Sound environment protection measures							
1	noise control							
1.1	The speed limit plate and noise warning board are set up in the construction area, and the traffic management of the approach road is strengthened. Strengthen the maintenance of road use period and vehicle maintenance, reduce the noise source. Low noise equipment is selected; noise monitoring of environmental sensitive points is strengthened; excessive detection is found; protective measures are taken immediately. Reasonable arrangement of construction period; take noise reduction measures; reasonable layout of plant machinery; strengthen construction management; strengthen the maintenance of construction machinery; vibration reduction equipment for large vibration equipment is equipped with	→	→	→	→	→		Construction period
四	Solid waste treatment							
1.1	The garbage collection system was set up in the construction area. Garbage is Collected and then transported to the	→	→	→	→	→		Construction period

	garbage sanitary landfill in Wanan landfill							

(Continued) Table 6.9-2 Bazizui navigation-power environment protection engineering

Serial No.	Project name and main environment protection measures	1	2	3	4	5	Operation period	Planned completion time
Part3	Environment monitoring							
1	Water environment							
1.1	Waste water monitoring							
1.1.1	Domestic sewage monitoring points are set up in the sewage outfall of the construction camp living area. The monitoring indexes are: pH, CODcr, BOD5, total nitrogen, total phosphorus, ammonia nitrogen, LAS, fecal coliform bacteria, SS and, sewage treatment capacity. Monitoring frequency: the construction period is 5 years, monitoring 4 times per year (1 times per quarter)	→	→	→	→	→		Construction period
1.1.2	The monitoring points of production wastewater are set up at the discharge outlet of the processing system of sand and gravel processing plant, and the monitoring index is SS. Production wastewater is monitored at normal production time of sand and gravel, and 2 times are monitored every year. The monitoring periods of construction peak year and normal construction year are selected.	→	→	→	→	→		
1.2	Surface water monitoring							
1.2.1	In the construction period, a control section is set at 1km upstream of the dam, and a control section is respectively set at 2km downstream of the dam sites of the East river and the West river. The monitoring items include pH, SS, dissolved oxygen, CODMN, BOD5, CODcr, ammonia nitrogen, petroleum and fecal coliform bacteria. The construction period is 5 years, Monitoring 3 times a yearl (1 time at wet, flat and dry seasons each), 2 days for each monitoring.	→	→	→	→	→		
1.2.2	During operation, monitoring sections are respectively set at the reservoir section (Baita river fork),Zhongnian waterworks in Meigang county, industrial zone waterworks in Jinbu county, Caiyuan waterworks,Shenling waterworks in Daxi county, 1.0km upstream of the dam site, 1.0km downstream of dam site of East river in Xin river, 1.0km downstream of dam site of West river in Xin river, waterworks in Baimaqiao county and 500m upstream of the Baita River entering Xin river. The monitoring items include pH, DO, permanganate index, COD, BOD5, ammonia nitrogen, total phosphorus, total nitrogen, arsenic, mercury, six valence chromium, volatile phenol, petroleum, chlorophyll a and fecal coliform group, a total of 15.。 Monitoring is carried out in the year before reservoir storage, second year after reservoir storage, and 2 years are continuously carried out after completion of acceptance. monitoring is carried out in the wet, flat and dry						→	

Serial No.	Project name and main environment protection measures	1	2	3	4	5	Operation period	Planned completion time
	periods every year。							
2	ecological environment							
2.1	Terrestrial ecology							
2.1.1	The composition, distribution and quantitative status of terrestrial fauna and flora, biodiversity (including species diversity, habitat diversity) and their changes, the situation of vegetation restoration, national key protected wildlife population status and changes, the structure and change of landscape ecological system are investigated in the construction area, reservoir area and around reservoir area (Extended 2km range of reservoir inundation line). One investigation is carried out before the closure of the reservoir, and one is in the year after the completion of the project, and one is in fifth years after the completion of the reservoir, a total of 3 times.	→	→	→	→	→	→	
2.2	Aquatic ecology							
2.2.1	An aquatic ecological monitoring section is respectively set up at Bazizui reservoir area, downstream of the dam site of West river of Xin river and the downstream of the dam site of east river of Xin river。The contents include: ①the plankton, benthic animal species, quantity, biomass, fish fauna, dominant species, species, distribution and variation situations. ②Enhancement effect③fish passing situation, fish species, and fish numbers in fish way. From the first year before reservoir impoundment, 3 times of aquatic ecological environment monitoring are carried out in April, July and December every year, and are monitored continuously for 5 years。	→	→	→	→	→	→	
3	Atmospheric environmental monitoring							
3.1	One monitoring point is set respectively at Waixiong country(right bank of the dam site), Zhoufan(left bank of the dam site), a total of 5 monitoring points. Monitoring NO_2、TSP、PM10、PM2.5. During the two year construction, monitor 1 time a year. NO_2、TSP、PM10 are continuously monitored for 7 days once，no less than 18 hours everyday.	→	→	→	→	→		
4	Acoustic environment monitoring							
4.1	Regional environmental noise monitoring							
4.1.1	One monitoring point is set respectively at Waixiong country(right bank of the dam site), Zhoufan(left bank of the dam site) and Loubu country(pumping station), totally 3 monitoring points. During the construction period, 4 years were monitored, 3 times per year, 2 days once (including working day and rest day), 24 hour diurnal equivalent sound level per day	→	→	→	→	→		
4.2	Traffic noise monitoring							
4.2.1	There are 1 monitoring point in the temporary sidewalk in the East River. During the construction period, the monitoring is carried out for 4 years, 3 times per year, and the vehicle flow is recorded simultaneously.	→	→	→	→	→		Construction period

7 .Water and soil conservation

7.1Current situation of soil and water loss and soil and water conservation

7.1.1Current situation of soil and water loss in region

In accordance with the "standards of classification of soil erosion" (SL190-2007) in the national soil erosion zoning, the project region belonged to the southern hilly area project, soil erosion types are dominated by water erosion. According to the "Jiangxi Provincial People's government's announcement on dividing the key areas for prevention and control of soil and water loss", the location of the project belongs to the key area for soil and water loss control in Jiangxi province. Water and soil conservation work is mainly to control soil erosion, improve production conditions, and build ecological environment, as well as to make prevention, protection and supervision.

The soil erosion area in Yugan County of Shangrao city is 285.45km2, which accounts for 12.2% of the total land area. The current soil erosion is mainly natural erosion. Among them, mild erosion area is 128.82km2, accounting for 45.1% of the total erosion area, moderate erosion area is 121.23km2, accounted for 42.5% of the total erosion area, strong erosion area is 32.13km2 accounted for 11.3% of the total erosion area, extremely strong erosion area is 3.26km2, accounted for 1.1% of the total erosion area, severe loss of soil and water loss in the area is 0.01km2. The soil erosion is mainly medium and mild, accounting for 87.6% of the total loss area.

The soil erosion area in Yujiang County of Yingtan city is 133.76km2, which accounts for 14.4% of the total land area. The current soil erosion is mainly natural erosion. Among them, mild erosion area is 55.07km2, accounting for 41.17% of the total erosion area, moderate erosion area is 43.08km2, accounted for 32.75% of the total erosion area, strong erosion area is 22.57km2 accounted for 16.87% of the total erosion area, extremely strong erosion area is 11.25km2, accounted for 8.41% of the total erosion area, severe loss of soil and water loss in the area is 1.07km2, accounted for 0.80% of the total erosion area. The soil erosion is mainly medium and mild, accounting for 73.9% of the total loss area.

7.1.2 Current situation of soil and water loss in project area

The project construction area is located in the red soil hilly region of the south, with abundant rainwater, and the main types of soil erosion are hydraulic erosion. According to the standard of classification and classification of soil erosion, the amount of soil loss was 500t/ (km2.a) in the project area. Soil erosion in the project construction areas was investigated by field investigation, referring to relevant information, and data provided by local water conservation departments. The existing soil erosion situation in the project area was estimated, combined with various engineering regional geomorphology, vegetation etc. In the area of the project area, the land use rate is high and the soil erosion is slight. The background and value of erosion in the project area are mainly based on the field investigation, including the topography, slope, land composition, vegetation and so on. According to the classification index of erosion, the area of the erosion intensity of each area is obtained, which is shown in Table 7.1-1.

Table 7.1-1 Background value of soil erosion modulus

Project area	Area covered（hm^2）	Current Situation description	soil erosion modulus（$t/km^2·a$）
Junction engineering area	131.47	The main area of the hub area is the water use land and the cultivated land, and the soil erosion intensity along the line is dominated by the slight degree of erosion	860
Junction management area	14.32	Mainly water use land (by the front River Island River floodplain), soil erosion is slight erosion	600
Reservoir area protection engineering area	150.33	The land is mainly cultivated land, with some water use land, the ground is gentle and the soil erosion intensity is light and moderate.	750/500
Material field	13.30	The present situation of vegetation is dominated by woodland	740/820
Waste residue field	249.59	The area of temporary project is mostly flat and the vegetation is good in forest and grassland, and the soil erosion intensity along the line is mild.	600
Construction and living area	64.31	The area of temporary project is mostly flat and the good vegetation is mainly forest and grassland, and the soil erosion intensity along the line is mild.	1220
Traffic road	60.32	The area of temporary project is mostly flat and the good vegetation is mainly forest, grassland, and dry land, and the soil erosion intensity along the line is mild.	1100

7.1.3 Status of soil and water conservation

In recent years, the development and construction projects are increasing year by year. According to the characteristics of the recent construction projects, taking the implementation of the soil and water conservation plan of the development and construction projects as the core, the soil and water conservation plan is compiled in the construction approval procedure. According to the report of soil and water conservation plan projects are increasing year by year. The project area vigorously carry out afforestation, management of barren hills and slopes, and changing cropping system. Land slope greater than 25 degrees is gradually returning farmland to forest or planting fruit trees. Repair of building dam, pond desilting basin implement blocking, storage and drainage of comprehensive protection, prohibited deforestation and land occupation. Soil and water conservation work has achieved great development. The work of governance is from the past no plan and no scale, and gradually to the present scientific model of organized, planned and centralized management. The development of comprehensive control of soil and water conservation has achieved remarkable economic and social benefits. It reduces sediment deposition to water conservancy projects and prolongs the service life of water conservancy projects. It is effective to control soil erosion and reduce the natural disasters such as drought and flood. In addition to natural erosion in the project area, there are some soil erosion caused by human activities in the process of development and construction. Therefore, in the future work of soil and water conservation, the key is to do to reduce and prevent the construction project of soil and water loss work, to strengthen the supervision and management of construction projects to implement the "three simultaneous" system, the implementation of the "Regulations of soil and water loss caused by who who is responsible for governance. Water and soil erosion caused by new human factors is strictly controlled.

7.2 Prediction of soil and water loss

7.2.1 Prediction range and period

This project is a one-time development and construction projects. the construction of water, electricity, road and site leveling, sand quarrying and other activities, seriously damage to the original landform, soil and vegetation and soil and water conservation facilities, resulting in destruction of soil structure, forest and farmland destruction, reducing the corrosion resistance of the surface soil, causing serious soil erosion in the construction period. With the completion of the main project, the construction disturbance is over and the strength of soil erosion is weakened.

The soil and water loss prediction period includes the construction preparation period, construction period and natural recovery period. According to the construction disturbance time of each unit, and combined with the season for soil loss, the prediction period is determined according to the most unfavorable conditions. It is less than one year over the rainy season, counting for one year. Not exceeding the length of the rainy season, it is calculated according to the proportion of the length of the rainy season. According to the specific circumstances of the project and the main period of rainfall from March to July, junction project area is determined for 3 years, embankment engineering area and drainage project area of the protection project are for 2 years, backfill and landfill of the reservoir protection project are for 1 year, junction management area is 0.5 year, material field for 3 years, the waste residue field area is 3 years, the construction and production life area is 0.5 year and the traffic road area is 1 year. The natural recovery period refers to the time required for all the following achieved: under the condition that the soil and water conservation measures are not taken after the end of the construction disturbance, the loosely exposed surface gradually tends to be stable, the vegetation is naturally restored, the soil erosion intensity is weakened and near to the original background value. According to the rain and heat condition of the project area, the natural recovery period is 1 years. According to the actual characteristics of this project, the division of the prediction period of each project unit is shown in table 7.2-1.

Table 7.2-1 Prediction period for soil and water loss Unit：year

<table>
<tr><th rowspan="2">No.</th><th rowspan="2" colspan="2">Prediction area</th><th colspan="2">Prediction year</th></tr>
<tr><th>Construction period</th><th>natural recovery period</th></tr>
<tr><td>1</td><td colspan="2">Junction engineering area</td><td>3.0</td><td>1.0</td></tr>
<tr><td>2</td><td colspan="2">Junction management area</td><td>0.5</td><td>1.0</td></tr>
<tr><td rowspan="3">3</td><td rowspan="3">Reservoir area protection engineering area</td><td>Embankment engineering area</td><td>2.0</td><td>1.0</td></tr>
<tr><td>Drainage engineering area</td><td>2.0</td><td>1.0</td></tr>
<tr><td>Backfill and landfill engineering area</td><td>1.0</td><td>1.0</td></tr>
<tr><td>4</td><td colspan="2">Material area</td><td>3.0</td><td>1.0</td></tr>
</table>

5	residue field area	3.0	1.0
6	Construction and living area	0.5	1.0
7	Traffic road area	1.0	1.0

remarks：The commencement period of some projects may be advanced or postponed. This is only a division of the prediction period of soil erosion.

According to the similarity of soil erosion in the same land uses, in the construction period water loss and soil erosion o area is divided into 7 soil erosion subareas, namely junction project area, junction project management area, reservoir protection project, material field, residue field area, construction and living area, and traffic road areas, see table 7.2-2.

Table 7.2-2 Prediction subarea unit and area Unit：hm^2

Prediction subarea		In construction period Soil erosion area	natural recovery period Soil erosion area
Junction engineering area		107.78	1.80
Junction management area		14.32	4.50
Reservoir area protection engineering area	Embankment engineering area	75.08	24.60
	Drainage engineering area	31.78	7.20
	Backfill and lifting field engineering area	43.47	43.47
Material field area		13.30	13.30
residue field area		249.59	249.59
Construction and living area		64.31	64.31
Traffic road area		60.32	36.20
Sum		683.64	444.97

7.2.2 Predictive result of water loss and soil erosion

7.2.2.1 Prediction and analysis of soil and water loss during construction period

(1)The total area of the perturbed surface, the damaged land and vegetation

Total area occupied by the project is 2710.83hm2, among which Perpetual land occupation is 2213.38hm2 and temporary construction area is 497.45hm2. Cultivated land is 359.90hm2, woodland is 84.85hm2, grassland is 77.30hm2, water and water conservancy facilities is 2188.78hm2.

The permanent area of the project includes the land occupation of the hub project, the area of the reservoir protection project (Embankment engineering project, the drainage project), the area occupied by the hub management area, the permanent road occupation area, and the reservoir inundation area. The temporary construction covers the area of the protection project of the reservoir area (Backfill and landfill engineering area), the construction area, the construction road, the soil material field, the waste field and so on.

The area of the perturbed surface is 83.64hm2, and the damaged vegetation area is 162.07hm2. See table 7.2-3 for details.

(2) Damage area of soil and water conservation facilities

According to the engineering design data, combined with field investigation, it is confirmed in the construction process occupied or damaged soil and water conservation facility is mainly the forestland and grassland Land that are requisitioned or leased for the construction of the project. There is no engineering facility to be destroyed. According to the statistics, the total area of the damaged soil and water conservation facilities is 162.07hm2 (excluding the area of flooded area), which are all located in Yugan county. Yujiang county does not involve damage to soil and water conservation facilities. See table 7.2-4 for details.

Table 7.2-3 A list of disturbed surface and damaged vegetation Unit: hm^2

Project area		Land occupation type				total
		Cultivated land	forestland	grassland	Water area and water conservancy facilities land	
Junction engineering area		38.34	27.58	10.28	55.27	131.47
Junction management area					14.32	14.32
Protection engineering area	Embankment engineering	33.25	13.12		28.71	75.08
	Drainage project	12.87	0.22		18.69	31.78
	Padding farmland project	43.47				43.47
	subtotal	89.59	13.34		47.40	150.33
Material yard			7.83	5.47		13.30
Slag yard		141.25	21.74	51.45	35.15	249.59
Construction production and living area		46.36	9.37	7.55	1.03	64.31
Traffic road area	Permanent road	12.08	3.41	1.00	9.33	25.82
	Temporary road	28.81	1.50	1.55	2.64	34.50
	subtotal	40.89	4.91	2.55	11.97	60.32
total		356.43	84.77	77.30	165.14	683.64

7.2-4 Damage and occupation of soil and water conservation facilities Unit: hm^2

Administrative zone	Project area		Land occupation type		total
			forestland	grassland	
Yugan county	Junction engineering area		27.58	10.28	37.86
	Junction management area				
	Protection engineering	Embankment engineering	13.12		13.12

	area	Drainage project	0.22		0.22
		Backfill and Padding farmland project			
		subtotal	13.34		13.34
	Material yard		7.83	5.47	13.30
	Slag yard		21.74	51.45	73.19
	Construction production and living area		9.37	7.55	16.92
	Traffic road area	Permanent road	3.41	1.00	4.41
		Temporary road	1.50	1.55	3.05
		subtotal	4.91	2.55	7.46
	total		84.77	77.30	162.07

(3) Prediction of earth and slag discharge amount

The total excavation amount is 16 million 330 thousand and 300 M3. Stripped topsoil of 791 thousand and 400 m3 is temporary placement for later greening soil. The remaining part of the excavation is partly utilized. The total fill amount is 10 million 330 thousand and 800 M3. In addition to the use of engineering excavation, 1 million 578 thousand and 600 m3 is exploited from Soil yard and gravel yard and is used for filling. After earthwork balance, 7 million578 thousand and 100 m3 waste slag (8 million 639 thousand M3 loose square) was produced in this project.

7.2.2.2 Prediction of new soil and water loss

According to the forecast period of each unit, soil erosion area, topographic condition and soil erosion modulus, the total amount of soil and water loss will be 276 500 t. the new soil and water loss is 262100t. The calculation results are shown in table 7.2-5.

Table 7.2-5: Soil and Water Loss Prediction Scale

Predict period	Predict unit		Erosion area（hm^2）	Background value of soil erosion modulus（$t/km^2 \cdot a$）	Soil erosion modulus after disturbance（$t/km^2 \cdot a$）	Erosion time（year）	Predict loss（t）	Newly increased loss（t）
Construction period	junction engineering area		131.47	860	12600	3.0	49696	46304
	Junction management area		14.32	600	11200	0.5	802	759
	Reservoir area protection engineering area	Embankment engineering	75.08	750	12720	2.0	19100	17974
		Drainage project	31.78	750	11200	2.0	7119	6642
		Backfill and Padding	43.47	500	22200	1.0	9650	9433

		farmland project						
	Material yard		13.30	740	15600	3.0	6224	5929
	Slag yard		249.59	600	22200	3.0	166227	161734
	Construction production and living area		64.31	1220	8820	0.5	2836	2444
	Traffic road area		60.32	1100	9790	1.0	5905	5242
	subtotal		683.64				267560	256461
Natural recovery period	junction engineering area		1.80	860	2000	1.0	36	21
	Junction management area		4.50	600	2000	1.0	90	63
	Reservoir area protection engineering area	Embankment engineering	24.60	750	2000	1.0	492	308
		Drainage project	7.20	750	2000	1.0	144	90
		Backfill and Padding farmland project	43.47	500	2000	1.0	869	652
	Material yard		13.30	740	2000	1.0	266	168
	Slag yard		249.59	600	2000	1.0	4992	3494
	construction production and living area		64.31	1220	2000	1.0	1286	502
	Traffic road area		36.20	1100	2000	1.0	724	326
	subtotal		444.97				8899	5622
total							276459	262083

7.2.2.3 Prediction of possible damage of soil and water loss

(1) the hub project area and the hub management area

During construction, we can excavate bare slopes and temporary dump. If we can't get timely and effective protection and control, under the action of rainfall runoff, sediment will directly enter the river and cause River siltation. It will affect the people's production and living water and the safety of flood control; it may also bury the surrounding roads and farmland, and affect the normal farming of the nearby residents.

(2) Protection engineering area of the reservoir area

During construction, we can excavate bare slopes and temporary dump. If we can't get timely and effective protection and control, soil erosion is easy to bury the farmland and silt the drainage facilities around the farmland, which has a great influence on the mass production and life.

(3) Material area

The exploitation of soil and water in the material field may affect the downstream roads and farmland, etc. In addition, small ponds are distributed around the soil material on right bank, elevation is about 500m away from material mining bottom. In the process of mining, mining face should choose back to ponds side, and take the water, sand and other protective measures to avoid soil erosion field material deposition ponds, and protective measures such as drainage, sediment and so on should be taken to avoid soil erosion sedimentation ponds.

(4) Waste residue field

Waste residue field is loose debris accumulation, and rain is likely to cause massive loss of slag. The loss of waste residue has a great influence on the safety and stability of the slag field. Secondly, according to the location of the waste residue field, the loss of waste residue is easy to directly enter the river channel, causing river silt, affecting the mass production and living water and the safety of flood control.

(5) Road engineering area, construction production and living area

During the construction process, the forest and grass were destroyed and the ecology was affected. The ground is rolled or crushed by machines and vehicles, which will cause the soil to be impermeable. The ability of water conservation is reduced and plant growth is affected. At the same time surface water is easy to form surface runoff, thus aggravating soil and water loss, causing environmental degradation and environmental landscape.

7.3 Prevention scope and zone of soil erosion and water loss

7.3.1 Prevention scope

The prevention scope of soil erosion and water loss is 2723.69hm2. The construction area is 2710.83hm2, and the directly influenced area is 12.86hm2. And the direct influenced areas are 10m range outside the downstream boundary of the fill area in junction engineering area, 5m range at the upstream in material yard and 20m at downstream, the range from upper slope 2m to lower slope 5m in traffic road area. The responsibility scope for soil and water loss control is detailed in table 7.3-1.

Table 7.3-1 Responsibility scope for soil and water loss control

Project area		total	project	Directly influenced area	
			Construction area	area	Value basis
junction engineering area		132.33	131.47	0.86	10m range outside the downstream boundary of the fill area
Junction management area		14.59	14.32	0.27	5m range around the site
protection engineering area	Embankment engineering	76.13	75.08	1.05	5m outside the boundary of the

					fill area in the dam
	Drainage project	31.91	31.78	0.13	5m range around the site
	Backfill and Padding farmland project	44.34	43.47	0.87	5m range outside the downstream boundary of the fill area
	subtotal	152.38	150.33	2.05	
Material yard		14.49	13.30	1.19	Upstream 5m, downstream 20m
Slag yard		252.81	249.59	3.22	downstream 20m
construction production and living area		65.21	64.31	0.90	5m range around the site
Traffic road area	Permanent road	29.04	25.82	3.22	Upper slope 2m, Lower slope 5m
	Temporary road	38.87	34.50	4.37	Upper slope 2m, Lower slope 5m
	subtotal	67.91	60.32	7.59	
Reservoir inundation area		2027.19	2027.19		
total		2723.69	2710.83	12.86	

7.3.2 Soil erosion and water loss prevention and zoning

According to the construction characteristics of engineering construction, combined with the types of soil and water conservation measures, the responsibility scope for soil and water loss prevention and control in this project is divided into 8 primary control zones. They are junction engineering area, hub management area, reservoir protection engineering area, material yard area, waste residue area, construction production and living area, traffic road area, and reservoir inundated area. The protection engineering area of reservoir area is further divided into 3 two - grade divisions: embankment engineering area, drainage engineering area and backfilling and lifting field area. The traffic road area can be further divided into 2 two-grade zones: the permanent road area and the temporary road area. Reservoir inundation area mainly carries on the prevention and the surveillance, does not arrange the concrete prevention measure. The details are shown in the table 7.3-2.

Table 7.3-2 Prevention areas

No.	Prevention areas		area（hm2）	Area where soil and water loss easily happen
1	junction engineering area		131.47	Earthwork filling, cross linking dam slope, temporary stacking site
2	Junction management area		14.32	Office, living quarters, construction scope, construction base
3	protection engineering area	Embankment engineering	75.08	The cut-off ditch anti-seepage wall, foundation excavation
		Drainage	31.78	Pumping station slope

		project		
		Backfill and Padding farmland project	43.47	Fill slope in lifting area
		subtotal	150.33	
4	Material yard		13.30	Slope and end platform for quarry mining
5	Slag yard		249.59	Slag slope
6	construction production and living area		64.31	Construction camp, construction subsidiary enterprise, material stacking site
7	Traffic road area	Permanent road	25.82	Permanent highway digging and filling slope
		Temporary road	34.50	Temporary road digging and filling slope
		subtotal	60.32	
8	Reservoir inundation area		2027.19	
total			2710.83	

7.4 Target of soil erosion prevention and control measures layout

7.4.1 Target of soil erosion prevention

This project belongs to the provincial key area of soil and water loss control. This project is located in the lower reaches of the Xin River, one of the five major rivers of Poyang Lake river system, so the standard grade of soil erosion prevention and control is adjusted to the first grade standard of construction projects.

(1) Qualitative objectives

①The original soil and water loss in the project construction area has been basically treated, and the new soil and water loss has been effectively controlled

②Implementation of prevention first, protection first, first block and then abandon and implement safeguards, do not have a direct impact area

③The surface soil resources are protected and utilized, the comprehensive utilization rate of earthwork is high, the soil and water conservation facilities are safe and effective (intact), and the ecological environment is obviously improved.

④Quantitative indicators meet the current national standard GB 50434-2008 requirements

(2)Total quantity target

The average annual rainfall in the project area is more than 800mm. The original erosion modulus is slight erosion area. According to the difference of rainfall, soil erosion modulus and reference value area in project area, the absolute value of soil erosion total control degree (%), forest vegetation recovery rate (%) and forest grass coverage rate (%) in the control standard are all increased by 2%. The soil erosion control ratio was adjusted to 1%. The adjusted control objectives are shown in table 7.4-1.

Table 7.4-1 Target value of soil and water loss control during construction period and design year

Project and area			First grade standard	Disturbed land consolidation rate（%）	Total governance degree of Soil erosion（%）	soil Loss Control ratio	Slag retention rate（%）	Restoration rate of forest and grass vegetation（%）	Forest grass coverage（%）
			Objectives of soil and water conservation						
Phased and phased targets for prevention and control	1	junction engineering area	Construction period	*	*	0.7	95	*	*
			Operation period	95	97	1.0	95	99	27
	2	junction engineering area	Construction period	*	*	0.7	95	*	*
			Operation period	95	97	1.0	95	99	27
	3	protection engineering area	Construction period	*	*	0.7	95	*	*
			Operation period	95	97	1.0	95	99	27
	4	Material yard	Construction period	*	*	0.7	95	*	*
			Operation period	95	97	1.0	95	99	27
	5	slag yard	Construction period	*	*	0.7	95	*	*
			Operation period	95	97	1.0	95	99	27
	6	construction production and living area	Construction period	*	*	0.7	95	*	*
			Operation period	95	97	1.0	95	99	27
	6	Traffic road area	Construction period	*	*	0.7	95	*	*
			Operation period	95	97	1.0	95	99	27
Comprehensive value			Construction period	*	*	0.7	95	*	*
			Operation period	95	97	1.0	95	99	27

7.4.2 Overall layout of prevention and control measures

According to the characteristics of soil erosion, the degree of damage and the target of prevention and control in the construction of the project, in the principle of the combination of governance and protection, plant measures combined with engineering measures, and the combination of soil erosion control and improve the land productivity improvement and reconstruction, overall layout of various soil and water conservation measures are carried out. The arrangement of soil and water conservation measures in each area is as follows:

(1) Junction project area

Before the construction, topsoil stripped, piled up, and blocked and covered; a soil-bag wall and temporary drainage ditch constructed in excavation area beside the river during excavation period, the piled soil is protected by weaved bag with soil and waterproof cloth. In later stage, the backfill slope of the field excavation is protected. The original topsoil is used to clean up the construction and reforestation area, and planting trees to beautify the grass.

(2)Junction management area

Before the construction, topsoil stripped, piled up, and blocked and covered; in the filling area, the wall protection foot and drainage ditch shall be set up, laying stone is to block the slope of the wall above the retaining wall; the piled soil is protected by weaved bag with soil and temporary drainage ditch is constructed. The surface of the heap is covered with waterproof cloth. In the later period of construction, the topsoil was covered and the garden style was greening.

(3) Protection engineering in reservoir area

Before the construction, topsoil stripped, piled up, and blocked and covered in the area along the bank embankment; in the filling area, the wall protection foot and drainage ditch shall be set up. The piled soil is protected by weaved bag with soil and temporary drainage ditch is constructed. The surface of the heap is covered with waterproof cloth. In the later period of construction, regulation of overlying topsoil in disturbed area and measures of vegetation protection are carried out. Topsoil is back filled and replanted in backfill area. Fill slope is protected by planting grass.

(4) Material field area

A cut ditch is set up at the upper reaches of the excavation line before mining. On the slope, a chute is designed to connect toe drains. At the end of the drainage ditch a desilting basin is set. Topsoil is stripped and piled up at the slope toe, and the piled soil is protected by weaved bags. In the early stage of construction, temporary planting of grass seed was used for temporary greening, and on the excavating plantform build a brick masonry drainage ditch, and at slope toe drainage ditch and sedimentation basin were built. In the later stage of the construction, the cement laid stone masonry is built for excavation slope, grass planting is used to protect soil slope, and the mining platform is covered with soil, and planted with Joe, irrigation and grass for greening.

(5) Waste residue field

Before the construction, topsoil stripped, piled up, and took temporary block. The drainage measures are arranged at the periphery of the slag body before the slag. The cement laid stone masonry is built for block at the downstream of the waste residue field. In the process of stacking, the layer compaction is applied to prevent the loss of slag and to protect the slag slope by planting grass. After the deposit is finished, the land is cleaned up, vegetation restoration or replanting measures are taken.

(6) Construction and production living area

Before construction, the topsoil is stripped off, concentrated in a pile, and the woven bag is used to cover the soil. During the construction period, temporary planting of seeded grass seed was seeded, and the surrounding drainage ditch was arranged around the construction site, and the slope was planted on the side slope of the filling slope. In the later stage of construction, the site is covered with soil, greening and replanting.

(7) Traffic road area.

The topsoil is removed before construction, and it is stacked in the area along the road, and the woven bag is used to protect the soil. During the construction period, the grass seed was seeded for temporary greening, and a simple drainage ditch was built on the side of the construction road. Soil bag wall is temporarily used to block at the slope toe of fill section. In the later stage of the construction, the permanent road slope was planted with grass to protect. Trees are planted on both sides of the road. In the later stage of construction, the site is covered with soil, and greened with Joe, irrigation and grass for greening or replanting.

The system of soil and water conservation measures is shown in Fig. 7.4-1 and Table 7.4-2.

Fig.7.4-1 Diagram for Water and soil erosion control system

Soil and water conservation measure system

Prevention partition Control measures

Primary partition Secondary partition

Junction project area
- Project measurement: Topsoilbackfilling& land leveling
- Plant measure: Planting arbor shrubs
- Temporary measures: Topsoil stripping, temporary drainage ditch, waterproof cloth, woven bag LanDang

Junction management area
- Project measurement: Topsoilbackfilling& land leveling, drainage, block, slope protection
- Plant measure: Landscaping
- Temporary measures: Topsoil stripping, temporary drainage ditch, waterproof cloth, woven bag block

- Protection project area of reservoir area
  - Embarkment project area
    - Project measurement: Topsoilbackfilling& land leveling
    - Plant measure: Planting grass
    - Temporary measures: Topsoil stripping, waterproof cloth, woven bag block
  - Drainage works area
    - Project measurement: Topsoilbackfilling& land leveling
    - Plant measure: Planting grass
    - Temporary measures: Topsoil stripping, waterproof cloth, woven bag block
  - Backfill&lifting field area
    - Project measurement: drainage, block
    - Plant measure: Planting grass to protect slopes
    - Temporary measures: waterproof cloth cover, woven bag block
- Material field area
  - Project measurement: drainage ditch, Topsoilbackfilling& land leveling, protect slopes
  - Plant measure: Planting grass to protect slopes, planting arbor, shrubs, and grass seeds
  - Temporary measures: Topsoil stripping, woven bag block, temporary greening
- Residue field area
  - Project measurement: Topsoilbackfilling& land leveling, drainage, block, slope protection
  - Plant measure: Vegetation restoration, protecting slopes
  - Temporary measures: woven bag block
- Construction and living area
  - Project measurement: Topsoilbackfilling& land leveling
  - Plant measure: Planting grass to protect slopes, planting arbor, shrubs, and grass seeds
  - Temporary measures: Topsoil stripping, woven bag block, drainage ditch, waterproof cloth cover
- Traffic road area
  - Permanent road area
    - Project measurement: drainage ditch,
    - Plant measure: planting seeds to protect slopes, sidewalk plantiing
    - Temporary measures: woven bag block
  - Construction road area
    - Project measurement: Topsoilbackfilling& land leveling
    - Plant measure: Planting grass to protect slopes, planting arbor, shrubs, and grass seeds
    - Temporary measures: Topsoil stripping, woven bag block, drainage ditch, temporary greening

Table 7.4-2 Prevention and control of soil and water conservation zoning

Prevention area	measures	Measures distribution

First-grade area	Second-grade area			
junction engineering area		Engineering measure	Surface soil backfill and land leveling	The construction land greening area
		Plant measures	Planting arbor and shrub	Greening area of construction base
		Temporary measures	Topsoil stripping, temporary drainage ditch, woven bag, tarpaulin cover block	Forest and grass vegetation coverage area、Earthwork excavation site near the river side
junction engineering area		Engineering measure	drainage Block, Slope protection, Surface soil backfill and land leveling	Fill area、Greening area
		Plant measures	Landscaping	Greening area
		Temporary measures	Topsoil stripping, temporary drainage ditch, Woven bag block, Rainproof cloth covering	Forest and grass vegetation cover area and topsoil stacking area
protection engineering area	Embankment engineering Drainage project	Engineering measure	Surface soil backfill and land leveling	Greening area of construction base
		Plant measures	Grass planting	Greening area of construction base
		Temporary measures	Topsoil stripping, Woven bag block, Rainproof cloth covering	Forest and grass vegetation cover area and topsoil stacking area
	Embankment engineering Drainage project	Engineering measure	Surface soil backfill and land leveling	Greening area of construction base
		Plant measures	Grass planting	Greening area of construction base
		Temporary measures	Topsoil stripping, Woven bag block, Rainproof cloth covering	Forest and grass vegetation cover area and topsoil stacking area
	Embankment engineering	Engineering measure	Drainage, Block	Fill area slope
		Plant measures	planting grass for slope protection	Fill slope
		Temporary measures	Woven bag block, Rainproof cloth covering	Topsoil stacking area, uncompacted slope
Material yard		Engineering measure	Intercepting drains, topsoil backfilling and land leveling, foot protection	Intercepting ditch is on the upside of the mining face，Foot protection in mining slope
		Plant measures	planting grass for slope protection, planting trees and shrubs and grass seed sowing	Excavated disturbed area
		Temporary measures	Topsoil stripping, Woven bag block, temporary greening	Topsoil dump
slag yard		Engineering measure	Drainage, Block、slope protection, topsoil backfilling and	Surrounding the slag field, fill slope, slope of slag heap

			land leveling,	
		Plant measures	slope protection、 Vegetation restoration	slope of slag heap, Slag slope
		Temporary measures	Woven bag block	slope of slag heap
construction production and living area		Engineering measure	topsoil backfilling and land leveling,	Vegetation restoration area
		Plant measures	planting grass for slope protection, planting trees and shrubs and grass seed sowing	Vegetation restoration area
		Temporary measures	Topsoil stripping, Woven bag block, Rainproof cloth covering, Drainage ditch	Drain ditches are arranged around the site
Traffic road area	Permanent road Permanent road	Engineering measure	Drainage ditch	subgrade
		Plant measures	planting grass for slope protection, sidewalk planting	Roadside slopes and roadside trees planted on both sides of the road
		Temporary measures	Woven bag block	Topsoil dump
	Temporary road	Engineering measures	topsoil backfilling and land leveling	Vegetation restoration area
		Plant measures	planting grass for slope protection, planting trees and shrubs and grass seed sowing	Road slope and vegetation restoration area
		Temporary measures	Topsoil stripping, Woven bag block, Drainage ditch, greening	Excavation backfill stonework Temporary stacking, Topsoil dump

7.5 Total investment of soil and water conservation is 4885.71*10^4 yuan.

Total investment of soil and water conservation is 4885.71*104 yuan, Among them, the main body has invested 740.06*104 yuan, the newly increased investment is 4145.65*104yuan. In the newly increased investment, 2383.94*104 yuan is for engineering measures, 589.14*104 yuan for plant measures, 273.36 *104 yuan for temporary project, 511.65 *104 yuan for independent fee(108.00 *104 yuan for supervision fees and 111.38*104 yuan for monitoring), basic reserve funds of 225.49 *104 yuan, and 162.07 *104 yuan for compensation for soil and water conservation facilities.

8. Environmental Management and Monitoring Program

8.1 Environmental Management

Environmental management, a part of engineering management, is an important link in the effective implementation of engineering environmental protection. In order to give full play to the figure of Bazizui Navigation and Hydropower Hub of economic benefit, social benefit and ecological benefit and to protect the ecological environment in the construction area, it should be the maximum reduction of adverse impact on ecology and environment so as to make the benign development of the ecological environment in the engineering construction area. In order to implement of various environmental protection measures made in Environmental Impact Statements, we must strengthen the environmental management during the construction and operation period of the project and establish and improve a complete environmental management system.

8.1.1 Aims of Environmental Management

(1)Ensuring that all environmental protection measures are implemented in accordance with Environmental Impact Statements and its replies as well as the requirements of the environmental protection design so that all environmental protection facilities are in normal and effective operation.

(2)Preventing the pollution accidents and ensuring all kinds of pollutants up-to -standard discharge and reasonable reuse. It is requires that the water, air and acoustic environment reach the standard of environmental quality requirements in the constructions area and the place around it.

(3)Minimizing the impact on ancient and rare trees during the program as required of the department responsible for ancient and rare trees.

(4) Preventing and mitigating effectively soil erosion and ecological destruction. Measures should be taken to restore the original soil and water conservation function and ecological environment quality.

(5)Carrying out health and epidemic prevention measures in the construction area and improving the epidemic management system and controlling the incidence of infectious diseases among the construction population so as to avoid the outbreak and spread of infectious diseases.

(6)Clarifying the relationship between project construction and environmental protection to ensure the smooth progress of the construction and promote the landscaping of the construction area.

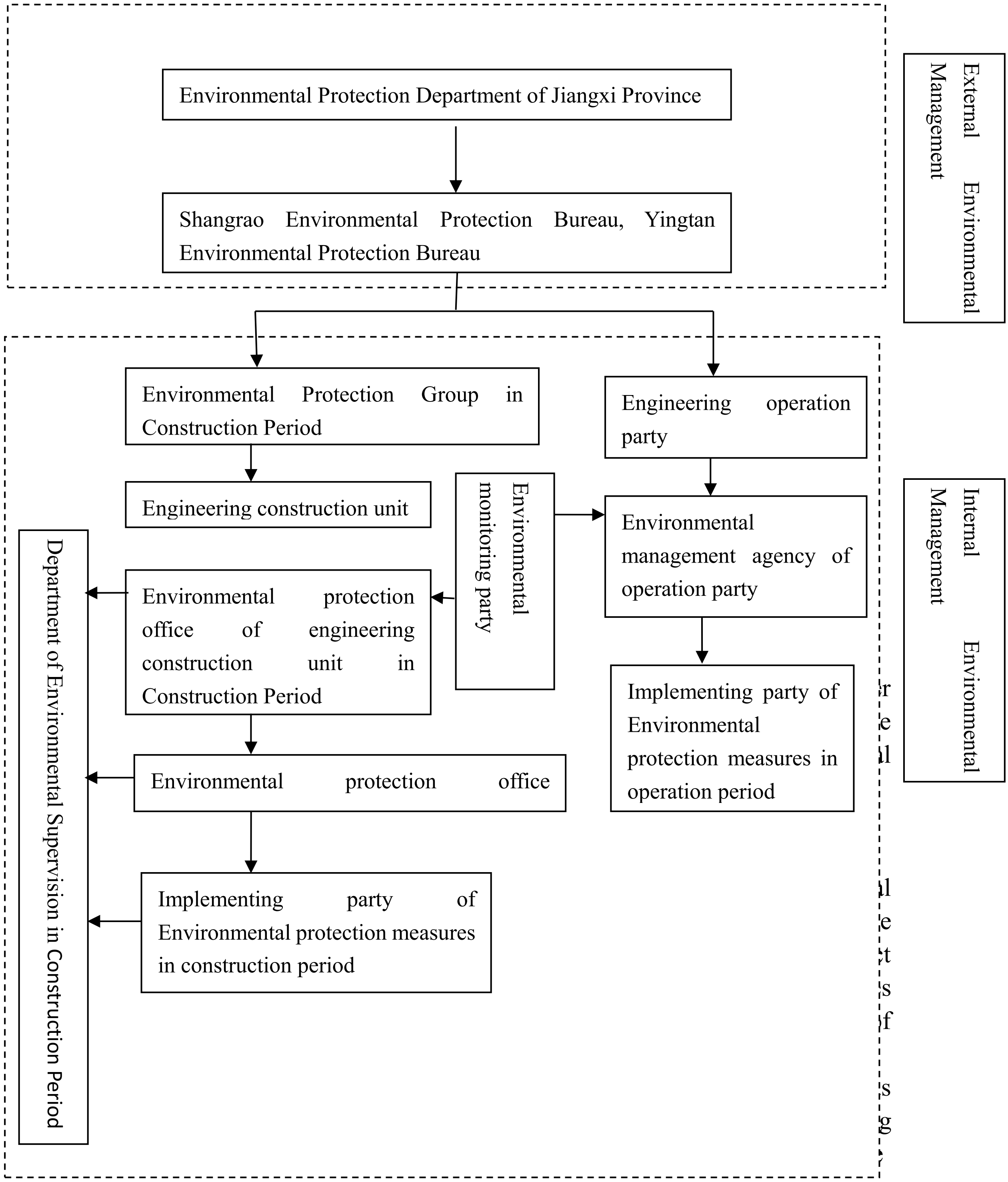
8.1.2 Environment Management System

Environmental management of Bazizui Navigation and Hydropower Hub is divided into two parts: external environment management and internal environment management.

External environment management refers that the state and the local administrative departments of environmental protection on the basis of the relevant national laws, regulations and policies, in accordance with environmental standards and requirements which the project should reach, carry out activities including non-regular supervision, checking, completion inspection and acceptance of environmental protection during all the construction periods.

Internal environmental management refers that the construction company conform to the national and local laws, regulations and policies relating to environmental protection and reach the environmental protection standards, and carry out the environmental protection measures and then manage the processes and activities during the project according to requirements of environmental protection. The internal management is divided into two stages: the construction period and operation period. During the construction period, the construction unit is responsible for the internal management. It makes optimization, organization and implementation of the environmental protection measures during construction period and ensures that they meet the national construction project environmental protection demands and requirements of the local environmental protection department. National and local people's congress and the Chinese People's Political Consultative Conference (CPPCC) are in charge of inspections with law enforcement. During the construction period, internal environment management system are composed of the development unit, construction unit, design unit and supervision unit which establish their corresponding mechanism responsible for environmental protection of construction. The project operation management unit is responsible during the operation period. It also makes optimization, organization and implementation of the environmental protection measures. The environmental management system of Bazizui Navigation and Hydropower Hub is shown in figure 8.1-1.

Figure 8.1-1 Bazizui navigation and electricity junction project environmental management system framework map



completion inspection and acceptance of environmental protection work. The main work content as follows:

1) Checking the design content of the engineering environment protection and the bidding contents;

2) Integrating the bidding design results of environmental protection measures into the bidding documents and contractors' contracts;

3) Making annual environmental protection work plan;

4) Reviewing and arranging of environmental protection work funds;

5) Supervising the implementation of the contractor's environmental protection countermeasures;

6) Arranging environmental monitoring;

7) Supervising the implementation of environmental protection measures for resettlement projects;

8) Preparing and writing the annual report on environmental protection;

9) Preparing and writing the project completion environmental protection acceptance report, the environmental investigation report and the post-environmental assessment report;

10) Other matters.

According to the related content in this report, the construction period of Bazizui Navigation and Hydropower Hub project includes the main environmental management tasks and the construction and implementation of requirements, the construction duration, accountability unit, owner responsibility, etc. All these can be seen in Table 8.1-1.

Table 8.1-1 List of major environmental management tasks during construction period of Bazizui navigation and electricity junction

Environmental Factor	Management Task	Implementation Method	Time	Implementing Agency	Owner Responsibility
Water Environment	Treatment of Wastewater from Gravel Concrete System	Reuse after being treated	Three simultaneous	Contractor	Responsible for the affair arrangements, the development of agreements, fee payment, supervision facilities operation
	Treatment Measures for Foundation Pit Drainage	Discharge into Xinjiang river after reaching the standard	Three simultaneous	Contractor	
	domestic sewage of Contractors and owner camps	Reuse after being treated	Three simultaneous	Contractor, owner	
	Mechanical Oily Wastewater Treatment	Reuse after being treated	Three simultaneous	Contractor	

Environmental Factor	Management Task	Implementation Method	Time	Implementing Agency	Owner Responsibility
Terrestrial ecology	Protection of old trees	Commissioned by professional bodies, three camphor trees which submerged in the project will be taken tracking monitoring and protection measures	Before the reservoir water storage	owner	Supervision of implementation management
	Wildlife protection	Strengthen publicity and management to the construction staff	Construction Period	Contractor	Urge the management, the development of the system
Aquatic ecology	Fish proliferation release	Construct fish proliferation and release station, discharge fry of the "four kinds of family fish" and other economic fish	Before and after the closure of the project	owner	Commission professional organizations to design, allocate fund in the implementation period
	Fishway	Commission professional institutions to design the fishway	Construction Period	owner	Supervision of implementation management
Ambient air	Dust Reduction and Control of Concrete System	Dust removal equipment	Three simultaneous	Contractor	Develop management requirements and quality standards, and monitor the situation
	Traffic dust reduction and control	Road cleaning, sprinkling water	Construction Period	Contractor	
	Construction site dust control	Road cleaning, sprinkling water and cover with dusting material	Construction Period	Contractor	
Sound environment	Fixed noise source control	Select low-noise mechanical equipment and technology; strengthen the construction equipment maintenance; reasonable arrangements for production time.	Before construction machinery and equipment putting into operation	Contractor	Develop management requirements and quality standards, monitor the situation, monitor the implementation of the results.
	Occasional noise control	Control blasting scale and blasting time	Construction Period	Contractor	Put forward controlling requirements
	Traffic noise control	In the traffic sensitive area, set up speed limit signs and embarrassment signs; select low noise vehicles; prohibit the speaker tweeter	Entering period and operation period	Contractor	Develop management requirements and quality standards, and monitor the situation
Solid Waste	Construction area waste disposal	Sorting, recycle metal, wood, paper, plastic and so on, send earth and stone to abandon slag field	The whole construction period	Contractor	Supervise and check

Environmental Factor	Management Task	Implementation Method	Time	Implementing Agency	Owner Responsibility
	Garbage disposal	Commission Yugan County sanitation sector to clear and handle	Implement immediately after officers entering the camp	Contractor or owner	Supervise and check
	Drinking water management	Water source protection, disinfection	Construction Period	owner	Develop protection measures, implement of water purification, monitor of drinking water and water quality

(2)Responsibilities during the Operation Period

1) Formulating annual environmental protection plan;

2) Implementing of environmental protection work funds;

3) Coordinating work relationship with other departments and arranging environmental monitoring;

4) Compiling the annual report on environmental protection work;

5) Being responsible for the completion and acceptance of environmental protection;

6) Being responsible for the post-environmental impact assessment of the project;

7) Other matters.

8.1.3.2 Environmental Supervision Organization

Environmental supervision organization must have supervision qualification. In accordance with the terms of the contract, the state environmental protection laws and regulations and policy requirements, it supervises and reviews as well as evaluates the implementation of various environmental protection measures of construction units according to the results of the environmental monitoring data and patrol. The construction actions of breach of contract terms and environmental protection requirements should be discovered and corrected in time.

8.1.3.3Contractor's Environmental Management Office

The construction unit sets up the Environmental Management Office. As the main responsibility agency and reception agency of environmental protection during construction period, the construction unit implements and undertakes the tasks of environmental protection in strict accordance with the terms of the contract and the content of environmental protection and soil and water conservation specified in bidding documents.

Contractor's Environmental Management Office is responsible for the implementation of the environmental protection countermeasures and measures specified in the bidding documents during construction period. It accepts the supervision and management of Environmental Management Office of the engineering construction unit. Its main work is as follow:

(1) Formulating annual environmental protection work plan;

(2) Implementing engineering environmental protection measures to deal with relevant problems in the construction process;

(3) Calculating and checking the use of annual environmental protection expenses;

(4) Examining the construction progress, quality and operation status of environmental protection facilities;

(5) Handling daily affairs.

The Environmental Management Office of the engineering construction unit is set up when the contractor enters into the field, and is withdrawn after the completion and the acceptance of the project.

8.1.4 Environmental Management Regulations

The establishment of perfect environmental management system is conducive to the supervision, management, implementation and emergency handling for environmental protection projects. The environmental management system of Bazizui Navigation and Hydropower Hub is mainly composed of the following aspects:

(1) Environmental Protection Accountability.

In the environmental protection management system, the environmental protection accountability should be established, and the environmental protection responsibility of each environmental management agency should be clarified.

(2) Hierarchical Management System.

In the construction bidding documents and contracts, the pollution prevention and control facilities and measures should be specified, and the construction contractor shall be responsible for their organization and implementation. The Environmental Management Office of the construction unit is responsible for regular inspection and reports the results. The environmental supervision unit is entrusted by the owner to carry out environmental management within the scope of the rights to supervise the environmental protection work of the construction contractor.

(3) Acceptance System of Three Simultaneities.

According to the Three Simultaneity Management Measures for Environmental Protection of Construction Projects, the pollution prevention and control measures in the construction process must be designed, constructed and put into operation simultaneously with the construction project. The Three Simultaneity projects cannot put into operation completely and officially until they are checked and accepted by the relevant departments in accordance with the contract. The facilities to prevent and control pollution should not be dismantled or left idle.

(4) Written System

All requirements, notices, rectification notices and comments in daily environmental management should be communicated and presented in written form or correspondence.

(5) Reporting System

Construction contractor submits regularly environmental monthly, semiannual and annual reports, to the Environmental Management Office of construction unit and environmental supervision department. These reports should involve the contents of the implementation of the environmental protection and execution, the correction scheme and results for problems that occurred in the implementing process. The environmental supervision department regularly reports the environmental protection status and supervision progress of the construction area to the Environmental Management Office of the construction unit and submits the supervision monthly, semiannual and annual reports. Environmental monitoring unit submits regularly environmental monitoring report to the Environmental Management Office of construction unit. The Environmental Management Office of construction unit should entrust relevant technical units for environmental assessment during construction period and require them to provide the assessment quarterly and annual reports.

8.1.5 Environmental Monitoring Program

The specific supervision work of the environmental supervision and management plan of the Bazizui Navigation and Hydropower Hub is described in detail in table 8.1-2.

Table 8.1-2 Environmental monitoring plan of Bazizui navigation and electricity junction

Stage	Institution	Content of supervision	Purpose of supervision
Feasibility study stage	Environmental Protection Department of Jiangxi Province, Jiangxi Provincial Department of Water Resources	1. Approval of environmental impact report. 2 approval of soil and water conservation program report	1. To ensure that the EIA content is comprehensive, the topic is set properly, the focus is outstanding. 2. To ensure that major, potential problems which the project may have been reflected. 3. To ensure that environmental impacts are mitigated are viable and feasible.
Design and construction stage	Environmental Protection Department of Jiangxi Province,	1. Review the preliminary design of environmental protection. 2. Check whether the environmental investment is implemented. 3. Check contaminant emissions, control	1. To strictly enforce the "three simultaneous". 2. To ensure environmental protection investment. 3. To reduce the impact of construction on

	Shangrao Environmental Protection Bureau, Yingtan Environmental Protection Bureau, Yugan County Environmental Protection Bureau	and treatment. 4. Check the construction of the construction area of the choice and recovery. 5. Check environmental protection facilities at the same time, determine the final period and whether the environmental protection facilities meet the standard requirements.	the surrounding environment, the implementation of relevant environmental regulations and standards. 4. To ensure that the construction site to meet environmental requirements, and resources are not seriously damaged. 5. Check and accept of environmental protection facilities.
Operation Stage	Department of Jiangxi Province, Shangrao Environmental Protection Bureau, Yingtan Environmental Protection Bureau, Yugan County Environmental Protection Bureau and police department and fire deparment	1. Check the implementation deadlines for the monitoring plan. 2. Check whether it's necessary for further environmental protection measures (possible undetected environmental problems.) 3. Check whether the environmental quality of the environmentally sensitive areas meet the corresponding quality standards. 4. Check the service area sewage treatment. 5. Strengthen the supervision to prevent accidents, eliminate the hidden dangers of accidents, pre-developed emergency program, in case of accidents can promptly eliminate dangerous and highly toxic materials leak. 6. Environmental acceptance. 7. Review the environmental impact assessment.	1. Implement the monitoring plan. 2. Protect the environment effectively. 3. Strengthen the environmental management, and effectively protect the population health. 4. Ensure that the effluent discharge meets the emission standards. 5. To eliminate the hidden dangers of accidents, to avoid the occurrence of malignant pollution of environmental events. 6. Acceptance of environmental protection measures. 7. Summarize the EIA work of this project.

8.1.6 Acceptance Plan for Environmental Protection Project

According to the Three Simultaneity Management Measures for Environmental Protection of Construction Projects, the pollution prevention and control measures in the construction process must be designed, constructed and put into operation simultaneously with the construction project. The Three Simultaneity projects cannot put into operation completely and officially until they are checked and accepted by the relevant departments in accordance with the contract. Moreover, the facilities to prevent and control pollution should not be dismantled or left idle.

According to the implementation requirements of environmental protection in this project, the acceptance plan of the environmental protection project of Bazizui Navigation and Hydropower Hub is as follows:

8.1.6.1Acceptance of Environmental Protection Project during the Construction Preparation Period

It carries out the civil case acceptance mainly on usage of environmental protection facilities during the construction period, such as wastewater treatment facilities civil engineering of the main project sandstone concrete system, sewage treatment facilities civil engineering and the speed limit and no tooting signs. The acceptance is carried out in late stage of the construction preparation period.

8.1.6.2Acceptance of Environmental Protection Project during the Construction Period (before impoundment)

(1)Acceptance of Operation of Environmental Protection Facilities during the Construction Period

It mainly checks the operation of the supporting environmental protection works during the construction stage, such as the acceptance of the operation of the wastewater treatment facilities on the left and right side of the sandstone concrete system, the acceptance of the operation of the life sewage treatment facilities in the owners' camp and the Contractor's camp.

(2) Acceptance of Partial Environmental Protection Civil Engineering During the Construction Period

During the construction period, the acceptance of environmental protection works is mainly based on the environmental protection facilities to be built during construction period, so as to implement and urge them to build in time according to requirements, such as civil works of fish breeding stations, ancient trees and rare plants transplant projects.

Acceptance of the Operation Period of the Environmental Protection Project During the Construction Period

It is mainly aimed at acceptance of construction of slash disposal under the submerged line as well as measures of water and soil conservation projects.

8.1.6.3 Acceptance of Environmental Protection Project for Completion of Engineering Completion

It is the acceptance of the environmental protection project after completion of the project. According to the relevant provisions of Acceptance Measures of Environmental Protection Management of Construction Project, the acceptance includes all environmental protection facilities in Bazizui Navigation and Hydropower Hub, such as treatment system and monitoring of sewage and wastewater, fish breeding station, ecological protection and monitoring measures.

The key points for acceptance of completion of environmental protection project at each stage of the Bazizui Navigation and Hydropower Hub are shown in table 8.1-3.

Table 8.1-3 A list of key contents of acceptance of environmental protection at each stage

of Bazizui navigation and electricity junction

Stage	Important Location	Important Content
Construction Preparation period	Aggregate processing system, concrete mixing system	Whether environmental design waste water treatment and reuse facilities are built at the same time and the operation is normal; Whether low noise equipment and other noise reduction facilities are used; Whether low-dust process and sprinkler measures are used; Whether soil and water conservation measures are taken.
	Owner camp, contractor camp	Whether the domestic sewage treatment facilities are completed at the same time and the operation is normal; Whether it is equipped with garbage collection measures; Whether it is centralized water supply, drinking water disinfection, allocation of drugs; Whether the soil and water conservation measures are taken.
	Hub dregs	Whether it is sprinkled with water; Whether soil and water conservation measures are taken.
	Field traffic	Whether sound insulation screen, speed limit ban is built; Whether it is sprinkled with water; Whether the vehicle is maintained, strictly prohibited, and forced to update the scrapped system; Whether soil and water conservation measures are taken.
Construction period	Aggregate processing system for gravel	Wastewater treatment and reuse facilities operating conditions, entrance and exit of major pollutant concentration, wastewater treatment rate; Sprinkler dust frequency, atmospheric environmental quality Sound environmental quality; Soil and Water Conservation Measures and Soil and Water Conservation Monitoring.
	Concrete mixing system	
	Mechanical repair station and car park	Wastewater treatment and reuse facilities operating conditions, entrance and exit of major pollutant concentration, wastewater treatment rate.
	Project Management Center, Contractor Camp	The operation status of domestic sewage treatment facilities, the concentration of major pollutants in the entrance and exit, the sewage treatment rate; Garbage collection, centralized transportation, cost Whether old trees camphor tree and rare plant camphor trees are transplanted and fish proliferation station is built; Soil and Water Conservation Measures and Soil and Water Conservation Monitoring.
	Xinjiang river tributaries	Water quality; Whether the fishway measures are synchronized; Warehouse bottom is clean, acceptance under the gate water storage.
	Right bank I1 soil yard Left bank I2 soil yard	Watering frequency; Atmospheric environment and sound environmental quality; Soil and Water Conservation Measures and Soil and Water Conservation Monitoring.
	Hub dregs	Watering frequency; Atmospheric environment and sound environmental quality; Soil and Water Conservation Measures and Soil and Water Conservation Monitoring.
	Field traffic	Sound insulation screen, the effect of speed control measures, sound environmental quality; Watering frequency, atmospheric environmental quality，

Stage	Important Location	Important Content
		Road maintenance status; Soil and Water Conservation Measures and Soil and Water Conservation Monitoring.
	Others	Whether the establishment of environmental protection management agencies, related management, supervision, monitoring personnel, system, report is complete.
Trial operation period	Project Management Center, Contractor Camp	Number of garbage collection transportation and cost Whether ancient trees camphor tree and rare protected plant camphor are transplanted, fish proliferation station operation and management status.
	Xinjiang river tributaries	Water quality; The effect of fishway and the implementation of fishery stations. Vegetation restoration status.
	Right bank I1 soil yard Left bank I2 soil yard	Vegetation restoration status.
	Hub dregs	Land remediation and vegetation restoration.
	Field traffic	Sound environmental quality, atmospheric environmental quality.
	Others	Environmental protection supervision report, the completion of water and soil acceptance report.

8.2 Environmental Supervision

8.2.1 Supervision Purposes

During the construction of Bazizui Navigation and Hydropower Hub, according to the design requirements for engineering environmental protection, we should supervise the implementation of the disposal system of the waste sewage outlets and carry out the environmental supervision during the construction period. It is commissioned by the owners to manage the engineering environment on behalf of the owners within the authorized scope of the owners. We shall comprehensively supervise and inspect the implementation and effects of environmental protection measures of all construction units and timely handle and coordinate the sudden emergencies of environmental pollution and ecological damage during construction.

8.2.2 Scope of Supervision

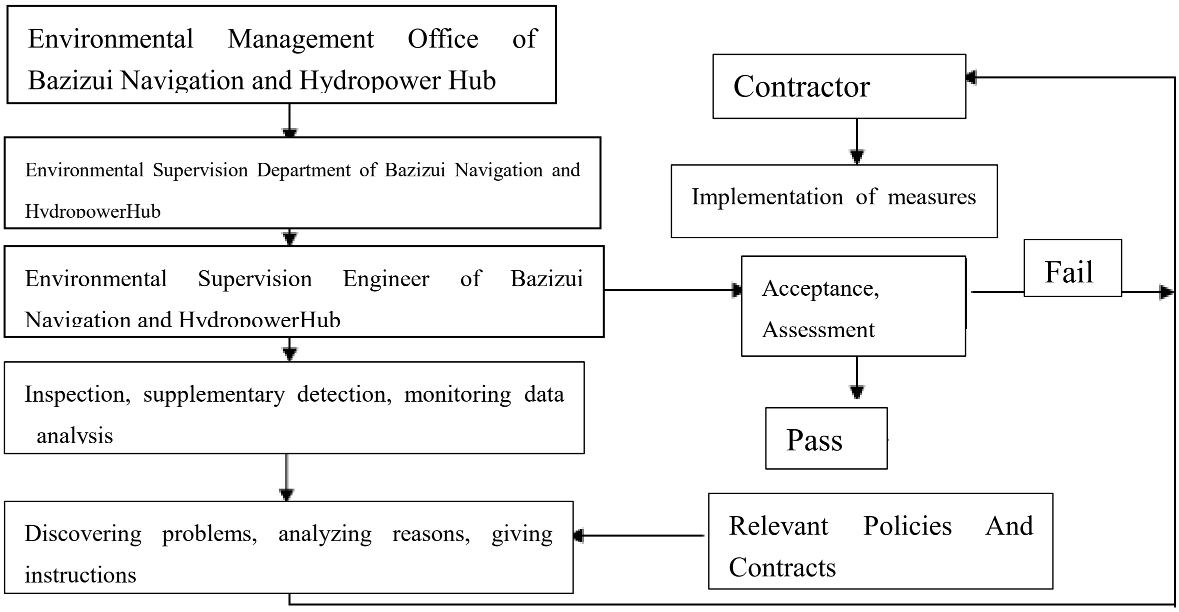
The scope of environmental supervision of construction area of the Bazizui Navigation and Hydropower Hub includes all areas which cause environmental pollution and ecological destruction which are the construction sites contracted by contractor and its subcontractors, production area, living camp, construction road, the owners camps (specifically refers to the area of construction land within the red line).

8.2.3 Organizations and Mode of Work

Environmental supervision is an important part of environmental management but has its relative independence. Therefore, the environmental supervision organization is belonged to the environmental management organization named the Environmental Supervision

Department.

Organizational settings and working procedures are shown in figure 8.2-1



8.2-1 Environmental supervision organization and working procedures of Bazizui Navigation and Hydropower Hub

8.2.4 Supervision Contents

Supervision contents include to observe the principles, policies, laws and regulations of the state and local governments on environmental protection and to supervise contractors to implement the environmental protection clauses in the project contract. The main responsibilities are:

(1) To compile environmental supervision plan and to draw up environmental supervision projects and contents.

(2)To supervise the contractor's construction activities to prevent and mitigate the damage of construction operations to vegetation and wild life and prevent the occurrence of forest fires and environmental pollution incidents.

(3)To supervise comprehensively and inspect the implementation and effects of environmental protection measures of all construction units and timely handle and coordinate the sudden environmental pollution and ecological damage during construction.

(4) To inspect comprehensively construction unit’s treatment in the slag field and the construction land and its recovery, including the recovery of slope stability and land greening measures and effects etc,.

(5)To conduct environmental monitoring and to review the relevant environmental reports. According to the monitoring results of water quality, atmosphere and noise, it put forward corresponding requirements for engineering construction and management so as to minimize the adverse impact of engineering construction on the surrounding environment.

(6)To make a good supervision record and report record in the daily work and to organize quality assessment and participate in the completion of acceptance.

8.2.5 Supervision Work System

(1)Work Record System

Environmental supervision engineer, according to the work performance, takes notes (supervisory diary) which focuses on the inspection situation in the field of environmental protection work. The reports should also point out the existing environmental problems and responsibility units and analyze reasons so as to put forward suggestions and treatment results.

Supervision Report System

It should organize and compile monthly report, quarterly report, semi-annual report, annual report and environmental monthly report of the contractor and submit them to the environmental management office of the construction unit.

Correspondence System

The environmental problems found by the supervision engineer during the field inspection shall be issued and notify the contractor to correct or deal with them in time. The supervision engineer shall notify them in written form for the requirements on environmental protection. In case of an emergency, an oral notice must be confirmed in a written letter.

The System of Environmental Meetings and the Issuing System of Meeting Minutes

Environmental meetings should be convened in each month and the contractor reviews and sums up environmental management on the corresponding stage of the contract. The supervision engineer conducts a comprehensive review on the environmental protection work of each contractor during this month. Meeting minutes

Should be compiled after the meeting and sent to the participating parties to urge the relevant units to obey.

If there are serious environmental pollution and ecological damage accidents, the environmental supervision engineer shall organize the investigation and work together with the construction units and local environmental protection departments to study the treatment plan, and issue it to the contractor for implementation.

8.3 Ecological and Environmental Monitoring

8.3.1 Monitoring Purposes

(1) Controlling the dynamic changes of the main project area and reservoir inundated ones so

as to provide scientific basis for the environmental pollution control and environment management during the construction and operation period.

(2) Timely mastering the effects of environmental protection measures in order to avoid the damages of emergent accidents on the environment and providing the basis for acceptance of environmental protection for the project completion.

8.3.2 Monitoring Principles

There are many environmental factors for the monitoring of the Bazizui Navigation and Hydropower Hub, and following principles should be abode by when environmental monitoring plans are formulated:

(1) The principle of close integration with engineering construction

The scope, object and key of the monitoring should be combined with the characteristics of construction and operation as well as the distribution of the surrounding environment sensitive point; thus the influence of environmental changes on the construction and operation can be showed and the effects of the construction and operation on the surrounding environment sensitive point can be reflected in time.

(2) The principle of pertinence and representativeness

According to the environmental status quo and evaluation results of environmental impact prediction, we should strive for a targeted and representative plan by monitoring main factors featuring controllability, representativeness and can have great influence on the environment.

(3) The principle of economy and operability

Meet main tasks of the monitoring system on the basis of relevant professional technical specifications, monitoring projects, frequency, periods and methods. Make full use of the existing monitoring institutions nearby while setting up new sites which is highly operable; thus less input can result in more complete environmental monitoring data.

(4) The principle of unified planning and step-by-step implementation

Monitoring system should be planned in a unified way with full consideration. With various focus and requirements in different stages of the project, the system should be established, implemented and improved step by step.

8.3.3 Monitoring Overall Layout

Combined with the purpose and environmental factors of monitoring as well as the conclusions and measures of environmental impact assessment of the project, the environmental Monitoring system of the Bazizu Navigation and Hydropower Hub, including the environmental monitoring of main project and monitoring subjects , is shown in Figure 8.3-1.

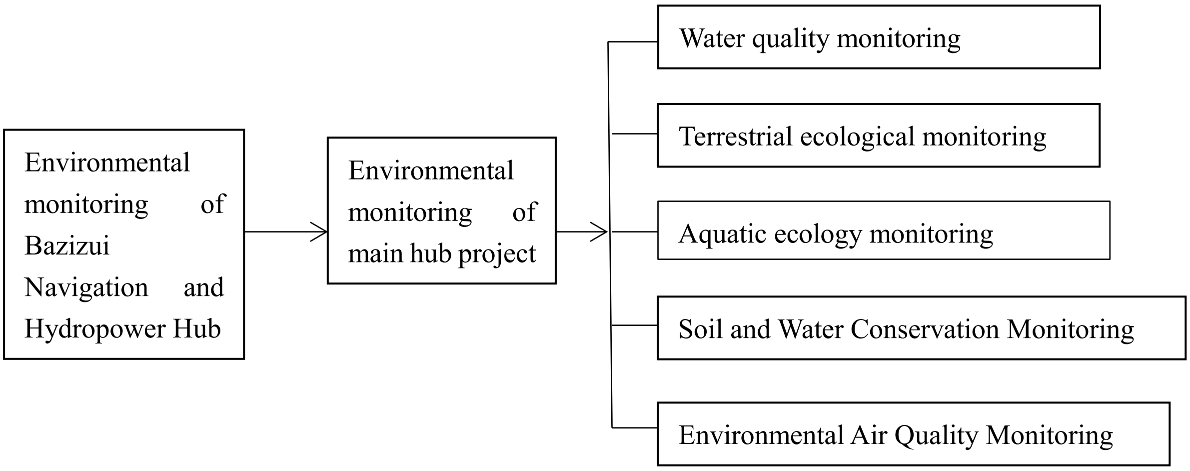


Figure 8.3-1 Environmental Monitoring Projects Composition of Bazizui Navigation-Power Junction

8.3.4Environmental Monitoring of Main Hub Project

According to the environmental status and environmental impact prediction of the main hub in Bazizui Navigation and Hydropower Hub, the environmental monitoring factors include water temperature, water quality, hydrology, sediment, terrestrial biology, aquatic organism, soil and water conservation, environmental air and noise and geological hazards. The hydrological and sediment monitoring is completed by the Hydrological Information Station of the hub, and the geological hazard is completed by the local seismic observatory.

8.3.4.1 Water Quality Monitoring

(1) Water Quality Monitoring During Construction Period

① Wastewater Monitoring

According to the analysis result of pollution source in construction period, ensure that the objects of wastewater monitoring are sand flushing wastewater and living sewage in construction living area. The purpose of monitoring is to confirm the operation effect. The site, projects, time and method of construction wastewater monitoring are detailed in table 8.3-1 and fig. 28.

Table 8.3-1 the Construction Wastewater Monitoring Scheme of Bazizui Navigation and Hydropower Hub

Monitoring targets	Monitoring points	Monitoring parameter	Monitoring time and frequency	Monitoring methods	Comment
Wastewater	Sand stone	SS and	Monitoring	*Technical*	Monitor the

resulting from sand processing and production	processing system and facilities at the entrance and the exit of the eyot.	wastewater treatment capacity; recycling whereabouts and recycling amount.	when sands and stones are regularly produced, monitoring and twice a year. Construction peak year and normal construction year should be chose to monitor.	*Specifications for Surface Water and Sewage Monitoring* (HJ/ t91-2002) and *Surface Water Environmental Quality*	recycling standard of waste water after treatment and the treatment effect of sewage.
Living sewage	Construction living area sewage outlet	PH, CODcr, BOD5, total nitrogen, total phosphorus, ammonia nitrogen, LAS, fecal coliform, SS and sewage treatment capacity; recycling whereabouts and recycling amount.	A 29-month construction period; monitoring 4 times per year (once a quarter).		

② Surface water Monitoring

The site, project, time and method of surface water monitoring during construction period are detailed in table 8.2-2 and fig. 28 in light of the flow state of the river.

Table 8.2-2The Surface Water Monitoring Scheme during Construction Period

Monitoring section		Monitoring projects	Monitoring time and frequency	Monitoring methods
Contrast section	1.0km upstream of the dam	PH, SS, dissolved oxygen, CODMN, BOD5, CODcr, ammonia nitrogen, petroleum, fecal coliform	A 29-month construction period; monitoring 3 times per year (respectively in wet, normal and dry season), each	*Environmental Monitoring Technical Specifications* and *Surface Water Environmental Quality*
Control section	2.0km downstream of the east river dam			
	2.0km downstream of the west river dam			

			monitoring for 2 days.	

(2) Water Quality Monitoring During Operation

1) Surface water

Monitoring and timely mastering reservoir water quality, improve the safety and reliability of water resources utilization. According to the operation characteristics of the Bazizui Navigation and Hydropower Hub, six water quality monitoring sections being affected by the project and the surface water quality monitoring during running period are detailed in table 8.3-3.

Table 8.3-3The Surface Water Quality Monitoring Scheme during Running Period

Monitoring section		Monitoring projects	Monitoring time and frequency	Monitoring methods
The storage section	Baita river crossing, about 37km upstream of the dam site	A total of 15 bacteria including pH, dissolved oxygen, permanganate index, chemical oxygen demand, BOD5, ammonia nitrogen, total phosphorus, total nitrogen, arsenic, mercury, hexavalent chromium, volatile phenol, petroleum, chlorophyll a and fecal coliform.	During the first and the second year of reservoir filling to two years after the completion of construction, the reservoir is continuously monitored. Monitor through sampling once every season including the wet, normal and dry seasons.	*Environmental Monitoring Technical Specifications* and *Surface Water Environmental Quality*
Meigang town Zhongnian water plant water intake	On the left bank of Xinjiang river,24.5km upstream of the dam site			
Huagjinbbu Industrial Park water plant water intake	On the right bank of Xinjiang river,26km upstream of the dam site			
Yangbu town Caiyuan water plant water intake	On the right bank of Xinjiang river, 8.9km upstream of the dam site			
Daxi town Shenling water plant water intake	On the left bank of Xinjiang river,4.2km upstream of the dam site			
Cross section in the front of the dam	About 1.0km upstream of the dam site			
Outbound section	1.0km downstream of			

	east Xinjiang river dam			
	1.0km downstream of west Xinjiang river dam			
Baimaqiao town Gaoyuan water plant water intake	On the right bank of east Xinjiang river, about 7.5km downstream of east Xinjiang river dam			
Tributary Baita	500m upstream of Baita River into the mouth of Xinjiang river			

2) Groundwater

① Monitoring points layout:

Five dynamic observation wells in the groundwater level (mainly using the existing civil wells) were established (detailed in table 8.3-4) in accordance with the relevant requirements of the Technical Specification of Groundwater Environmental Monitoring (HJ/T164-2004) and combined with the characteristics of aquifer and groundwater runoff in the evaluation area. To fulfill it, the effects on the groundwater quality, water level and sensitive objects in the evaluation area during the project running period were considered, and the representativeness and operability of the monitoring points were took into account. Four out of five wells are prepared for monitoring the dynamic changes of groundwater level and water quality when reservoirs were impounded, while the other one which is in Tangbei village mainly monitors the change of groundwater level and the influence of Yugan County municipal solid waste landfill on the groundwater quality.

② Monitoring Program

The groundwater monitoring scheme during running period is detailed in table 8.3-4.

Table 8.3-4 The Groundwater Monitoring Scheme during Running Period

Number	Location (village)	Town	Monitoring level	Frequency of groundwater lever	Frequency of groundwater quality	Monitoring projects
G1	Daxi village	Daxi town	Pore water	Observe occasionally	During the first year to	Color, smell and taste,
G2	Hebu village	Yangbu town				

G3	Pingshang village	Xiashan town		the change of groundwater level in the affected area of the reservoir.	the 2nd year of reservoir filling, the reservoir is continuously monitored. Monitor through sampling once every season including the wet, normal and dry seasons.	turbidity, pH, total hardness, total soluble solids, ammonia nitrogen, nitrate nitrogen, nitrite nitrogen, volatile phenol, permanganate index, fluoride, arsenic, mercury, cadmium, hexavalent chromium, iron, manganese, lead and coliform bacteria
G4	Tangbei village	Huangjinbu town				
G5	Laowuyujia	Meigang town				

8.3.4.2Terrestrial Ecological Monitoring

(1) Terrestrial Ecological Investigation

1) Investigation scope: zones, reservoir and surrounding areas (2km outreached reservoir submerged line).

2) Investigation contents: Terrestrial flora and fauna composition, distribution and its quantitative status, biodiversity (including species diversity and habitat diversity) and its changes, vegetation restoration, the status and changes of national key protection of wild flora and fauna population, landscape ecological system structure and its changes.

3) Investigation periods: 3 times in sum. One is before the reservoir closure, one is in the year the project was completed, and the last one is in the 5th year after the completion of the reservoir.

(2) Ancient tree monitoring

Track and supervise the monitoring measures of ancient trees in inundated areas, mainly including the growth of the ancient trees after reservoir impounded. Increase the observation hole of the groundwater level in the location of the ancient trees to timely observe the changes of water levels and the growth of the plants. Tracking and monitoring period lasting for five years since the reservoir filled.

8.3.4.3 Aquatic Ecological Monitoring

(1) Monitoring contents

1) Habitat Condition Monitoring

Water temperature, dissolved oxygen, ph value, transparency, depth and flow rate.

2) Aquatic biological Monitoring

The species, distribution density and biomass of plankton, sessile organisms, benthic animals and aquatic vascular plants.

3) Fishes sets and population dynamics

The species, population structure and quantity of fishes, especially monitoring the population dynamics of the fishes spawning in water.

4) Fish way fish effect monitoring

Monitoring the number, species, main time of fish passing through the fish way, the hydrological conditions in the fish way.

(2) Monitoring and investigation areas

1) Habitat conditions and aquatic biological monitoring

An Aquatic ecological Monitoring section was set up at the Bazizui reservoir area and the downstream of the east and west dam site in the Xinjiang River.

2) Fish sets and population dynamics

Focus on regional monitoring and mainly monitor the reservoir area.

3) Fish way fish effect monitoring

Monitor the fish way in the observation room.

(3) Frequency and duration of monitoring and investigation

From the first year of the reservoir filling, three aquatic ecological environment monitoring was conducted in April, July and December of each year for five consecutive years.

8.3.4.4 Environmental Air Quality Monitoring

1) Monitoring point location

Two monitoring points should be set up, one in the Waixiong village (on the right bank of dam site) and the other in Chou fan (on the left bank of the dam site).

2) Monitoring project

In view of the large number of construction machinery and excavation blasting, monitoring subjects like NO2, TSP, PM10, PM2.5 and so on.

3) Frequency of monitoring

Monitor once a year during construction of the two monitoring sites. NO2, TSP and PM10 should be monitored continuously for 7 days with no less than 18 hours a day.

8.3.4.5 Acoustic Environment Monitoring

(1) Regional environmental noise monitoring

1) Monitoring Point location

Three monitoring points should be set up, one in the Waixiong village (on the right bank of dam site), one in Chou fan (on the left bank of the dam site) and the last in Loubu village. The distribution of construction sites should be combined with the engineering activities and take into consideration the changes of construction situation.

2) Frequency of monitoring

During the construction period, it should be monitored for 4 years with 3 times per year and 2 full days (24 hours) every time (including working days and rest days).

(2) Traffic noise monitoring

1) Monitoring Point location

One monitoring point should be set up in the adjacent bay of the East River construction temporary pavement.

2) Frequency of monitoring

During the construction period, it should be monitored for 4 years with 3 times per year and the traffic flow should be recorded meanwhile.

9. Estimation of Investment Budget and Analysis on Economic Benefits and Losses of Environmental Impact

9.1 Environmental Investment Budget

The investment of environmental protection in this project includes three parts: the investment of environmental protection engineering of the main project, the investment in soil and water conservation and the investment of the special environmental protection projects.

According to the Compilation and Calculation Standard of Hydropower Engineering Design Budgetary Estimate (2007 Edition), the investment of the special environmental protection projects is divided into 3 parts: hub project, construction land acquisition and resettlement as well as independent cost.

The environmental protection investment of hub project includes water environmental protection fee, terrestrial ecological protection fee, aquatic life protection fee, air environmental protection fee, sound environmental protection fee, solid waste treatment engineering fee, population health protection fee and environmental monitoring fee. The environmental protection project fee for land acquisition and resettlement includes water environmental protection fee, terrestrial animal and plant protection fee, domestic waste treatment project fee, population health protection fee and environmental monitoring fee. The independent cost includes the project construction management fee, the production preparation fee, the research and design fee and the basic reserve fee.

The total investment in environmental protection and soil and water conservation is 88.6669 million yuan, of which 39.888 million yuan is invested in environmental protection project and 48.8571 million yuan for soil and water conservation investment.

The budget for environmental protection of the project is detailed in Table 9.1-1.

Table 9.1-1 The environmental protection budget of Bazizui Navigation and Hydropower Hub unit: ten thousand yuan

Number	Names of projects and fee	Investment New investment	Notes
Part：Environmental protection measures of the project		2128.34	
i	Hub area	1395	
1	Proliferating station	800	
2	Artificial fish nest	60	
3	Fish way		Incorporation of the project quantity of the main body of the hub
4	Protection of ancient trees	20	

Number	Names of projects and fee	Investment	Notes
		New investment	
5	Fish multiplication		Included in the project freight charge.
6	Protection of water intake in reservoir area	500	
7	Solid waste disposal	15	
ii	Protection area	733.34	
1	Bank revetment project		Incorporate the main project
2	Embankment project	78.18	
3	Drainage pumping station project	318.14	
4	Tree transplantation project	337.03	
5	Comprehensive maintenance and management fee		Included in the operation cost of the project
Part II：The costs ecological and environmental monitoring		190	
i	Ecological and environmental monitoring costs during the construction period	190	
1	Environmental monitoring during construction period	110	
2	Ancient trees monitoring	20	
3	Terrestrial ecological monitoring	20	
4	Aquatic ecological monitoring	40	
ii	The cost of ecological and environmental monitoring during the operation period		A total of 3.6 million Yuan, included in the project operation fee
1	environmental monitoring during the operation period		A total of 1.1million Yuan, included in the project operation fee
2	Terrestrial ecological monitoring		A total of 200 thousand Yuan, included in the project operation fee
3	Aquatic ecological monitoring		A total of 400 thousand Yuan, included in the project operation fee
4	Research on Aquatic Ecological Science		A total of 1 million Yuan, included in the project operation fee
5	Aquatic ecological post assessment		A total of 1 million Yuan, included in the project operation fee
Part III：Equipment and installation		238	
1	Management station domestic sewage treatment system	40	
2	Domestic sewage collection and treatment system	15	
3	Oil sewerage treatment system	20	
4	warning sign	8	
5	Accessory equipment	75	oil containment boom, Buoy, anchor, anchor line
6	Oil absorbent felt 2t、one Oil Machine	80	
Part IV：Temporary measures		985	
i	Hub area	860	

Number	Names of projects and fee	Investment New investment	Notes
1	Water environment protection during construction period	680	
2	Atmospheric environmental protection	55	
3	Acoustic environment protection	30	
4	Solid waste disposal.	70	
5	Population health protection	25	
ii	Protection zone	125	
1	Cost of environmental protection during construction period.	80	
2	Ambient air cost	15	Sprinkler costs
3	Cost of solid waste treatment during construction period	20	
4	Population health	10	
Total of Part I ~ IV part		3541.34	
Part V：Independent cost		250.07	
1	Construction unit management fee	106.24	Calculating according to 3% of project cost.
2	Engineering construction supervision fee	60	Calculating by 100 thousand Yuan per person per person per year
3	Research and survey design fee	106.24	Calculating according to 3% of project cost.
4	Environmental impact assessment fee		Having been included in the independent cost of the project budget
Total of Part I ~ V part		3791.41	
Part VI：Basic reserve fee		189.57	According to the 5% total of part I ~ partV
Investment in environmental protection special projects		3980.98	

9.2 Analysis on Economic Benefits and Losses of Environmental Impact

Economic profit and loss analysis of environmental impact is to use the principle of environmental economics to analyze the project environmental benefits and losses by the cost-benefit analysis method on the premise of sustained, stable and coordinated development of the project construction and ecological environment, social environment and regional social economy. The rationality of project construction is judged from the environmental protection perspective according to the ratio of benefit/expense ratio.

9.2.1 Profits

9.2.1.1 Economic benefits (see Economic Analysis)

9.2.1.2 Environmental benefits

（1）The environmental benefits of hydropower's substitution for thermal power

The installed capacity of the Bazizui navigation and electricity junction is 12.6MW, and the average annual generating capacity is 45.03 million kW · h. According to the principle of equivalence, the alternative economic method is used to calculate the environmental economic benefits caused by the reduction of the pollution load. 4535 million kWh can save about 15,000 tons of standard coal. According to the per ton of standard coal combustion emissions of carbon dioxide of 2620kg, sulfur dioxide 8.5 kg and nitrogen oxide 7.4 kg, once Bazizui navigation and electricity junction put into operation, CO_2 emissions of about 3.93 Million tons can be reduced, C emissions of 137,000 t, O_2 emissions of about 0.013 million t, nitrogen oxide emissions of about 0.011 million tons can be reduced. According to the relevant statistics, China's thermal power plant desulfurization operation costs are generally 6,000 yuan / t, which means the annual savings of about 37.41 million yuan is saved. It can be seen that the replacement of the same scale thermal power plant can produce greater environmental and economic benefits.

(2) Environmental benefits arising from channel improvement

After the completion of the Bazizui navigation and electricity junction, the channel can be channeled in the reservoir area, improvement of the shipping conditions, transport ship will be developed towards to large-scale, standardization, serialization direction. Channel conditions will be improved and the operation of the ship will be greatly improved as well and the operating efficiency will be greatly reduced. According to the survey of the status quo of shipping, the existing shipping cost of the ship in the middle and lower reaches of the mouth is 0.2638 yuan/t · km and the fuel consumption is reduced by 30% ~ 40%. After analysis, after 2021, fuel consumption will be saved about 23,000 t. At the same time, due to the hinterland cargo travel distance and unit cargo energy consumption is much lower than the highway and railway, a large number of goods go through the waterway into the middle and lower reaches of the Yangtze River can reduce the oil, coal and other non-renewable resources consumption.

(3) Other environmental benefits

The terrestrial eco-protection measures of this project include the restoration of construction site vegetation, the transplanting of old trees and rare plants of camphor tree and the construction of reserve ancient tree groups, which not only restores part of the vegetation, but also relocates old trees and reserve ancient trees to provide better ecological profits.

The aquatic ecological protection measures for this project include the protection of aquatic habitats, the proliferation and release of fish proliferation and discharge stations, and the provision of fishway for fish. This not only provides a better habitat protection and resource multiplication for the fish in the reservoir area above the Bazizui dam site, but also provides the conditions for the exchange of fish germplasm and artificial breeding of the upstream and downstream of the dam.

The above environmental benefits are difficult to monetize and are not included in the schedule.

9.2.1.3 Social Benefits

(1) After the construction of Bazizui navigation and electricity junction, the average annual generating capacity of electric power plants will reach 45.03 million kW · h, with an average annual generating benefit of 461.79 million yuan.

(2) Jiangxi province is a coal-scarce region. After the construction of the navigation and hydropower hub, it can replace 45.35 million kW · h of thermal power so that the power system can reduce the annual consumption of standard coal by 16,500 tons which is equivalent to 23,100 tons of raw coal and reduce the coal shortage in this area.

(3) After the construction of the navigation and electricity junction, the 49km waterway in the reservoir area can be improved to promote the development of the shipping business in the area.

(4) After the construction of the navigation and electricity junction, it can also improve the external economic environment conditions such as local energy and transportation, promote the local economic development and improve the investment environment where the project is located. It is conducive to attracting investment and promoting the development of the secondary and tertiary industries in the area so that people can improve living standards and improve cultural quality.

9.2.2 Loss

To take the reduce of the project adverse environmental impact or protection for recovery and compensation for environmental benefits and compensation costs as a reflection of the loss degree of environmental impact to calculate the value of its loss. Among the various types of losses brought by the construction of Bajianzui navigation and electricity junction, it can be monetized mainly by reservoir inundation and project permanent land occupation, environmental protection measures and compensation costs.

9.2.2.1 Land acquisition loss

According to the requirements of relevant national policies, regulations and technical specifications as well as the inundation indicators of Bazizui navigation and electricity junction reservoir and the physical indicators of land occupation, combined with the original production and living conditions of resettlers, the resettlement production is resettled on the principle of not reducing the living standard of resettlers. The investment for resettlement compensation for requisitioned land of this project is estimated to be 248.4902 million yuan, of which 151.0396 million yuan is for partial compensation in rural areas, 2.60 million yuan is for professional projects, and 16,600 yuan is for cleaning up of bottoms. The other costs are 22.6502 million yuan and the preparatory expenses are 28 million yuan and 44.1826 million yuan of taxes and fees.

Among them, the reservoir flooding treatment compensation investment is estimated to be 34.9391 million yuan and compensation for the protection of land for construction projects is estimated to be 44,474,400 yuan. The compensation investment of junction project area is 169.0837 million yuan.

9.2.2.2 Environmental Impact Loss

The permanent land occupation of construction and the submerged reservoir will result in the loss of primary net biological productivity.

In order to reduce, restore or compensate for the adverse environmental impacts caused by the construction and operation of the Bazixijiao navigation and electricity junction project, the measures will be taken for environmental protection mainly include: wastewater treatment and reuse during construction period, prevention and control of atmospheric pollution, prevention and control of noise pollution, solid waste disposal; water environment protection and water quality management in operation period; ecological protection and soil erosion prevention and control; population health protection; prevention and control of environmental and geological impacts; risk countermeasures. On the basis of technical and economic analysis and comparison and selection of programs, various recommended schemes of environmental protection measures and their cost estimates are put forward and “the cost of recovery and restoration method” is mainly used to calculate the required expenses. Baizai navigation and electricity junction environmental protection measures a total investment of 39.8098 million yuan, accounting for about 0.89% of the total investment (4.49009 billion yuan).

The effect analysis of environmental protection measures for Baizaijiao navigation and electricity junction can be seen in Table 9.2-3.

Based on the above analysis, the Bazizui navigation and electricity junction project has good economic, social and environmental benefits. The total cost of environmental protection measures which is taken for the purpose of reducing adverse environmental impacts is 39.8098 million yuan. Under the circumstances that various environmental protection measures are implemented, the environmental effect of costs is obvious, which can largely reduce the potential economic losses caused by environmental losses. Therefore, from the perspective of environmental profit and loss and environmental economics, the construction of the project is feasible.

Table 9.2-3 List of main environmental protection measures and effect analysis on Bazizui navigation and electricity junction

Environmental elements	Impact analysis	Impact Level	Main measures	Effectiveness analysis	Final Impact Level
Water Environment	The direct discharge of waste water from construction will have an impact on the water quality of Xinjiang River; owner camp in operation period will produce part of domestic sewage and a small amount of oily sewage	-3	The waste water in the construction area will be completely reused after it is disposed and it will not be discharged into the Xinjiang river. During the operation period, waste water from the main site will be treated for comprehensive utilization	Wastewater reuse completely which is the rational use of water resources, and reduces the impact of the water environment of the Xinjiang river	0
Hydrological situation and aquatic life	Hydrological characteristics will change after the reservoir which will have an impact on the hydrological situation and aquatic organisms	-3	Construction of fishways, the establishment of fish proliferation station for proliferation release	Reduce the impact on aquatic organisms and conserve species resources and biodiversity	-1
Terrestrial creatures	Construction land occupation and reservoir inundation have an impact on the local vegetation and ancient trees such as camphor tree	-3	Old trees to be followed，monitored and protected, and publicity and education and management are also conducted	Reduce greatly the impact of vegetation, old trees and landscape ecology in the project area	-1
Ambient air	The dust generated from excavation and traffic has an impact on schools and some residents outside seal area	-3	Reasonably choose equipment, construction optimization and to take measures to reduce dust	Reduce greatly the impact of construction on the ambient air	-1
Sound environment	Excavation and traffic noise impacts some residents outside the enclosed area	-3	Speed limit warning signs	Reduce greatly the impact of construction on the acoustic environment	-1
Solid Waste	Project waste and various types of garbage have an impact on the regional environmental	-2	Construction site should be set up special closed trash, commission Yugan County Environmental	Reduce the adverse effects, try to realize the waste, reducing and harmlessness	0

	health, water environment, soil		Health Management Institute to collect and dispose the garbage of construction area and the owner camp.		
Soil erosion	Soil erosion will be caused by excavation, pressure-bearing and spoil-dregs which will affect land utilization, agricultural production, ecological environment and project safety	-3	Take engineering measures and plant measures to control soil and water loss	Effectively prevent and control soil and water loss	-1

10. Environmental Risk Analysis

According to the definition of Technical Guidelines for Environmental Risk Assessment of Construction Projects (HJ / T 169-2004), environmental risk refers to the extent to which a sudden accident damages the environment (or health). The purpose of environmental risk assessment for the construction project is to assess the impact and damage on people's security and environment that caused by poisonous, flammable and explosive substances, or new toxic and hazardous substances caused by emergencies, predictable and unexpected incidents or accidents during the construction and operation of a construction project, thus putting forward prevention, emergency and mitigation measures to lower the construction project accident rate, loss and environmental impact to an acceptable grade.

10.1 Evaluation Rating and Area

（1）Rating

According to the provisions of the classification of environmental risk assessment work in the Technical Guidelines for Environmental Risk Assessment of Construction Projects, the grade of environmental risk assessment of this project is determined to be grade 2.

（2）Scope

According to the construction layout, environmental background and the impact characteristics of the ship oil spill accidents, the environmental risk assessment area of this project is determined to be the Bazizui reservoir area and downstream dam, with a focus on the drinking water intake of the reservoir area and downstream dam, and the environmental safety of the dam area and both sides of reservoir also need to be look on.

10.2 Environmental Risk Identification

Bazizui Navigation and Hydropower Hub is a second-class project. It does not belong to the chemical raw materials and chemicals manufacturing, oil and gas exploration and refining, information chemicals manufacturing, chemical fiber manufacturing, non-ferrous metal smelting processing, mining, building materials and other types of project defined by Technical Guidelines for Environmental Risk Assessment of Construction Projects. During the construction period, there is no source of environmental risks in the construction activities.

Bazizui Navigation and Hydropower Hub is the comprehensive utilization of electricity generation and shipping. The project will not add new risk sources. The operation phase of the Bazizui Navigation and Hydropower Hub does not involve the risk sources defined in the Technical Guidelines for Environmental Risk Assessment of Construction Projects and will not result in environmental risks of air pollution, risks of water pollution and risks of accidents characterized by ecosystem damage. After the project is completed and put into operation, it will be possible to channel the natural waterway of about 49km between the Jiepai hub and the Bazizui hub so that the standard of the Jiepai-Bazizui waterway would be upgraded to level III.

The improvement of shipping conditions will help to reduce the probability of accidents occurring in the Ships of the Xinjiang waterway, especially during the dry season. However, there is still the possibility of polluting the reservoir area and the water body downstream of the dam with oil spill accidents.

The identification results show that the main environmental risk of the project comes from the water polluting of the polluted reservoir area and the downstream of the dam by the ship's oil (liquid) spill and of the downstream water environment caused by the oil leakage from unit of the power station after the reservoir is impounding, as well as the possible dam failure and reservoir bank collapse risk.

In the Babuizui Navigation and Hydropower hub project area, there are four drinking water intakes for Daxixi County Shenling waterworks intake, Yangbu County Caiyuan waterworks intake, Huangjinbu Industrial Park waterworks intake, Meigang County Zhongnian waterworks water intake. In the downstream Mopiling hub dam, the western branch of Jiangxi River, there is proposed to establish Hongjiazui County waterworks intake, Jiangbu County waterworks intake, Feng'gang County Heshan Waterworks intake, Ruihong Town Waterworks intakes . In the lower reaches of the Hushanzui hub, the eastern branch of Xinjiang River, Baimaqiao County Gaoyuan waterworks intake, Yugan County Waterworks, Zhangjiagang intake and Shuanggang water intakes are distributed. In addition, there does not involve other special protection areas, ecological sensitive and vulnerable areas. Therefore, the environmental risk assessment of this project is mainly for risk identification, source analysis and brief analysis of the accident, with emphasis on the risk of ship oil spill accidents in operation period, the oil spill risk of power plant units, and the dam breach and the risk of bank collapse, putting forward risk prevention measures and contingency plans.

10.3 Environmental Risk Analysis

10.3.1 Ship Oil Spill (liquid) Risk

(1) Ship Oil Spill (liquid) Risk Identification

According to the engineering design, the cargos transported by ships in the navigation channel of Bazizui Navigation and Hydropower Hub area are mainly coal, mining and construction materials, petroleum and products, ore, steel and steel products, cement, containers and other miscellaneous goods. It is estimated that the traffic volume at Hushanzui will reach 7.1 million tons in 2020, of which oil and oil products will be 100,000 tons, accounting for 1.4% of the total amount of cargos transported. The traffic volume of Mopiling will be 2.6 million tons, mainly for mining construction materials, including oil and products. It is projected that the transport volume of Hushanzui will be 17 million tons in 2050, of which 300,000 tons are petroleum and petroleum products, accounting for 1.7% of the total volume of goods transported; and the Mopiling traffic volume will be 6.2 million tons, including petroleum and its products.

After the impoundment of Bazizui Navigation and Hydroelectric Hub reservoir, it can channel the waterway about 49km in the reservoir area, which will improve the navigation conditions in the reservoir area and raise the waterway standard of the relevant section of the project from grade VI to grade III of the present status, and to a certain extent it can reduce the probability of ship accidents due to poor waterway conditions. In particular, it is conducive to reducing the probability of ship accidents during dry season. With the improvement of shipping conditions, the number of ships in the reservoir area will increase to a certain extent, and the risk of marine environment pollution caused by oil spill accidents may increase. Ship oil spill (liquid) accident risk mainly refers to the ship collision, overturning and other accidents that happen during the operation, docking and trans-shipment, which result in the leak of fuel oil and petroleum products transported and contaminate the water, and which may have a negative impact on aquatic organisms and residents' drinking water, etc.

(2)Probability Analysis of Ship Oil Spill (liquid) Accident Risk

Statistics of major accidents at home and abroad show that there is a certain risk probability of oil spills in unexpected accidents. Probability analysis of a project risk, due to the impact of objective conditions and uncertainties, there is no mature method of calculation, and the method of statistical data analysis is generally applied.

Analogy method is used to determine the probability of risk of oil spill accidents in this project. The analogy project is the statistical data of the oil spill accident in the Hanjiang Channel in Hubei province. The Hanjiang River and the Ganjiang River are both tributaries of the Yangtze River with similar hydrological and shipping conditions. According to statistics, the risk probability of oil spill accidents of ship from Xinglong-Hanchuan section of Hanjiang River in Hubei Province is 0.03-0.08 times per year. Accordingly, it is assumed that the probability of the maximum risk of a ship oil spill accident occurring in the waterway of this project will be 12.5-33.3 years once.

(3) Ship Oil Spill (liquid) Accident Risk Impact Analysis

Once an oil spill occurs in the waterway of the reservoir area, the oil spills into the water and diffuses into an oil film soon, and then drifts under the effects of water flow and wind flow while the equivalent oil film that is diffused by the oil spill will continue to expand. After the destruction of the oil film, the physicochemical changes that occur due to environmental factors will continue to evaporate, disperse and emulsify and oxidize under the action of the force of water and wind, and gradually dissipate. In the event of an accident in the reservoir area leading to the leakage of dangerous chemicals such as oil and products, the dissolution of hazardous chemicals into the water will spread to the downstream with the flow of water, which may affect the water quality in the vicinity of the accident site in the reservoir area and the drinking water safety at the intake at the downstream of the accident point.

There are 4 water intakes in Bazizui reservoir, including Daxi County Shenling Waterworks, Yangbu County Caiyuan waterworks intake, Huangjinbu Industrial Park waterworks intake, Meigang County Zhongnian waterworks intake drinking water intake. If the accident occurred in the reservoir area and results in the leakage of hazardous chemicals (discharge liquid), it may have a great impact on the water quality of the four drinking water intakes in the reservoir area. Due to the blocking effect of sluice gate of Bazizui Navigation and Hydropower Hub , Oil film is difficult to spread to the downstream reaches of the dam and thus drinking water in the downstream of the dam is likely to suffer less impact on its water quality.

10.3.2 Oil Spill Risk of Power Plant Units

Power station unit oil spills is mainly caused by the power plant unit oil spills and oil depots. Unit oil leakage mainly comes from generator, turbine bearings, speed control system and the operation of hydraulic equipment and other equipment, and oil depot mainly involves oil spills. In the oil depot, an emergency oil gathering tank can be set up and then spilled oil can be collected in the tank. Through the oil-water separator treatment, the water is discharged in the form of tail water and oil is recovered.

The oil system of the project is arranged in the dynamo floor of the auxiliary workshop. The gas system and the technical watering system are arranged in the hydraulic turbine floor of the auxiliary workshop. The maintenance system of the unit and the water leakage and drainage system of the plant share the water collection well, which is arranged in the gallery of the main valve room.

The factory tank and the oil treatment room are separated by firewall and fire doors. Open fire doors are set, Oil baffles are used at the door and an emergency oil gathering tank is set up under the oil tank. The main transformer has an accident oil pit and oil drain pipes to connect to the emergency oil gathering tank.

The power plant building in this project shall be designed and selected strictly in accordance with the design specifications. During the normal operation of the power plant, the fuel consumption will be few and basically the oil spill will not occur. During the oil depot design, fire safety has been fully considered. As long as the relevant management systems are fully in compliance with in the operation, it is expected that risk of fire would not occur.

10.3.3 Dam Break and Bank Collapse Risk

(1) The Risk of Bank Collapse

The bank of Baizaijiao Navigation Hydropower Hub Project is mainly soil bank, followed by rocky bank, only part of which is mixed geotechnical slope.

1) Rocky Slope

Rocky bank slope or rock-soil mixed bank slope are distributed in both the left bank and the right bank. The lithological characters of the rocky bank slope or rock-soil bank slope includes feldspathic quartz sandstone, siltstone and phyllite. At present, the bank stability is in a good status and the reservoir has exerted little influence on it.

2) Soil Bank

There are two types of soil banks. First, due to the high ground elevation, the construction of embankments isn’t needed. For example, from Niupitan Village to Shigang Village, JiangxinRujiepaizhou, Zhongzhou in the opposite bank of Jinjiang County (the outlet stream of

Baita River) and Zhongzhou in the opposite bank of Jinbu Village. Second, a dike is built in the bank, such as Jiangfang Wei, Jinbu Wei, Daxi Wei, Huangbu Wei, Zinian Wei and so on. (Zhou: “洲”, means oasis. Wei: “圩”, means embankments in low-lying areas, Jianghuai area, China)

On the right bank, the section from Niutan Village to Shigang Village is composed of clay, and the stability of the bank is good presently. This section belongs to the end of the reservoir, and the elevation of the water level is low thus has little impact on the bank slope. The lower part of the bank slope of Jiangxin Zhou is mostly sand and gravel pebbles, while the upper part is cohesive soil. The bank slope is in a steady state under the condition of no man-made change of bed shape (i.e., sand mining). Since the normal water level (18 m) is lower than that of the 5-year floods level (22.36m), and after the reservoir is impounding, the frequency conversion range of the water level becomes smaller, which changes the flow regime of the river, and the erosion effect of the river water on the river bank becomes smaller, which is more conducive to the stability of the river bank. Therefore, the stability of no-dike section of the bank slope is better.

For the bank with an existing embankment, the bank slope is mostly the alluvial terrace soil slope and the lower part is the sand layer and the gravel pebble layer, and the upper part is the clay layer. Most of the embankments have a wide beach front. The current overall stability of the bank is good as long as there is no continuing change of bank shape (sand mining). Besides, if there is a small part of the bank collapse, it will eventually and naturally become stable and pose little safety threat to the embankment.

However, there are some bank slope stability problems when the bank slope is in the scouring position, deep-trough, and where embankment foot is seriously damaged by water flow and embankment without the protection of the bund. In particular recent years, due to the river bed undercutting, the slope of the underwater bank has become steeper, resulting in the collapse and insatiability of part of the bank slope. The total length of this type of slope is about 13.87km (for details, see 3.3.4.3 Geological Conditions and Evaluation of Main Dykes in the Reservoir Area). In the past, the water conservancy department conducted some measures such as rip-rap and foot care for part of the risk insurance section with stable bank slope in the course of strengthening and reinforcing the dike in the past and that, to a certain extent, can control the risk of the instability of the bank slope.

(2) Reservoir Leakage Causes Dam Failure Risk

The reservoir area is basically located on the mainstream of the Xinjiang River and its tributary alluvial terraces. Quaternary alluvial layers generally have a dual-layer and double-layer structure, with the upper part mostly contains salty clay and the clay are relatively impervious. The lower part contains sandy soil and gravel layer which have desirable water content and permeability. The groundwater has many pressure properties, and it is closely related to the flow of the Xinjiang River and its tributaries. There are phyllite, sandstone and other non-soluble rocks below.

Both sides of the river have embankments. From upstream to downstream, the embankment elevation is from 24.5m to 31m. When the reservoir water level reads 18m, the water level is below the channel. After the embankment, the lowest ground elevation is about 17m (in Daxi Wei) and numerous drainage ditches are distributed. The elevation of the ditches ranges from 15m to 16m. The water level in the reservoir is generally 1-3meters high above the embankment. According to engineering experiences, when soil cover thickness equals or is half higher than the embankment outside the dam, there is generally no problem of embankment infiltration stability. According to the survey results, the thickness of the cohesive cover is generally thicker than 3m, mostly reads 4.5m - 9.5m, which is larger than the safety thickness. Therefore, there are no leakage and seepage stability problems in the dike foundation of the reservoir area.

In summary, there is no obvious new tectonic activity in the reservoir area, no active faults, no rupture in the area and the hydrogeological conditions are simple. Besides, the reservoir is a low-head reservoir, thus the reservoir dam failure probability is small.

10.4 Risk Prevention Measures and Management Measures

(1) Ship Oil Spill (liquid) Accident Risk Prevention Measures

During the project operation period, the flow of ships in the channel and the lock is relatively large. To prevent the occurrence of ship accident risk in the navigation channel, the following necessary preventive measures shall be complied with: ① Power station management departments need to be equipped with working boats, overflow interception and recovery equipment. Overflow interception equipment includes oil booms (2000m), buoys, anchors, mooring rope and other ancillary facilities. Overflow recovery equipment includes suction felt (5t), Suction machine (1). A working vessel is needed for the overflow recovery operation and boom installation. ② 12 beacon lights should be installed to prevent the risk of ship accidents. ③It is required to set up 12 aid signs to alert the passing ships to pay attention to safety awareness. When an accident occurs, they can immediately call the emergency line to notify the emergency organization.

(2) Optimize Shipping Planning and Formulate Reasonable Ship Operation Routes

After the channel conditions in the reservoir area are improved and the channel capacity is increased, the transport department should formulate reasonable shipping plans and ship operation routes according to the development needs and trends of the regional shipping. According to the regulations, the corresponding logos or signs should be set up to avoiding risk sources.

(3) Strengthen Pre-Job Training for Ship Drivers

According to the analysis of the causes of the accident, the main reasons for the occurrence of the ship accident are: weak sense of responsibility, illegal navigation and improper operation of the crew, complex navigable environment, changes in waterway conditions and ship owners and operators' lack of safety management, investment and shipping skills and so on. Therefore, after the navigation conditions in the reservoir area are changed, the ship type and driving regulations may be adjusted accordingly. Before starting the work, the ship drivers should carry out uniform pre-employment training to familiarize themselves with the relevant operating procedures under the new conditions and accurately grasp the traffic avoidance rules, meanwhile strengthen the crew's responsibility education.

(4) Promptly Notify Waterworks to Suspend Water Intake and Strengthen Monitoring

In the Babuizui Navigation and Hydropower Hub project area, there are Daxixi County Shenling waterworks intake, Yangbu County Caiyuan waterworks intake, Huangjinbu Industrial Park waterworks intake and Meigang County Zhongnian waterworks water intake. In the downstream Mopiling dam, the west of Jiangxi River, there is proposed to built Hongjiazui County water plant water intake, Jiangbu County water intake, Feng’gang County Heshan Waterworks intake and Ruihong Town Water intakes. In the lower reaches of the Hushanzui hub, the east of Xinjiang River, Baimaqiao County Gaoyuan waterworks intake, Yugan County Waterworks Zhangjiagang water intake and Yugan County Waterworks Shuanggang water intakes are distributed. Therefore, in the event of an accident in Bazigou reservoir area, which will results in the leakage of hazardous chemicals (discharge liquid), the relevant personnel shall promptly notify the relevant water intake in the reservoir area and downstream of the dam to stop taking water and promptly start the accident emergency plan so as to reduce the pollution impact on the water intake. At the same time water intake water quality monitoring should be strengthened to ensure water intake safety.

(5) Prevention Measures for Oil Spill Risk of Power Station Units

Power plants are designed and selected strictly in accordance with the design specifications. So are the equipment selection and construction carried out. In the operation period, the management of power station units is to be strengthened and the accident pool is set up. After the accident, the accidental oil and water are collected into the oil pool in time to avoid the impact on the water environment of the dam. After the accident water is treated by the oil-water separator, the water is discharged from the tail water and the oil is recovered.

(6) Prevention Measures of Risk of Bank Collapse

There is a problem of bank collapse or bank rebuilding locally after the Bazizui Hydropower Hub Project reservoir is impounded. In engineering design, embankments of dangerous sections in the reservoir area are to be treated. The measures of rip-rap protection of the foot and gabion slope protection are to be applied below the dyke foot. Rock rip-rap method is used below the Perennial average dry water level. The slope from above to dyke foot would be cut to 1: 2 after the use of gabion slope protection with a thickness of 0.6m, and a 15cm thick broken stone ballast and a 15cm thick sand cushion are built below. The above embankment applies precast hexagonal slope protection. The precast block’s thickness is 10cm; the side length is 30cm. A 10cm-thick sand pebble cushion is constructed below. A total length of dangerous dyke accounts for 10km.

(7) Dam Break Prevention Measures

1) Further improving the dam design and supervising construction quality. Attention to geological survey, hydrological meteorology and planning and design work should be paid. The

project worker should select the various parameters of function and resistance seriously and carry out specialized analysis and demonstration for the potential risks of the dam, such as the peak and amount of floods, flood control, flood discharge capacity of the dam, the ability of the dam and buildings to resist various natural and special hazards as well as the anti-slip and impervious stability of dam foundation. Construction supervision should be strengthened during the construction period to monitor the dam quality, especially the initial value before the dam is impounded. It is necessary to carry out planning and remediation on the poor stability of the reservoir banks to eliminate the unsafe factors.

Construction management should be emphasized. In the implementation of the project, it is necessary to implement the legal owner responsibility system, and the project legal person should implement the whole process management. The project supervisory unit should strengthen the supervision and strictly implement the project's basic construction procedures so as to ensure the quality of the project. The project applies bidding system, the bidding should be carried out according to the law, and the most qualified company or unit will be chosen. The water conservancy supervision and administration departments at all levels should conscientiously supervise the quality of the project, make sure that the system is in place, the personnel in place and the supervision in place. The project legal person shall determine the supervision unit by bidding. The supervision unit shall be engaged in the project progress, quality and investment control according to the contract. Pay attention on the acceptance work and the acceptance work should be implemented according to the acceptance of water conservancy and hydropower engineering procedures.

2) Strengthen dam safety monitoring. It is required that the dam safety monitoring work should be done according to the relevant provisions to understand the operation status of hydraulic structure, to carry out water level observation, dam foundation uplift pressure observation and seepage around the dam observation and dam displacement observation. If any signs of abnormalities are found, the dam should be reinforced or dealt with in time to ensure dam safety. The operator should strengthen management and apply necessary management facilities. The reservoir should be equipped with safety monitoring facilities, forecasting and warning systems, flood control communications facilities, flood control roads and vehicles. The construction of dam displacement observation and seepage monitoring facilities should be applied to increase the monitoring of seepage flow and to carry out rainfall hydrological forecast.

3) Strengthen risk management. The construction of dam-break and flood discharge may affect the submergence map of the downstream area, and the operator should provide and hand out the submergence map to the relevant downstream areas so as to timely conduct hydrological survey and report for use by local governments in flood warning and evacuation planning. During the war, the floodgates should be opened in time to vacate the reservoir and avoid the catastrophic damage caused by the dam break.

10.5 Environmental Risk Contingency Plan

The contingency plan of regional water accidents should be compiled and a permanent regional emergency response center for accident risk should be set up for the environmental pollution accidents on the sudden waterway. After the completion of the water storage of Bazizui Navigation and Hydropower Hub, once sudden accidents occur like ship oil (liquid) spill, the contingency plan and the center can handle and dispose in a timely, rapid, accurate and effective way to minimize the damage for the life, property and environment caused by the pollution accident.

At present, the municipal government and relevant departments of Shangrao city have proposed a complete system of regional emergency risk prevention and management. Once there is an accident, emergency measures can be taken in time. In December 2011, the Shangrao Municipal People's government released the Shangrao water contingency plan. In December 2013, it issued the Shangrao General Plan for Emergencies, and established the Shangrao emergency response mechanism.

10.5.1 Emergency Working Mechanism of Sudden Events in Shangrao city

The emergency working mechanism of the sudden events in Shangrao mainly includes monitoring and early warning, information report, emergency disposal, restoration and reconstruction as well as investigation and evaluation.

Ⅰ Prediction and Early Warning

The county (city, district) people’s government, the relevant departments of the municipal government and the relevant units (located in city) directly under the municipal government should establish and improve the prediction and warning mechanism for all kinds of unexpected events and carry out risk analysis so as to achieve detection, reporting and disposal as early as possible.

1. Prediction and Warning system

The county (city, district) people's government, municipal special emergency command offices, the relevant departments of the municipal government and the relevant units (located in city) directly under the municipal government should comprehensively analyze and predict the warning information that may cause emergencies and report in time. The municipal government office (emergency office), in conjunction with the all county (city, district) people’s government, the relevant departments of the municipal government and the relevant units (located in city) directly under the municipal government, integrates monitoring information resources and establishes and improves the emergency warning system relying on the resource network of government office business in all city and related networks.

The city emergency response center sets up a platform which receives emergency information submitted by all member units of the municipal emergency committee, county (city, district) people's government, various monitoring organizations and social massages.

2. Warning Grade and Warning Information Release

According to the results of the prediction analysis, emergencies which may be occurred and able to be warned should be warned. The warning grades are generally divided into four grades according to the degree of damage, urgency and development potential caused by emergencies. The four levels are: Grade I (extremely serious), Grade II (serious), Grade III (major) and Grade IV (ordinary), expressed in red, orange, yellow and blue.

When City Emergency Response Center receives emergency information, it should immediately organize the relevant departments and experts to conduct analysis, evaluation and prediction. For the fourth grade events, the center should inform to people's government of county (city or district) which events may occur in time. For the former three grades events, the center puts forwards suggestions to the Municipal Emergency Committee and implement according to decision by the Municipal Emergency Committee and promptly report to the provincial emergency committee in accordance with the principle of unified alarm and partial disposal.

The county (city, district) people's government and relevant departments directly under the municipal government should report to the Municipal People's Government in a timely and accurate way about the extremely serious, serious, major emergencies.

The warning information includes the categories of emergencies, the warning grade, the starting time, the possible impact range, the warning items, the measures to be taken and the issuing organs. The release, adjustment and removal of major or ordinary warning information related to administrative regions across counties (cities or districts) must be approved by the departments authorized by the Municipal Emergency Committee or municipal people's government.

Release, adjustment and removal of warning information can be issued through radio, television, newspapers, Internet, communication, alarm, propaganda car or door-to-door to inform. For the old, young, sick, disabled, pregnant and other special groups and schools and other special places and blind alert spot should take targeted announcement.

3. Early Disposal During the Warning Period

When the warning starts, the city and county (city, district) people's government can take the following measures according to the warning grade and actual needs: publicizing emergency knowledge of prevention and reduction of harm; transferring and arranging properly vulnerable people; requiring emergency rescue teams on standby; mobilizing the necessary emergency materials and equipment; ensuring communications, transportation, water supply, power supply and other public facilities in the safe and normal operation; Other measures need to be taken by laws and regulations.

4. Warning End

The factors that may cause unexpected events have disappeared. Then the relevant departments of the government which issued the early warning decision have announced to the society the end of warning after the approval of the emergency committee.

When emergency committees at all levels make warning and end of warning decisions, they should report to the superior emergency office in time.

Ⅱ Emergency Disposal

1. Information Report

When the emergency occurred, The county (city, district) people's government, the relevant departments of the municipal government and the relevant units (located in city) directly under the municipal government report truthfully to the city emergency office (phone: 8215512) in accordance with the Classification Standard within the specified time. The report should be prompt, accurate and comprehensive. At the same time, they inform the relevant regions and departments.

For the extremely serious, serious or major events, Municipal Emergency Committee should report to the Provincial Emergency Committee in accordance with the Classification Standard in the specified time. Under special circumstances, especially the extremely serious, serious emergency information, the government and operator on duty of related departments can report directly to Municipal Emergency Committee and report directly to Provincial Emergency Committee and the State Council while getting the consent. The main contents of the report include the time, place, source of information, nature of the event, the scope of influence, the trend of the event development and the measures taken. In the process of emergency treatment, the relevant information should be continued to submit in time. The specific information submission is carried out according to Further Strengthening and Improving Emergencies Information Submission (Shangrao municipal government [2013] 11th)issued by the two municipal offices.

The city emergency office should collect and report promptly important information and situations for emergencies and transmit the instructions to the relevant regions and departments and track the implementation of the instructions.

The county (city, district) people's government, the relevant departments of the municipal government and the relevant units (located in city) directly under the municipal government obtain timely and comprehensively all kinds of emergencies information. When confronted the sensitive events or events occurred in sensitive areas and sensitive time, or may converting into extremely serious and serious events, information submission are free from the Classification Standard restrictions.

When emergencies involve people from Hong Kong, Macao, Taiwan or foreigners, or affect overseas places, they need to be reported to the relevant countries, regions and international agencies and handled according to relevant regulations.

It should promptly verify for uncertain grades of emergency. According to the above regulations, information should continue to submit.

2. Early Disposal

After the incident occurred, the county (city, district) people’s government, the relevant departments of the municipal government and the relevant units (located in city) directly under the municipal government should take immediate measures to control the situation and organize rescue work while report to higher levels of government firstly within the statutory time limit.

When receiving emergency information, Municipal Emergency Committee instructs immediately related special emergency command to start the relevant contingency plans according to the categories and grades of emergency; the related special emergency commands should quickly issue an emergency order so as to dispose timely and effectively and control the situation.

When the event occurs overseas involving our city’s citizens, the city emergency committee should take measures to control developments with the State Council, embassies and consulates and relevant departments of the provincial government and organize emergency rescue work and report the relevant situations to the provincial government according to the procedures.

3. Emergency Response

According to the four-grade classification standards of emergency and the four-grade warning, the emergency response of sudden events is divided into four levels. The first level emergency response is started by the Municipal Emergency Committee, and the director of the Municipal Emergency Committee is responsible for the command. The second level emergency response is started by the municipal special emergency command under the approval by Municipal Emergency Committee, and the director or deputy director of Municipal Emergency Committee are responsible for the command. The third level emergency response is started by the municipal special emergency command of the city and Municipal Emergency Committee put it on record. The chief command of the municipal special emergency command is responsible for the command. The fourth emergency response is started by the county (city, district) people's government which is also responsible for command and control. Starting the former three levels of emergency response are organized and carried out by the relevant special emergency commands in accordance with the relevant contingency plans. The county (city, district) people's government must set up a field headquarters immediately in the incident site. The leaders of the county (city and district) government and municipal government departments must be present on command and dispatch. For the extremely serious and serious emergencies that require the coordination of the State Council or the provincial government, the Municipal Emergency Committee should submit a request to the superior in accordance with the procedures.

The emergency office of the municipal government should establish and improve the emergency linkage mechanism with neighboring cities. The corresponding systems should be established in all counties (cities and districts).

4. Command and Coordination

For major or more serious emergencies, Municipal Emergency Committee or municipal related special emergency command take the lead to establish the on-site headquarters according to the requirements of the emergency plan. They command the relevant regions and departments to carry out the disposal work. The main contents of the work include:

(1) To organize and coordinate the relevant county (city, district) and department, experts and contingency teams to participate in emergency rescue.

(2) To formulate and organize the implementation of the rescue plan to prevent secondary and derivative events.

(3) To coordinate the relevant counties (cities, districts) and departments to provide emergency security and to dispatch emergency resources from all parties.

(4) To arrange and maintain the public order and stability of the local society.

(5) To submit promptly reports of the progress of the emergency disposal work to Municipal Emergency Committee;

(6)To study and deal with other important matters.

The county (city, district) people's government shall be responsible for the establishment of the emergency response headquarters which is responsible for the emergency disposal on site under the command or guidance of the relevant special municipal emergency commands or emergency working groups appointed by the Municipal Emergency Committee.

If the unexpected events need to be disposed by several relevant departments of the municipal government, the department which is responsible for such events take the lead and the other departments assist them.

5. State of Emergency

If extremely serious emergency occurs or is about to happen, it is impossible to control and eliminate its serious social harm by adopting general disposal measures. It is necessary to declare that the whole city or part of the city is in a state of emergency, and handle it according to legal procedures.

6. End of the Emergency

After the emergency disposal work is finished, or the relevant dangerous factors are eliminated, the emergency response headquarters on the spot shall be revoked.

The emergency state of extremely serious and serious events cannot be released until get the approval of the provincial emergency committee. Other emergency release is put forward by the relevant special emergency command according to the leaders' instructions of the municipal emergency committee or actual needs. The county (city, district) people's government or municipal government can also put forward the release. When the municipal government emergency office check and the municipal emergency committee approves, the emergency release can be implemented.

After the lifting of the state of emergency, the relevant departments and units should timely replenish the emergency rescue materials and equipment according to the requirements of the special emergency plan and return to the emergency preparation status. The decision of the termination of emergency state and the announcement and publication shall be handled by the relevant agencies according to the legal procedure.

After the end of the emergency, the field headquarters or the main departments responsible for emergencies shall have a comprehensive summary of all aspects of the emergency response. The summary report should be completed in principle within 1 week after the end of the disposal and report to the emergency office of the municipal government.

III Restoration and Reconstruction

1. Afterward Disposal

The county (city, district) people's government, the relevant departments of the municipal government and the relevant units (located in city) directly under the municipal government shall actively and prudently carry out the afterward disposal work:

(1) The county (city, area) people's government shall organize the civil affairs departments to set quickly up the victims of resettlement places and relief materials supply station. It should make well works including materials and goods receiving, issuing and the use and management by law so as to guarantee the basic livelihood of the victims. Comfort efforts should also be taken for the victims.

(2) The health department shall provide technical guidance for the on-site disinfection and prevention of the epidemic diseases. The environmental protection departments shall, according to their respective functions and responsibilities, do a good job in collecting, cleaning and disposing of pollutants on the scene of the emergency. The environmental protection department shall also strengthen the monitoring of the on-site environmental quality.

(3) Materials or occupied buildings and lands should be returned promptly. Those that cannot be returned or damaged in time shall be compensated according to the state regulations.

(4) The salary, bonus and welfare benefits in organs, enterprises and institutions shall remain unchanged during the work of emergency response management. The local people's government shall give appropriate subsidies to those without units.

(5) The casualties shall be given pensions according to the relevant regulations of the state.

(6) The relevant competent departments of the municipal government shall, in accordance with the regulations, allocate funds and materials promptly.

(7) The insurance regulatory agency urges the relevant insurance agencies to make timely compensation for the loss of units and individuals.

The Red Cross, charities and other public welfare groups and organizations should conduct activities which provide extensive mutual aid and disaster relief donations and strengthen exchanges and cooperation with the International Committee of the Red Cross and other relevant international organizations.

2. Investigation and Evaluation

The relevant departments of the municipal government and the relevant units (located in city) directly under the municipal government, in conjunction with the county (city, area) people's government, conduct the investigation and assessment of the incident causes, nature, influence, responsibility, lessons learned and the restoration and reconstruction and then submit reports to the municipal government in 30 days .

The relevant departments and units of the municipal government emergency office shall conduct a comprehensive assessment of the emergencies occurred in the previous year in the first quarter of each year and report to the municipal government.

3. Restoration and Reconstruction

The county (city, district) people's Government shall be responsible for the restoration and reconstruction work.

The county (city, district) people's government can request assistance from the city. The municipal government related departments and relevant units (located in the city) directly under the municipal government, according to the report of investigation and evaluation and reconstruction plan for disaster areas, put forward solutions. The assistance can be implemented after getting approval according to the relevant provisions.

If the aid is needed from province or state, the request is made in accordance with the relevant provisions of the state and the province.

Ⅳ Information Publish

The information release and news publicity of emergencies shall be handled by the municipal government information office. The relevant special emergency headquarters or municipal main departments shall cooperate with each other and carry out implements. The local government and the main responsibility departments responsible for the handling of the incident are the first responsible unit of news release. The emergency information release shall be prompt, accurate, objective and comprehensive. While the emergency is occurred, the brief message should be firstly publicized. Then preliminary verification and government measures and preventive measures should be subsequently issued. It should do subsequent release work according to events disposition.

The form of information release mainly includes authorized release, distribution of news releases, reports, interviews with journalists, press conferences, etc,. Information also can be released through major news media, key news websites or related government websites.

10.5.2 Contingency Plan for Water Emergencies in Shangrao City

(1)Emergency Command System and Main Responsibilities

The emergency response command of water emergencies in Shangrao city is agency in charge of response for water emergencies in the whole city and guides the emergency management in the whole city.

◆Unit compositions of the city emergency command:

Chief Commander: mayor in charge of water traffic safety

Deputy Commander: director of Municipal Traffic Bureau, director of Municipal and Local Maritime Bureau, deputy Secretary General of Municipal Government, leaders of Municipal Public Security Bureau and Municipal Safety and Labor Supervision Bureau.

Member: City Government Offices, Municipal Traffic Bureau, Municipal Public Security Bureau, Municipal Safety and Labor Supervision Bureau, Municipal Agriculture Bureau, Municipal Health Bureau, Municipal Tourism Bureau, Civil Affairs Bureau, Municipal Finance Bureau, Municipal Water Resources Bureau, Municipal Land and Resources Bureau, Municipal Environmental Protection Bureau, Municipal Meteorological Bureau, Municipal Fire Detachment, officials of Municipal Maritime Safety Administration.

◆The main responsibilities of Municipal Emergency Command:

① To implement the decisions and instructions of Municipal Emergency Committee.

② To command and organize emergency disposal of extremely serious, serious, major water emergencies and set up a field headquarters and propose to the municipal emergency committee to put an end of the emergency situation.

③ To study and determine the major decisions and opinions on the water emergencies in the whole city.

④ To guide rescue work for the water emergencies in the whole city.

(2) Permanent Institutions

Municipal Emergency Command Office and the water search and rescue center of Shangrao city should be established. They are located in the Municipal Maritime Bureau. As the part of the Municipal Emergency Command, they are responsible for the daily work of the Municipal Emergency Command and take charge of the operation and management of water search and rescue.

Director of the water search and rescue center: the deputy director of the Municipal Traffic Bureau in charge; The deputy director of the water search and rescue center: the director of Municipal Maritime Bureau and the Municipal Port and Shipping Department.

The main responsibilities of the water search and rescue center of Shangrao city:

① To implement the decision and instructions of Municipal Emergency Command.

② To formulate relevant rules and regulations for municipal water rescue work, and compile the municipal water search and rescue budget.

③ To be responsible for the drafting, operation and management of contingency plan for water emergencies at municipal level.

④ To demarcate the responsibility area for the municipal water search and rescue agencies and conduct guidance.

⑤ To sign an inter-regional maritime search and rescue agreement with neighboring cities and establish an emergency cooperation and linkage mechanism.

⑥ To take charge of the municipal water search and rescue emergency duty and to be responsible for the comprehensive coordination of the water search and rescue work in the whole city and the related organizations management.

⑦ To take charge of the municipal water pollution emergency and water security alarm reception and liaison work.

⑧ To organize the municipal water search and rescue emergency drill and emergency exercise.

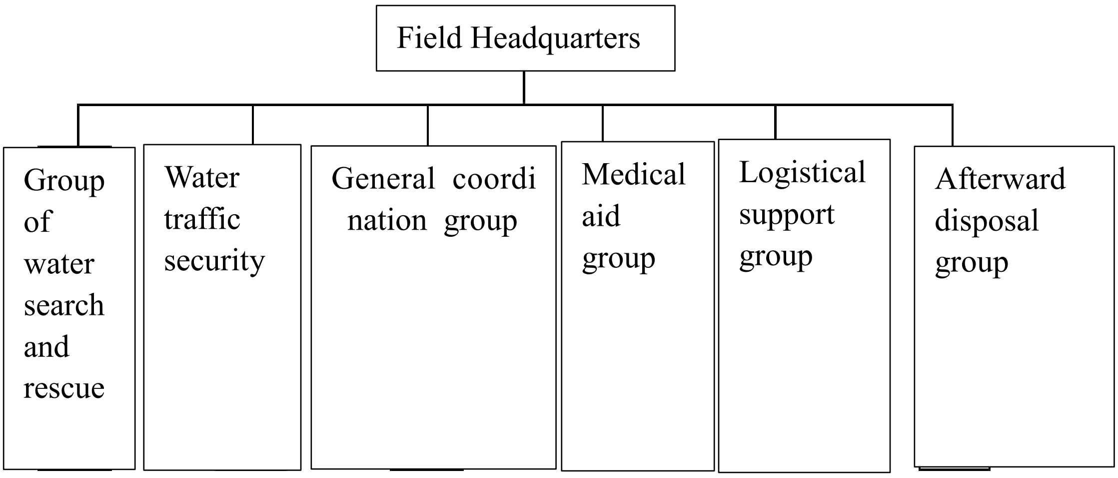
⑨ To organize the training of safety knowledge, professional knowledge, new technology application for the rescue teams and to publicize water safety knowledge.

(3) Field Headquarters

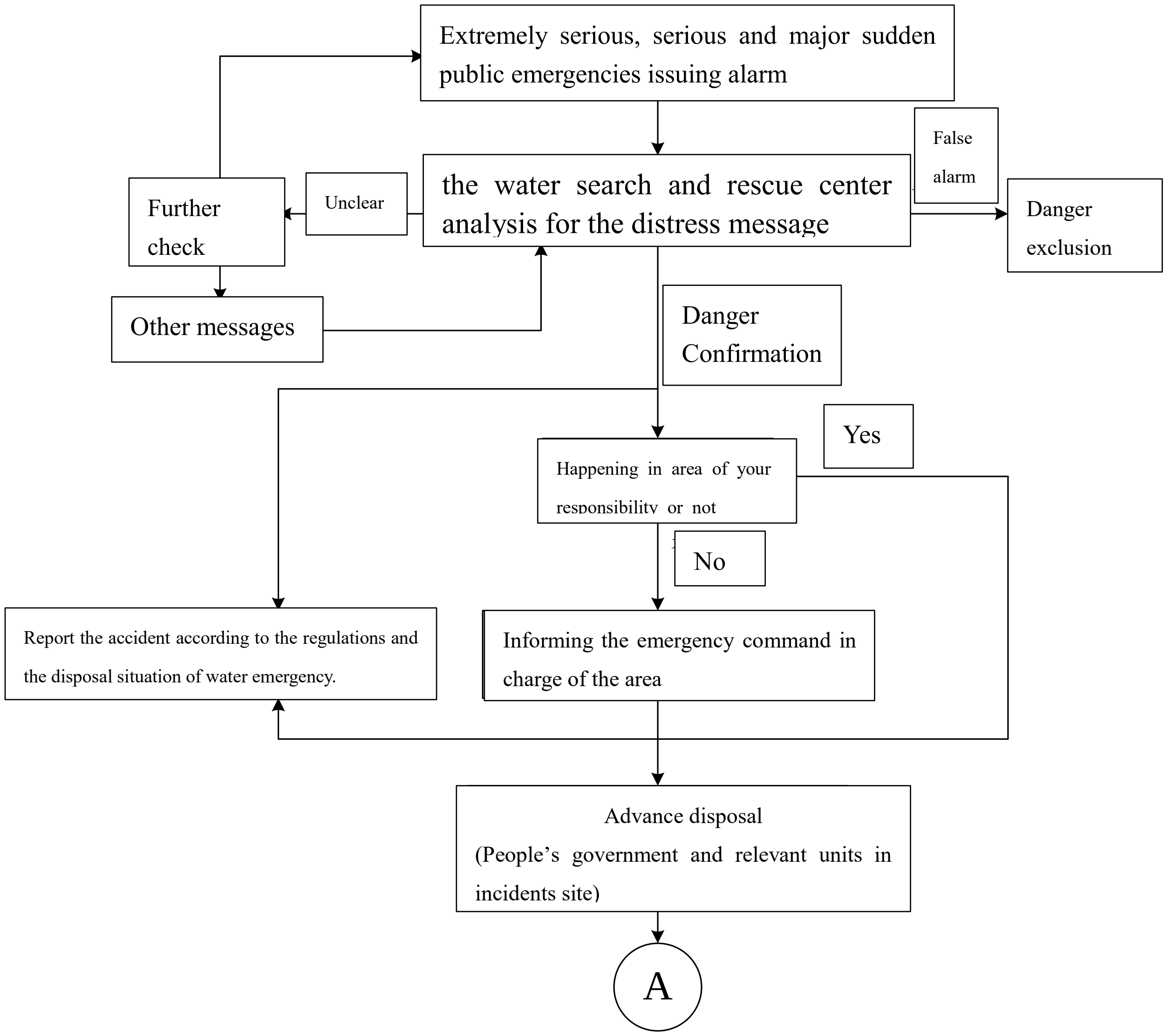
When the extremely serious, serious and major water emergencies occurred, Municipal Emergency Command shall set up a field headquarters. The chief commander shall be designated by the main leadership of the county (city and district) people's government or appointed by the provincial or municipal emergency command; The leaders of the county (city, district) relevant departments, units and the township (town) government form the site headquarters members depending on the emergency situation. The field headquarters sets up a number of professional groups as required. The details are shown in figure 10.5-1.

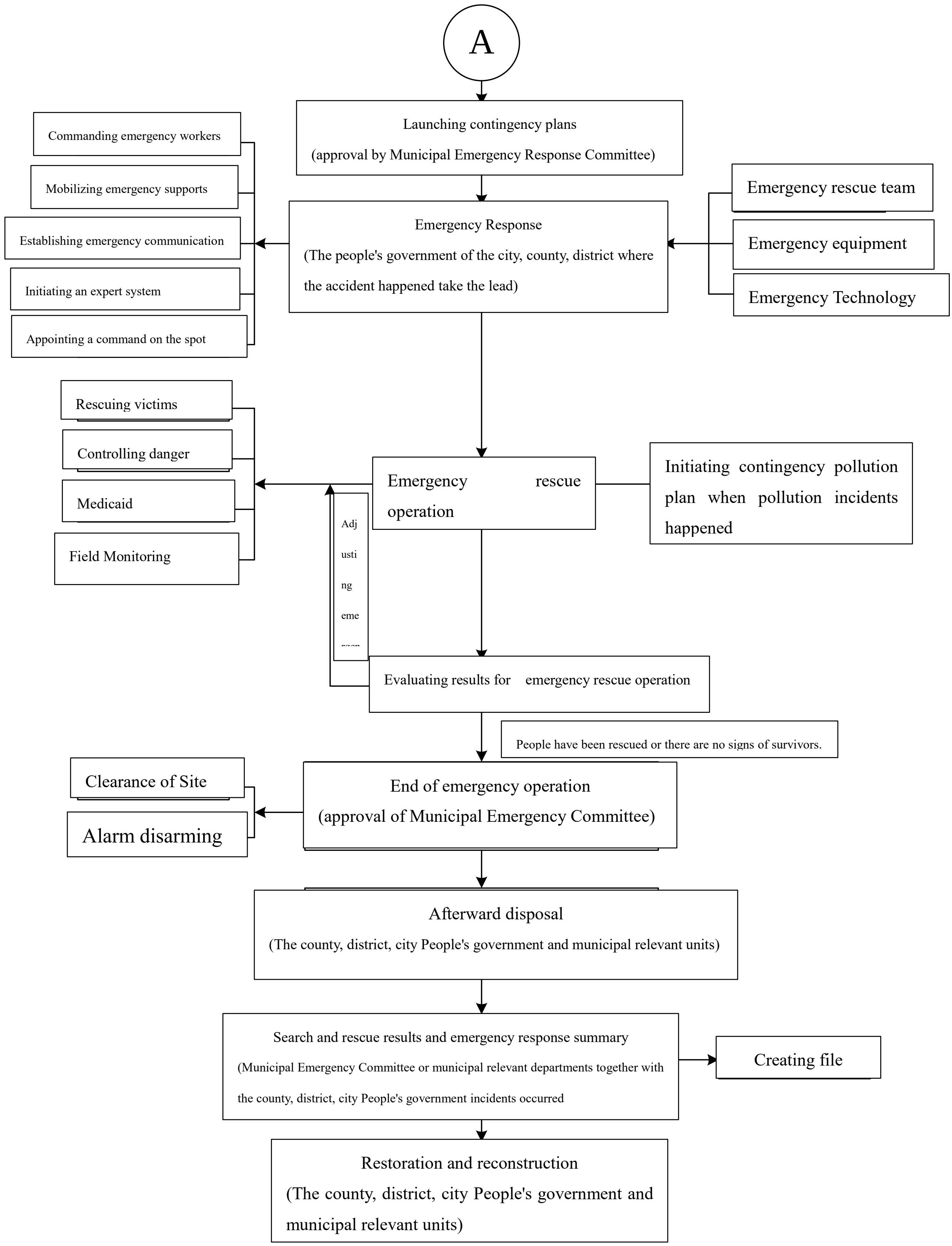
(4) Emergency Organization

The work procedures of the emergency command system are shown in figure 10.5-2. The organizational structure of the emergency command system is shown in figure 10.5-3.

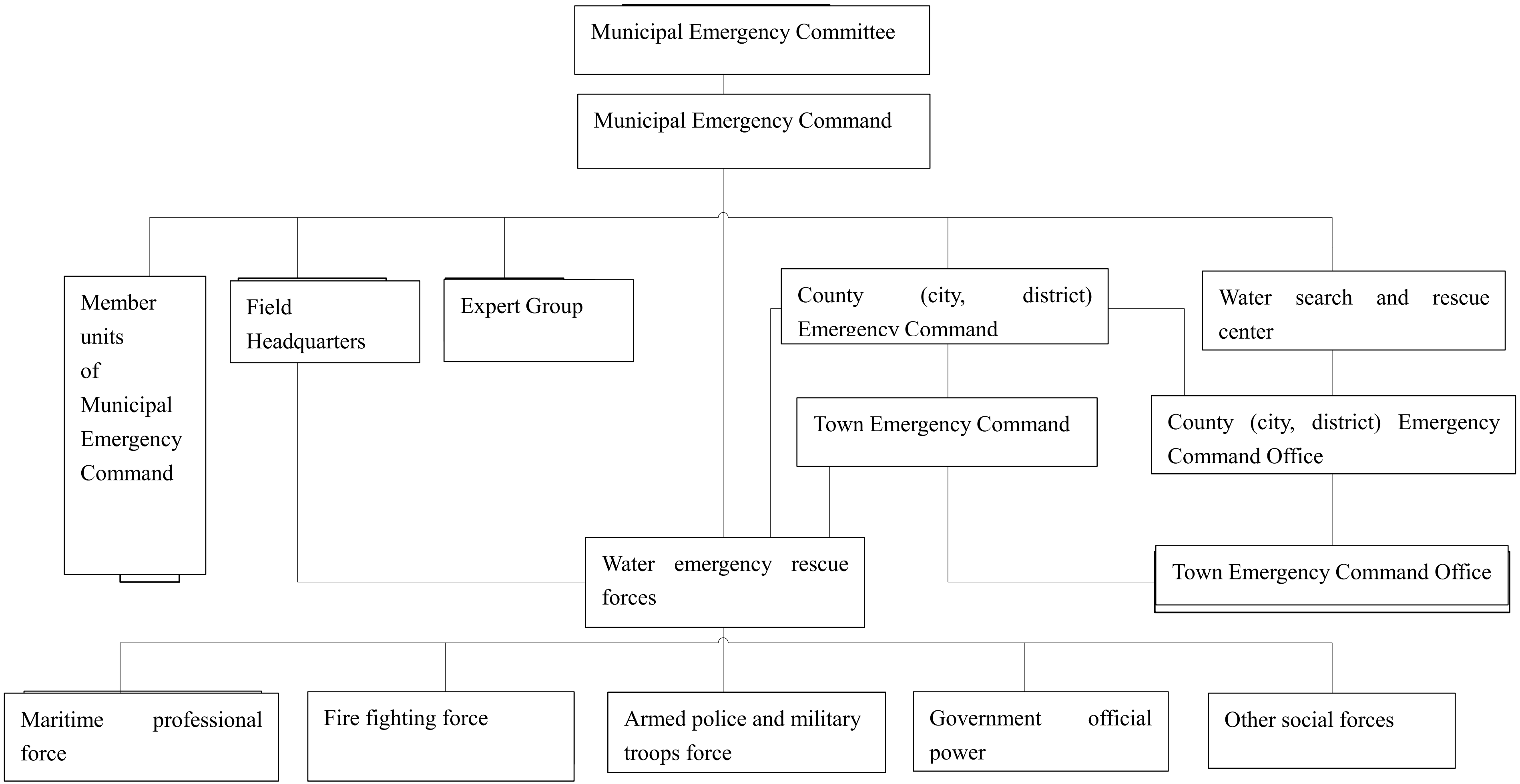


10.5-1 Organizations of field headquarters


Extremely serious, serious and major sudden public emergencies issuing alarm
False alarm
Further check
Unclear
the water search and rescue center analysis for the distress message
Danger exclusion
Other messages
Danger Confirmation
Yes
Happening in area of your responsibility or not
No
Report the accident according to the regulations and the disposal situation of water emergency.
Informing the emergency command in charge of the area
Advance disposal
(People's government and relevant units in incidents site)
A



10.5-2 The work procedures of the emergency command system



10.5-3 The organizational structure of the emergency command system

(5) Contingency Response Procedure

The relevant members of Municipal Emergency Command establish and improve the monitoring institutions and analyze comprehensively the warning information that may cause extremely serious, serious and major water incidents. They should promptly submit relevant information to the city emergency response center and the municipal water search and rescue center.

Relevant units, ships and personnel engaged in water activities should pay attention to receiving early-warning signals and take corresponding preventive measures according to different warning grades so as to prevent damage for lives, property and environment by water sudden incidents.

The Municipal Emergency Command and its members shall promptly make the relevant preparations according to the early warning information and their respective responsibilities. The emergency team at all grades of maritime affairs should enter the state of standby and prepare for emergency rescue.

After the occurrence of a water emergency, the person in distress or the witnesses should report to the local Maritime Administrative Department or the Public Security and Fire Department immediately. The distress ship should report to the above units at the same time. After receiving the report, the above units shall promptly notify the local water emergency response command organization or the maritime administrative organization. The local water emergency response command organization or the maritime administrative organization makes the verification. When ships carrying dangerous goods appear combustion, explosion, leakage and pollution accidents, they affect other ships' normal navigation and endanger the safety of the residents and agencies. Facing such situation, local water emergency command organization or the maritime administrative organization should immediately consult the deputy commander of the incident and notify the maritime institute (team) and ship management organization located in the upstream and downstream of segment which the incidents happened to implement traffic control for the ships. If it is necessary, the contingency plan will be started and the traffic control of the whole navigation area is carried out.

(6) Emergency Disposal of Pollution Incidents

To rescue the injured people in the accident;

To judge the nature of the accident and then the professional staff shall guide the ship to carry out self-rescue in accordance with the emergency plan of the ship's oil spill. People in danger of combustion or explosion should be evacuated in time.

To organize and evacuate other ships in the dangerous water area into the safe area on the basis of the situation.

The control and recovery of oil pollution team apply emergency equipment to control and recycle the spilled oil.

To escort the leaking vessel to the designated wharf in time and unload the dangerous goods; to organize relevant vessels in time to transfer the dangerous goods that cannot be self-propelled or towed.

To organize workers and equipment to clear pollution.

(7)Ways of Reporting an Alarm

The common informing an alarm, reporting and notified telephone number are detailed in figure 10.5-1.

When reporting on water distress information, the following contents should be included:

The time, location and situation of the incident; the names, type, contact methods of the ship and the aircraft or the personnel in distress.

The person who reports an alarm should provide with the following information as far as possible:

The main yardstick, owner, agent, operator and carrier of ships or aircraft.

The number of personnel in distress and casualty situation.

The loading situation, especially the dangerous goods: the name, type and quantity of the goods.

The direct cause of the incident, the measures taken and the request for assistance.

The meteorological and hydrologic information of the event, including wind power, wind direction, wave speed and wave height.

10.5-1The common informing an alarm, reporting and notified telephone number

Units	Telephone number	Fax Number
Dedicated telephone For water search and rescue.	Area code+12395	
Marine department of the Ministry of Communications.	010-65292218	010-65292245
Water search and rescue center of Jiangxi Province	0791-86151896	
Water search and rescue center of Shangrao city	0793-6219782	

Emergency office of Shangrao city	0793-8215512	
Public security department	110	
Fire fighting department	119	
Environmental protection of Shangrao city	0793-8316164	
Environmental protection of other counties	0793-3336615	

11. Conclusion

11.1 Project Overview

11.1.1 Basin and related planning overview (see introduction)

11.1.2 Project Overview

Bazizui navigation and electricity junction project is located in the lower reaches of the Xinjiang River in Yugan county of Shangrao City, Jiangxi Province. Its dam site is 49km to the junction of the hub of the dam, 12km far to Yugan County and 57km downstream of the proposed double-port shipping hub step. The proposed dam site has the geographic coordinates of 116 ° 40'30 " east longitude and 28 ° 37'20" north latitude. Xinjiang river is divided into East River and West River at the Bazizui, so the hub is divided into the East River Hushan Tsui dam site and West Damie Biling dam site and the two hub sites located on the same axis. Hushanzui dam site locates in Xiongjia Village, Baimaqiao Township, Yugan County. The dam site of Mopiling Reservoir locates in Xindu Village, Hongjiazui Town, Yugan County. Bazizui navigation and electricity junction project development tasks are taken shipping as main tasks, taking into account the comprehensive utilization of power generation.

Bazizui navigation and electricity junction project is a second-class project. The ship lock and waterway grade is Grade III and the design ship is 1000t grade, taking into account 2000t class while the ship lock scale is 180 × 23 × 4.5 / 180 × 23 × 3.5 (Hushanzui Lock / Tiejialing Ship Lock). The one-way capacity of the lock is 15.08 million tons/ year with waterway scale: 60 meters wide, 2.2 meters deep, turning radius 480m.

The power station is a riverbed power station with 4 units (2 units in each of Hushanzui and Taipiling), with an installed capacity of 12.6MW (Hushanzui 5.6MW and Taipi Ridge 7MW) and an average annual volume of 0.4503 trillion kW • h; normal reservoir water storage level is 18m with backwater length 37km and normal water storage reservoir area is 22.96km2. The normal storage level below the reservoir capacity is 0.136 billion m3 and the total storage capacity is 0.344 m3.

Hub sluice, lock retaining section, plant, left and right bank joints earthwork dam are designed by Grade 3, secondary buildings are designed by Grade 4. Pivotal permanent water and spillway is designed that floods take 50 years to reproduce and the recurrence of floods to verify is 300 years. The blockhouse and ship lock as a part of the water retaining structures, their design and recurrence of nuclear floods are same to the retaining structures. The flood recurrence period of downstream flood discharge energy-saving anti-red building is designed as 30 years.

The proposed layout of the junction layout is from the left bank to the right bank in order are: Mopiling left bank earth bank (front edge is 215m), Mopiling (front edge is 43.4m) and Mopiling gate dam section (front edge is 19m), Mopiling 20-hole sluice gate (front edge is 342m), Mopiling riverbed factory (front edge is 75.94m long), Mopiling (front edge is 8m long), connection between two hubs (front edge is 408m), Hu Shan mouth lock (front edge is 43.4m long), Hushanzui gate dam section (front edge is 19m long), Hupingshui 12-hole sluice (front edge is 206m long), Hushanzui River bed factory (front edge is 70.51m), Hushanzui fishway (front edge length is 8m), Hushanzui right bank earth dam (front edge length is 52m). The total length of the hub dam is 1510m. On the upstream side of the dam crest, a dam-top traffic highway runs through the entire hub with a width of 7m and a width of 1.0m of sidewalk on the upstream side. The Hub Management Center is planned to be built on the upstream side of the earth dam between the east and west of the hub. The management area covers an area of about 200 acres.

Protection projects in the reservoir area mainly include embankment protection in the mainstream of the Xinjiang River and tributary bridge and Zhu River protection. A total of 11 protection zones are involved. The total length of the protective embankment in the reservoir area is about 52 km. Anti-seepage treatment which is the addition of cutoff walls and post-embankment relief wells and embankment of the infiltration ditch is 32.19km. The length of risk insurance section is 10km; 1 new sluice and 11 sluice gates, of which 5 are on the left bank and 7 on the right bank; 9 are newly constructed and reconstructed in the reservoir area, of which 5 are on the left bank, Right Bank 4; control tower area is 652 acres.

Inundation of the reservoir area involved collective part of the arable land of Dachang Township, Hongjiazui Township, Baimaqiao Township, Yangbu Town, Xiashan Township, Huangjinbu Town, Meigang Township and Jinjiang Town of Yujiang County in the area of Yugan County as well as Jinbuzhen Zhuqiao village in Yugan County. The project does not involve the relocation of resettlers and does not set up resettlement areas. The acquisition of cultivated land involves 52.11 acres of Zhuqiao Village, Huangjinbu Town, and the annual population of resettled people under the planned level is 86.

The project covers a total area of 2710.83hm2 of which 2213.38hm2 will be permanently occupied with a temporary land occupation of 497.45hm2. Temporary project layout of concrete mixing system, concrete precasting plant, steel processing plant, temporary storage of metal structures, mechanical repair plant, construction substations, water supply of construction system, construction and living area, site labs, construction temporary project covers an area of about 621500m2. Temporary works all arranged in the Hexin island which is the center of Xinjiang river. The total excavated volume of the project is 16,330.03m3, of which 791,400m3 is peeled off for the temporary planting of greening soil at the later stage and the remaining excavation is partially utilized. The total filling volume of the project is 10,330,800m3. In addition to using the excavation of the project itself, 1,578,600 m3 of the material yard and grit gravel field, was used for filling. After earthwork and stone balance, 757.81 million m3 (8,693,000 m3 of Songfang) of dregs were generated (all were piled to hub spoil yard). A total of two soil material planning projects, 1 sand and gravel yard and 1 spoil yard are constructed. The total construction period is 54 months.

Bazizui navigation and electricity junction project with a total investment of 3.9999 billion yuan while the total investment in environmental protection 88.6669 million yuan. The investment in environmental protection accounts for 2.22% of the total investment in the project.

11.2 Coordination of Project Construction and Related Planning (omitted)

The national development and reform commission of the People's Republic of China has issued

Decree No. 9 Guidance Catalogue for Industrial Structure Adjustment (2011 Edition) (2013 Revision)on March 27th, 2011 which takes effect on June first, 2011. It refers to program which is about coastal deep water navigation channel and high level navigation channel in the inland river as well as building construction in the Part Twenty-fifth Water Transportation of Category Ⅰ: Encouraging Development. Bazizui Navigation and Hydropower Hub project belongs to the Category Ⅰ: Encouraging Development. It does not belong to Category Ⅱ: Restricted category and Category III: Eliminative category in this document. The construction of the Bazizui Navigation and Hydropower Hub project abides by the national industrial policy.

Ministry of Transport has issued National Inland Navigation Channel and Port layout Plan. It refers that the layout of the high grade channel of the Yangtze River water system is “one horizontal, one net and ten lines”. The horizontal refers to the Yangtze River. The one net refers to the Yangtze River Delta high-grade navigation channel net. The ten lines refers to the Minjiang River, Jialing River, Wujiang River, Xiangjiang River, Yuanjiang River, Hanjiang River, Jianghan canal, Ganjing River, Xinjiang River, Heyu line waterway. The Bazizui is located in the Xinjiang River and the construction of the project is in line with the National Inland Navigation Channel and Port layout Plan.

According to the Development Plan of Inland River Shipping of Jiangxi Province, the following 244km navigation section of xinjiang river estuary is planned as the third-grade channel. The 111km navigation section from Guixi to Shangrao City, is planned as the fifth-grade channel. National high-grade waterway on Xinjiang River is planned as three cascades and four hubs. From the upstream to the downstream, they are JiePai cascade, Bazizui cascade (including Wushanzui hub located in eastern branch and Mopiling hub in the western branch of Xinjiang River) and Shuanggang cascade. The construction of the project conforms to the Development Plan of Inland River Shipping of Jiangxi Province.

According to the Xinjiang River High-grade Navigation Channel Construction Development Plan (2011-2015), the overall construction plan for Xinjiang River navigation channel is that it is proposed to take third-level channelization combing with navigation channel regulations to reaching the III standard for 244km navigation channel from the Xinjiang River estuary to Zhuxi estuary. That means that three hubs are set up: Jiepai hub (already built, only finish or rebuilt), Bazizui hub and Shuanggang (or Poyang) hub. Navigation channel on the reservoir and lake area also is improved. The construction program conforms to the Xinjiang River High-grade Navigation Channel Construction Development Plan (2011-2015).

According to the Comprehensive Transportation System Development Plan of Jiangxi province in 13th Five-Year, the development goal of port and navigation channel in Jiangxi Province is to basically complete the high-grade inland navigation channels, namely one vertical and two horizontals. Two horizontals refer to the Jiangxi segment of the Yangtze River and Xinjiang River. One vertical refers to Ganjiang River. The length of the high-grade inland navigation channels will reach 795 kilometers. Port transportation ability is further improved. The freight handling capacity will reach 3 tons and container throughput reached 2.4 million annual TEUs annually. Jiujiang port construction will become an important shipping hub. Jiujiang port and Nanchang port are promoted jointly development. The BazizuiNavigation and

HydropowerHub program has been included in the key projects of port and navigation channel development planning in the Comprehensive Transportation System Development Plan of Jiangxi province in 13th Five-Yea. This program is in line with this document.

The construction of the Bazizui Navigation and Hydropower Hub conforms to the following documents: National Main Functional Area Plan, The 13th Five-Year Plan for Economic and Social Development of the People’s Republic of China, The 13th Five-Year Plan for Economic and Social Development of Jiangxi Province, The 13th Five-Year Plan for Economic and Social Development of Shangrao City, The 13th Five-Year Plan for Economic and Social Development of Yugan County, Ecological Function Regionalization of Jiangxi Province, The Surface Water (environment) Functional Regionalization of Jiangxi Province.

11.3 Environmental Rationality Analysis of Project Plan

11.3.1 Normal water level program environment comparison

Engineering design for the normal reservoir water level proposed four normal water level programs of 17m, 18m, 19m and 20m for comparison. Engineering design takes normal water level scheme of 18m as a project recommended normal water level program.

After the comprehensive environmental comparison and evaluation, 18m normal water level program was recommended from the perspective of environmental protection which is same to normal water level scheme program recommended by engineer design.

11.3.2 Dam site environment comparison and selection

The project design proposes three comparison and selection of dam sites, namely scheme one: Dongdahe Dam site (at the mouth of Hushanzui) is located about 2.5km downstream of the entrance of Dongdahe River, and Xidahe dam site (Xiapi ridge downstream dam site) is located about 2.2km downstream of Xidahe dam entrance. Scheme 2: Dongdahe Dam site (Hushanzhang dam site) and Xidahe dam site (Mopiling upstream dam site) are located at about 0.9m downstream of the east and west major river diversion ports. The two hubs are located at the same dam axis; Scheme 3: The dam site of the main channel is located about 1.4km upstream of the junction of the east and west rivers. In order to prevent the water from returning to Dongdahe river and Xidahe river to flow into Boyanghu Lake area during the dry season, another dam junction was constructed in the Xidahe River. The dam site is the dam site of Mopoling in the first scheme (about 2.2km downstream of the entrance of the Xidahe River). By comprehensive design comparison of engineering designs, the scheme 2 is determined as the recommended dam site program.

After comprehensive comparison and selection of the environment, it is recommended that the second scheme be recommended from the perspective of environmental protection and it is the same as the recommended scheme of engineering design.

11.3.3 Field site environment rationality analysis

The selected Xiongjia Village soil material field on the right bank Ⅰ1 of the project, the soil material field of Minfang Village on the left bank Ⅰ2 and the gravel material field of Tongkou Village on the left bank are all located near the dam site with the shortest distance, which effectively reduce the length of temporary road construction, temporary land occupation and avoid more vegetation loss and make less disturbance to the environment and less perturbation.

Due to the close distance, the impact of dust generated during transportation is relatively small. The present site of the Xijiacun earth material field in the right bank Ⅰ1 is wasteland, the existing farmland in Minfang Village Ⅰ2 on the left bank is woodland, the gravelly field in Tongkou village is floodplain, which can effectively protect the cultivated land in the project area. Stone used in the project are purchased from Wannian County, Dahyuan Town Dutch Village Stone Market. Therefore, from the perspective of environmental protection, the yard selection is reasonable.

11.3.4 Analysis of environment rationality of slag yard site selection

The spoil grounds of the hub mainly cover arable land, meadows and woodlands with small transportation distances and short roads for newly-built roads. Environmental impacts such as soil erosion and dust pollution caused by road construction are small. Prior to the spoil, the surface soil is pre-stripped and reclaimed work can be done after the spoil is completed and the reclamation can be carried out after the spoil is finished, which has little effect on the total cultivated land area. There are no ecological sensitive areas such as nature reserves and scenic spots in the hub spoil grounds. There is also no distribution of key protected wild animals and plants of the state and Jiangxi Province within the scope of the land occupation. There are no surrounding villages, settlements and other environment-sensitive target distributions. Therefore, it is reasonable to analyze the site selection of the spoil yard from the perspective of environmental protection.

11.3.5Analysis of the environmental rationality of construction layout

According to the construction design of the project, the temporary works of Bazizui Junction Project are all arranged on the Hexin island which is mainly including the concrete mixing system, concrete prefabrication plant, steel processing plant, metal structure temporary storage yard, mechanical repair plant, construction substation, water supply system for construction, construction and living area, site lab, etc. The temporary construction covers a total area of about 621500m2 which are all arranged near the dam site with small distance. This can reduce the impact of soil and water loss dust and vegetation loss caused by road construction and reduce road dust and noise during construction. Within 200m of the boundary of the construction site, there is no sound environment such as residents and schools, sensitive air and ambient air. The construction site does not involve the rare protection of plants, animals and plants and special vegetation communities. Overall, it is reasonable to locate various construction facilities at Bazizui Navigation and electricity junction project.

11.4 Surface Water Environmental Impact Assessment

11.4.1 Status of Surface Water Environment and Environment Protection Objectives

(1) water environmental protection goals

Within the scope of Bazizui Navigation and electricity junction project, the water intake of Daling Township Shenling Waterworks and the water intake of Middle-aged Waterworks in Meigang Township are distributed on the left bank of Xinjiang River. They are about 4.2km and 24.5km away from the Bazizui Navigation and electricity junction project. Yangbu town Caiyuan waterworks intake on the right bank of Xinjiang river, Huangjinpu power plant water intake, Huangjinpu Industrial Park waterworks intake are away from the Bazizui Navigation and electricity junction project dam site about 8.9km, 25km and 26km; interval of mouth of Ruihong town downstream into the Poyang Lake to Bazizui Navigation and electricity junction project are proposed Hongjiazui waterworks intake, Jiangbu waterworks intake, Fenggang Township waterworks intake, water plant water intake and water outlet Ruihong town which are about 4km, 11km, 15km and 42km away from the Xizhahe Dam site of Baizuijiao Navigation and Electricity Junction Project; The interval from Baizuijiao Navigation and Electricity Junction Project to downstream proposed Shuanggang navigation junction dam distributes the Baimaqiao Township Gaoyuan Waterworks Dam, the water intakes of Zhangjiagang Water Supply Plant in Yugan County and Shuanggang waterworks intake of Yugan Township in Yugan County which are 7.5km, 8.7km and 21.5km away from the Dongdahe Dam site of Baizuizui Navigation and Hydropower Project respectively.

(2) status of surface water environment

According to the Functional Zoning of Surface Water (Environment) in Jiangxi Province and the Confirmation Opinion on Implementation Criteria of Environmental Impact Assessment of Xinjiang Baizui Navigation and Electricity Junction Project in Jiangxi Province issued by Shangrao City Environmental Protection Bureau and Confirmation Letter of Implementation Standard for Environmental Impact Assessment of Xinjiang Baizui Navigation and Hydropower Project of Jiangxi Province issued by Yingtan Municipal Environmental Protection Bureau, the area which impacted by the project involves the Xinjian Jiepai hub dam to Xijiang Yugan County Chau is landscape entertainment water area, so it should be implementated Surface Water Environmental Quality Standards (GB3838-2002) Class Ⅲ standard; The area from Yugan County Chau Sikkim Seng River on the east and west of the river fork 4km upstream to the river Jiangdu Yugan County Waterworks intake is the landscape recreational water area and the Class III standard of Surface Water Environmental Quality Standard (GB3838-2002) is implemented. The remaining 4km upstream of the water intake of Yugan County Dajian River reaches 1km upstream of the waterworks intake are Grade 2 drinking water source protection areas, so Surface Water Environmental Quality Standards (GB3838-2002) Class III standards is implemented. From 1km to the upper reaches of XinJiang river Dongdahe Yugan county water intake to the downstream of 0.2km section of Yugan County waterworks intake is a drinking water source protection zone, Surface Water Environmental Quality Standards (GB3838-2002) Class Ⅱ is implemented. From 0.2km downstream to water intake of Yugan county waterworks of XinJiang river Dongdahe to the section of Dongdahe of Caijiawan in Boyang county into Le’an river is landscape water area and it implements Class III standard of Surface Water Environmental Quality Standard (GB3838-2002); the section from mouth of Dongdahe and Xidahe of Xinjiang river in Yugan county to Poyang Lake of Ruhong town in Poyang County into Boyanghu lake is the landscape water area and it implements Surface Water Environmental Quality Standards (GB3838-2002)

Class Ⅲ standard; Baishui bridge of Baita River of Yujiang county to entrance to Xinjiang river of Baita River in Yujiang County is a landscape water area and it implements Class III standard of Surface Water Environmental Quality Standard (GB3838-2002).

According to the routine monitoring data of Yingtan City surface water in 2016, the water quality of the nine monitoring sections of Yingtan Yingtan Section and Baitahe River are Class Ⅱ and the water quality of Yingtan City is excellent.

According to the routine monitoring data of surface water in Shangrao City from August 2016 to August 2017, the upper reaches of the dam site located at Xinjiang Meigang, the lower reaches of the dam Xinjiang river Dongdahe brake and the control section of Dahe Ruijhong Bridge, except COD of March 2017 and July 2017 total phosphorus exceeded, can meet Ⅱ ~ Ⅲ water quality standards. Bagged gate monitoring section is located at the junction of the Xinjiang River Dongdahe and the Le’an River junction, the emergence of chemical oxygen demand, total phosphorus excess is caused by Comprehensive factors of Le’an River Poyang County Industrial Park Outfall, Wannian County Industrial Park Outfall and the surrounding Le’an Town sewage drainage.

According to the survey results of 12 surface water quality monitoring sections, 12 monitoring factors all meet the requirements of relevant water function zoning. The surface water environment in the Xinjiang River section of the project generally meets the requirements of water quality standards of Class II-III and the water environment in the region is in good condition.

(3) Hydrological situation

Bazizui navigation and electricity junction dam site control a catchment area of 15942km2, the average flow of dam site for many years is 578m3/s and the average annual runoff of 18.228 billion m3. The flood season (p = 10%), flat water period (p = 50%) and dry season (p = 90%) annual discharge were 864m3/s, 545m3/s and 334m3/s respectively.

11.4.2 Surface Water Environmental Impact and the Environmental Protection Measures to be Adopted

(1) The main environmental impact

1) Hydrological situation

① construction period

The project adopts the second-stage diversion method. During the construction period, the continuous over-flow of the river is still maintained, and no river runoff and dewatering will occur.

② initial reservoir water storage

According to the design of construction, at the end of March of the fifth year, the hub will be equipped with water-retaining operation conditions and water storage begins in April. According to the average flow rate Q = 961m3/s in April of the Bazizui navigation and electricity junction, the discharge volume of ecological flow of 67.6m3/s (Ecology flow is 32.0m3/s under Dajiangba in Jiangdong River and 35.6m3/s in Daheba, Jiangxi Province). The water level up to 18m above normal water level (corresponding to 136 million m3 of storage capacity) needs 43h. Reservoir initial storage time is short and the hydrological situation on the river is less affected.

③ operation period reservoir hydrology

Baizui navigation and electricity junction is a radial development mode and the reservoir capacity of the building is very small with almost no regulation of runoff performance. Therefore, the annual average, monthly average and average daily flow rate and water level of the design representative year of downstream of Bazizui sluice dam are the same as the annual runoff and water level of representative dam design site under current conditions, that is, after Bajianzui navigation and hydropower project is completed and put into operation, the downstream average annual, average monthly, average flow and the average monthly water level will be almost unchanged.

Any navigational hub project can not change the distribution of incoming water upstream of the dam site, and the same is true for the Bazizui Navigation and Electricity Junction. After the project is completed and put into operation, it is impossible to change the incoming runoff and interval water flow in the upstream of the dam site. The annual runoff and typical daily flow of the representative design upstream of the dam site after the project's accomplishment are the same as before the dam site's accomplishment, which means dam site design under current circumstances represents the annual runoff and typical daily flow process.

According to the operation rules of Bazizui junction, when the water inflow at the upstream of the dam is greater than or equal to 1100m3/s or the downstream water level is greater than or equal to 18.0m, the reservoirs will need to be fully liberalized to restore the natural river status. After the flood, the reservoirs will not be able to start impoundment until the two conditions that the incoming water in the upper reaches is less than 1100 m3/s and the lower reaches is less than 18.0 m in length. When the water flow at the dam site is equal to the demarcation flow rate of 1100m3/s, the water level in front of the dam will be 1.65m higher than the natural state, raising the average flow rate over the years by 2.66m and the backwater length of 37.28km. The lower reaches of the dam flow to water, the bank-up water level of dam along the upper reaches is higher.

The operation mode of the Bazizui Navigation and Electricity Junction Project is basically the mode that the water flow of this power station comes from the discharge of the upstream hydropower station, as well as regional water in-flows. However, in order to guarantee the shipping base flow discharged by the Bazizui power station be greater than or equal to 67.6m3/s, and to meet the need of shipping downstream the dam site and ecological requirements, appropriate adjustments will be made according to its daily inflow. The deficiency of the discharge from the upstream hydropower station will be supplemented by the Bazizui reservoir.

After the completion of Bazizui Navigation and Electricity Junction Project, the minimum discharge of this dam will be adjusted to greater than 67.6m3/s. That is, the downstream flow of the dam site will increase to more than 67.6m3/s when the upstream water flow is less than 67.6m3/s in dry seasons.

The Bazizui Navigation and Electricity Junction Project is designed as a low-dam run-of-river hydropower station, and the water level cannot reach the top of the channel. The reservoir only adjusts during days of the dry period, but the regulation ability is also very limited. When the flowrate increases, the downstream water level increases, and the water area of the same cross-section increases accordingly. After the completion of Bazizui Navigation and Electricity Junction Project, under different flood levels, the water area of the reservoir will increase in different degrees, and the average velocity of the cross-sections will decrease in different degrees correspondingly. Therefore, the downstream flowrate through the the dam after the construction of Bazizui Navigation and Electricity Junction Project is by little different than that of the current situation.

In conclusion, the operation period of the project has little impact on the upstream flow, downstream flow, water level and velocity of flow through the dam.

1) Minimum Ecological Discharge

Ecological discharge of river channel under the Bazizui dam, during both the initial water storage period and the operation period of this project, is determined as 67.6m3/s by using three methods including the Tennant method, the method maintaining water requirement of river shipping function and the method of water for industrial and agricultural production and living. Among that, 32.0m3/s and 35.6m3/s ecological base flows are requested for the Hushanzui dam in the east and the Mopiling dam in the west, respectively.

A two-stage diversion scheme will be adopted during construction period of Bazizui navigation hydropower complex. The river will still maintain the continuous flow characteristics. Discontinuous flow or reduction of dehydration won't appear. River channels under the dam can satisfy the ecological flow requirements.

At Bazizui Navigation and Electricity Junction Project, during initial impounding period and operation period, the 75% confidence instream flow in low water season Q = 121m3/s (including 64.2m3/s flow under the Hushanzui dam in the east and 56.8m3/s flow under the Mopiling dam in the west) will meet the need of 67.6m3/s ecological discharge (while 32.0m3/s and 35.6m3/s ecological discharges for the Hushanzui dam in the east and the Mopiling dam in the west, respectively). During the initial storage period and during the operation period, the discharge flow at the dam site should be controlled by not less than 67.6m3/ s, which can meet the ecological flow requirements.

2) Water temperature

The water temperature of the Bazizui reservoir is a typical one of mixed reservoir. Due to the frequent exchange of water in the reservoir, the residence time of water in the reservoir is short and the water temperature will not be stratified. The outlet water temperature is little different from that of the reservoir.

3) water quality

A. Water quality during the construction period

The pollution sources of project construction period mainly come from the flushing wastewater of sandstone material processing system, flushing wastewater of concrete system, drainage of foundation pit, mechanical oily water and sewage of construction persons.

The main source of water pollution during construction period comes from the flushing wastewater of sand stone material processing system. Under normal conditions, the SS concentration can be reduced to less than 70mg/L after treatment. And the total recycle and zero discharge will not affect the water quality of Xinjiang river.

The concentration of the suspended material in the foundation pit will be about 2000mg/L and the pH value will be 9 to11. If direct discharge, it will adversely affect the water quality in the vicinity of the drainage area and downstream of the drainage. Therefore, it is necessary to properly dispose the regular pit discharge. After taking measures to deal with it, the pH value of waste water can be adjusted to the range of 6 to 9, and the concentration of the suspended objects can be dischargeable. This can basically reduce the adverse effect of the pH value and SS on the downstream of the drainage river.

The amount of flushing wastewater of concrete system will be small. The pollutants are simple and non-toxic. After being discharged into the water, it can be fully mixed, which will not adversely affect the water body. After taking the corresponding disposal measures, it will almost not affect the water quality of Xinjiang river.

This project sets up mechanical repair and mechanical parking. Mechanical repair and cleaning process will produce mechanical oily wastewater. The main pollutants are that of petroleum, with concentrations of about 30 to 150mg/L, with characteristics of intermittent discharges. Drainage ditches will be set up around the mechanical repair and mechanical parking, to collect the mechanical oily wastewater. In the end of each ditch, a drainage filter oil pool will be set up. Waste water containing mechanical oil will be proposed by oil removed, filtered, and precipitated, then the water can be reused in sprinkling to the air for dust control, and the oil pollution will be recovered by qualified units. It will not adversely affect water quality.

The average oil concentration of oily bilge water is about 3500mg/L. The influence of the oily bilge water to the ground water environment is great, if it is directly discharged without treatment. After treatment, the dischargeable concentration is not greater than 15mg/L.

Construction camp sewage during peak seasons can be about 144m3 per day. The main pollutants are COD, BOD5, etc. The concentrations are about 300mg/L and 200mg/L respectively. It will have a certain effect on water quality if directly discharged. The sewage will be treated with sewage disposal equipment in this project. The concentration of COD and

BOD5 pollutants after treatment will be BOD5 ≤20mg/L, and COD≤ 60mg/L. The disposed water is used for construction road sprinklers and for afforestation, which has little effect on ground water quality.

According to the investigation, it is proposed to build a water intake for the Hongjiazui water supply plant, at 4km downstream from the Mopiling dam on the west Xijing river. No construction has been started yet as land approval issues, the start time of the construction has not been determined. It is suggested that water supply of the Hongjiazui water supply plant should be carried out after the completion of this project. Beside this, the normal water intakes and water qualities in the reservoir area and under the dam are less affected by the normal construction activities during the construction period, after the necessary pollution control measures are taken.

According to the survey, 4km down to Mopiling hub of Xidahe river of Xinjiang river is proposed intake of Hongjiazui town waterworks, but the construction has not been started yet and the starting time is not determined yet. It is suggested that township water plant can start normal water supply after completion of this project. In addition, normal construction activities at the construction phase of the hub will have less impact on normal water intake and water quality at the intake of the reservoir area and below the dam after taking the necessary pollution prevention and control measures.

② water quality in gas transporting period

Through the overall prediction of reservoir water quality during operation, the water quality of Bazizui reservoir in the dry season of 2020 will reach the Grade III water quality standard of Surface Water Environmental Quality Standard (GB3838-2002).

Through the calculation and analysis of nitrogen and phosphorus in the Bazizui navigation and electricity junction project, it is estimated that the annual average concentration of total nitrogen in water of Bazizui navigation and electricity junction is less than 0.30mg/L and the average concentration of total phosphorus is less than 0.050mg/L. After the construction of Babizui Navigation and Electricity Project, the reservoir will not produce eutrophication in general.

Under the average daily flow rate of 90%, the maximum concentration of ammonia nitrogen in the four water intakes at the reservoir area was 0.932mg/L, the maximum concentration of BOD5 was 5.05mg/L and the maximum concentration of CODmn was 18.0mg/L after dam construction. The concentration of BOD5 in the water near the water intake of the Jinbu Port Industrial Park waterworks was 4.32mg/L, which did not meet the requirements of Class III in the Surface Water Environmental Quality Standard (GB3838-2002). The water quality at other water intakes in the reservoir area has reached the Class Ⅲ standard in Surface Water Environmental Quality Standard (GB3838-2002). In the process of water storage, wastewater discharge may cause pollution to the water intake of waterworks in Huangjinbu Town Industrial Park; in other period, it will not have a significant impact on the quality of water intake.

During the wet season, the hydrological situation at the downstream of the Bazizui reservoir dam site is close to the natural state and the operation of the reservoir has little effect on the water quality of the downstream reaches of the dam. During the dry season, the operation of the Baizui navigation and electricity junction can increase the downstream flow rate, having a beneficial effect. After the construction of Bazizui navigation and electricity junction project, it will not have obvious adverse impacts on the downstream water quality and water environment sensitive targets of dam.

(2) Water Environmental Protection Measures

The water environment protection measures of Bazizui Navigation and Electricity Junction Project during the construction period mainly deal with the production and domestic wastewater including flushing wastewater of processing of sand and gravel, mechanical oil-containing wastewater, domestic sewage and foundation pit drainage.

Sand and gravel rinsing wastewater is treated by high efficiency cyclone purification method. After the waste water was treated, they will be reused and the sludge is transported to the waste slag yard. The drainage of the foundation pit is treated with sedimentation tank plus flocculant and neutralizing agent and discharged after standing; The waste water from the tank is sent to the sand and gravel washing waste water treatment system through the pipeline for unified treatment; the mechanical oil-containing waste water is set up to be treated in the oil filter pool and the waste water is filtered back and used for watering and reducing dust; Separation of oil and water separation equipment for reuse, ship oil (HW08) and land-based machinery and equipment for the treatment of oil (HW08) are sent to a qualified unit for recycling; life camp for construction and the owner of domestic sewage treatment plant use domestic sewage treatment. The treated effluent is used for farmland irrigation or watering and dusting and greening of construction roads.

The water environmental protection measures of Bazizui Navigation and Electricity Junction during operation are mainly to reduce the pollution load in the reservoir area, which include: scientific soil testing and fertilization, reducing the pollution load of pesticides and fertilizers; promoting the use of biogas digesters, reducing the construction period of rural life pollution; promoting ecological agriculture. The domestic sewage of the management staff will be used for irrigation or the afforestation of the management area of the hub after being treated by the complete set of domestic sewage treatment equipment. The discharge of domestic sewage and bilge oil from ships in the waterway of the reservoir area shall not be allowed. The sewage from the ships shall be collected by domestic sewage collection devices and oil-water collection devices provided by the ship and then sent to the quay for recycling or unified reception processing by environmental protection receiving ship.

In order to ensure the water quality and the safety of water intake in drinking water source protection areas, the evaluation suggests that in the upper reaches of floods, when the inflow of water is more than 690m3/s but less than 1100m3/s and the downstream water level is less than 18.0m, under the premise of base flow is an ecological protection of 67.6m3/s, water can be divided into three phases with each period of about 2 weeks and each gate of the next consecutive water storage is about 15 hours. Before water storage, the water storage time will be informed to the water-intaking institution in the area, so that they can make the appropriate response. During the water storage period, a water quality monitoring section should be laid at the water intake at the waterworks of Jinbu Industrial Zone, the water intake of the waterworks at Meigang Township, the water intake at the waterworks of Golden Port Town, the water intake at the waterworks in Yangbu Town and the water inlet at the waterworks of Daxi Township Waterworks to monitor the water quality. Monitoring results show that when the pollutant concentration in water is on an upward trend, it should promptly inform the hub to stop storing water. Once the monitoring result shows that the pollutant concentration in water exceeds the standard, the intake should be informed to stop taking water and the hub should be immediately informed to stop water storage; to analyze and solve the problems that caused the excessive standard, then promptly compensate the related waterworks for disposal expenses.

In Daxi Township Shenling waterworks intake, Yangbu Township Caiyuan waterworks intake, Gold Buzhen Industrial Park waterworks intake, Mei Gangxiang middle-aged waterworks intake and other drinking water intakes which are water protected areas in the reservoir area, to set signs to remind the passing ships to protect water sources; to remind the past vessels to enhance safety awareness; to prohibit ships anchor and launch in the drinking water source protection areas.

In order to ensure that the discharging flow meets the downstream ecological flow requirements, an online automatic monitoring system should be set up at the Hushanzui junction of Dongdahe River and Xindiexi Dapingling junction to ensure that the ecological flow of Xijiangzui Dam is 32.0m3/s and Mopiling dam is 35.6m3/s.

11.5 Terrestrial Eco-environmental Impact Assessment

11.5.1 Terrestrial Ecosystem Status Quo

The distribution characteristics of plant communities in the evaluation area: the main vegetation of river floodplains and dike banks on both sides of the Xinjiang River are mainly shrub grasslands and wetland swamp vegetation, such as bermuda grass community, centipede grass community, carex community, smartweed community. river bank protection forest is mainly pterocarya tonkinensis forest and so on; except Xindu village in Bazizui has a certain area of farmland distribution, the Hexin island of Xinjiang river are mainly the musklin, camphor, poplar and other broad-leaved forest and wetland marsh vegetation dominated mostly under forest. The main landform in the lower terraced plain of the Xinjiang River is the inlaid mosaic of farmland and village buildings. The main types of forest land in this area are mainly artificial forest such as Phyllostachys pubescens, economic fruit trees and sporadic Nephelium deciduous broad-leaved forest, in addition, there is a small amount of Camphor tree forest. And other natural vegetation is less distributed, while field terraces, wasteland mainly are shrubs and grasslands distribution; the high terrace and the hilly area of the river are mainly Pinus massoniana, Pinus elliottii and other coniferous forest as well as the cotyledons shrubs, sparrow shrubs and other distribution. Pinus massoniana distribution area is of the most extensive distribution.

According to the investigation of the terrestrial ecological status in terrestrial area from February to March in 2017 and the related literatures, the vegetation in the evaluation area includes 3 vegetation types such as coniferous forest, broadleaf forest, shrub and grass shrub and grassland, 7 vegetation type, 19 groups, in addition to plantations and agricultural vegetation. There are 718 species, 421 genera, 128 families in the evaluation area, in which 32 species, 18 genera and 12 families in ferns; 686 species, 403 genera, 116 families (including 3 species, 3 genera, 2 families of gymnosperm, 114 species, 400 genera and 683 families of angiosperms). The number of vascular plants, genera and species in the evaluation area accounted for 47.9%, 28.5% and 15.9% of the total number of common vascular plants, total genera and total species in Jiangxi Province, respectively. There are 3 species of ancient tree (camphor tree) in the evaluation area. In addition, there are 5 species of camphor tree (Grade Ⅱ) and 5 species of key protected wild plants in Jiangxi (Adinandra milletii, bischofia polycarpa, Dalbergia, Ilex cornuta and Acer palmatum, which bischofia polycarpa wood and Acer palmatum are cultivated in garden).

There are 48 kinds of terrestrial vertebrates in the evaluation area, among which there are 1 order, 3 family and 4 species of amphibians, 2 orders, 6 families and 9 species of reptiles, and 10 orders, 21 families and 29 species in birds, 3 orders, 3 families and 6 species of mammals. There are no national key protected wild animals while there are 16 species of the provincial level protected animals of Jiangxi Province including Asiatic toad, black spot frog, turtle, red dot Kam snake, red chain snake, Chinese water snake, black eyebrow snake, viper, egret, mallard, Spot-billed duck, red-necked duck, swallow, Red-rumped swallow, hedgehog and yellow weasel and so on.

11.5.2 Terrestrial ecological environment and the measures to be taken

(1) Terrestrial ecological environment

Bazizui Navigation and Electricity Junction reservior has a total flooded area of 2027.19hm2 and a hinterland of 533.94hm2 (including permanent land occupation of 154.57hm2 and temporary land occupation of 379.37hm2) and a reservoir protection area of 149.7hm2 (including permanent land occupation of 31.63hm2 , temporary land 118.07hm2).

The construction of the project will affect the vegetation and plant resources in the assessment area to some extent. The inundation and the vegetation in the construction area are the result of the secondary evolution of man-made long-term persistent disturbance. In order to evaluate the general distribution types of riparian zones in the low- plantations, shrubs are the dominant species, most of which are common and widely distributed plant species in the region. The project has little effect on plant species and landscape pattern. The construction mainly aims to reduce the above-mentioned area and quantity of vegetation and plants and will not result in significant changes in plant species composition and plant population structure. After the construction, the natural conditions of the region such as water, heat and soil nutrients are good, which have little effect on the degree of landscape heterogeneity and impedance capability of the regional natural system and it will not bring obvious adverse impacts on the production capacity of the regional natural system. Regional landscape structure and function will be gradually restored and developed.

The three old trees of camphor tree in the evaluation area are located in the protective embankment in the reservoir area. The impoundment of the reservoir will not have obvious adverse effects on its growth but it may be affected by the flood embankment construction. Monitoring measures shall be taken during the construction to eliminate the destructive impact of the construction. There are 5 species of key protected wild plants in Jiangxi province, including Adinandra milletii, bischofia polycarpa, Dalbergia, Ilex cornuta and Acer palmatum in the evaluation area. All are distributed in the hilly land around the Bazizui reservoir and outside the construction area and reservoir inundation area range and its distribution is wide, Bazizui navigation and electricity junction will not have a greater adverse impact on the above-mentioned protected plants.

The direct impact on the terrestrial animals of the Bazizui navigation and electricity junction project is mainly caused by reservoir inundation, terrestrial animal habitats destroyed by land occupation and various construction activities, space for terrestrial animal activities and food sources are reduced as well, the normal life of terrestrial animals disturbed by construction workers and immigrants; the main distribution of riparian groups are affected, such as amphibians asiatic toad, pelophylaxe, reptiles Elaphe carinata, black-browed snake, silver snake, birds sparrows, jackals, turtledoves, egrets, herons, common kingfishers, and some types of mammals, and such adverse effects are mainly transient and small and do not pose a threat to their stock numbers. After the construction of impoundment of Bazizui navigation and electricity junction project, the change of environmental conditions in the reservoir area is conducive to the breeding and growth of terrestrial animals in the hi-water environment. The habitat that is adapted to the weeds, ditches, forests and shrubs and other fauna, as well as taking the above-mentioned environment as predominant habitats and food sources will be restored.

There are no national protected animals in the assessment area, and there are 16 species of protected animals at the provincial level in Jiangxi Province, namely, Asiatic toad, black spot frog, turtle, red dot Kam snake, red chain snake, Chinese water snake, black eyebrow snake, viper, egret, mallard, Spot-billed duck, red-necked duck, swallow, Red-rumped swallow, hedgehog and yellow weasel, all of which are common species in the evaluation area and nearby areas. The construction will slightly reduce the above animal population in the assessment area, but because of their strong adaptability to the local living environment, the population of these animals can be recovered after the construction is completed.

(2) Terrestrial ecological protection measures

① Strictly define the scope of construction activities and strengthen management and supervision to reduce the destruction of terrestrial vegetation and wildlife habitats caused by construction activities.

② After the completion of the project, vegetation restoration or reclamation will be carried out for the temporarily occupied area and the vegetation disturbance area in order to minimize the adverse impact of the land occupation on the terrestrial plants.

③ It is suggested to list and protect the three old camphor tree trees involved in the project and carry out follow-up monitoring to strengthen personnel management during the construction period.

④ At the design stage, the occupation of land by temporary construction such as construction campsite, construction access road, material yard and waste disposal yard should also be done, so as to reduce the amount of temporary land occupation, especially the amount of cultivated land occupied. The choice of construction camp site should make full use of the existing houses and sites on both sides of the embankment line and various soil and water conservation measures should be strictly implemented.

⑤ Before the construction of protection works, lift-up works, take-out of spoil grounds, temporary construction sites, etc., the fertile tillage soil in the above sites should be protected so as to facilitate the site greenery and vegetation restoration in the later stage of construction. Excavation and site cleaning should be at the same time of surface vegetation clearing, the surface of the mature soil is also stripped and temporarily stored. The design documents should be based on the above principles to raise or refine the topsoil stripping, stacking and protection work, and put forward corresponding environmental protection requirements for construction activities.

⑥ The layout of construction camps of each unit is based on the principle of convenient construction. The construction camps mainly rent houses nearby, reducing the temporary land occupation and avoiding occupying cultivated land. During the construction process, all soil and water conservation measures should be strictly implemented. After the project is finished, the area which is avaliable to be greening in the permanent land should be all greening; the temporary land used in the construction should be given priority to the re-cultivation while those can not be re-cultivated should be restored by vegetation.

⑦ Promote the application of energy technologies such as biogas digesters and marsh gas production to reduce the demand for vegetation of rural living energy sources.

⑧ Strengthen publicity and education on wildlife protection and enhance awareness of wildlife conservation so as to prevent the killing of wild animals.

11.6 Aquatic Ecological Impact Evaluation

11.6.1 Aquatic Ecological Status Quo

According to the survey, a total of 4 divisions, 27 families and 28 genera were detected in the survey of phytoplankton in Xinjiang River, 48 species, 29 genera and 12 families of zooplankton, 15 species, 15 genera and 10 families of zoobenthos, and 29 species, 20 genera and 16 families of aquatic vascular plant and 4 orders, 10 families and 40 species of fishes. The evaluation of the river section of Chinese sturgeon, white sturgeon, catfish, bluish fish, dace, Coreosiniperca roulei are basically difficult to see, there are 8 species of fish with reproductive migratory habits including "four kinds of family fish", elopichthys bambusa, bream, ochetobius, red-eye trout.

Evaluation river section has not yet found the spawning grounds of four kinds of family fish, overwintering and feeding grounds.

11.6.2 Aquatic eco-environmental impact and measures to be taken

(1) Aquatic ecological environment impact

The construction of the Bazizui Navigation and Electricity Junction Project will affect the continuity of the river. Fragmentation of the fish habitat will have a barrier effect on the exchange between the upstream and downstream fish stocks of the dam. At the same time, the water level of the reservoir area will increase after the impoundment, the area is expanded to form relatively still flow or hydrostatic environment. The flow velocity and bed quality in the reservoir area also changed due to the impoundment of reservoirs, which provided better conditions for the growth and reproduction of planktonic plants. And reservoirs primary productivity will increase.

The impact of Bazizui Navigation and Electricty Junction on fish mainly occurs after the completion of the dam. Based on the analysis of the impacts on the different ecological needs of fish, the construction of Bazizui Navigation and Electricity Junction Project will mainly exert a great influence on the fish living in the river section of the original reservoir area. The impact on the fish under the dam is mainly to block the long distance migratory of herring, grass carp, red-eye trout, dace, Coreosiniperca roulei, bream, silver carp and other 8 species, so that it can not reproduce the original spawning grounds, but other ecological needs of fish are less affected.

Fish that have a great impact on the ecological needs of the fish on the dam are mainly migratory fish, fish which like fluent aquatic environments and rocky beach, and fish that produce drifting eggs. After Bazizui reservoir is completed, the fish stocks in the reservoir area hvae four main trends: ① the amount of resources is reducing and the impact is serious: what belongs to this category is mainly the migratory fish including black carp, grass carp, spualiobarbus curriculus, elopichthys bambusa, bream, silver carp and bighead carp, etc.; ② the resources in the reservoir area will decline and the tributaries will be supplemented to maintain a certain population quantity: the species belonging to this category include Zacco platypus, Opsariichthys bidens, Xenocypris argentea Gunther, Xenocypris davidi, Scylla serrata, lip [fish bone], flower [fishbone], Rhinogobio typus, Saurogobio dabryi, catfish, Clariidae, Tachysurus fulvidraco, Mystus macropterus and so on; ③ resources in the reservoir area are decreased, tributaries can maintain a certain population size: what mainly like to live in streams and other tributaries of small fish, such as blackfin tuna, patchy sand loach, Odontobutis obscura and Lesser spiny eel; ④ resources are increased: after the hub is built, the flow rate becomes slow slowly and the water surface is open. Floating fish, Sharpbelly, Culter alburnus, Mongolian redfin, Wuchang bream, carp, crucian carp, loach, eel, siniperca chuatsi, Siniperca kneri will have better living conditions in the reservoir area and the amount of resources will have increased to some extent.

(2) Aquatic ecological protection measures

There are protective measures including construction of fishways, the construction of fish proliferation and discharge stations, the rehabilitation of habitats to strengthen fishery management and aquatic ecological monitoring and research and so on.

1) set up fish facilities. The project is located between the Mopiling power plant and two hubs connected earth dam, arranging between the Hushanzui power plant and the right bank earth dam between the Mopiling and Hushanzui fishway. The main consideration of the fish are herring, grass carp, silver carp, "four kinds of family fish" and red eye trout, Ochetobius, Elopichthys bambusa and bream and other economic fish.

The main entrances of both fishways are arranged on the right side of the tailrace of the power plant and connected to the fish collecting system arranged on the platform of tailrace of the power station. The upstream water enters into the water replenishment system through a special replenishment channel and then enters the fish collection system through the replenishment hole on the partition wall between the replenishment system and the fish collection system to induce fish by dripping. Set fish system on the 4 different levels of fish into the hole for fish to enter. The fish swimming in the fishing system and the fish swimming in from the fish main entrance go through the meeting pool and enter the fish tracks. The fish tank goes along the right bank of the tailrace drainage wall downstream to turn 90 ° to the tail of the retaining wall. The vertical dam axis passes through the earth dam. The exit of the Hushanzui and the Maopiling is respectively arranged at the earth dam and the connecting section is at 350m and 430m upstream of the junction, the total length is 775m and 850m respectively. This area is far away from the inlet runner of the power station and it has a small flow rate, which makes it easier for fish to go back upstream.

The recommended selection of fishway is crossing-shaped fish tank, fishway exports over the season design of water level is 18.0m, fish import design level of Maopiling is 14.64m (unit fully open) ~ 13.85m (open a machine), Hushanzui is 14.91m (unit fully open) ~ 13.82m (open a machine). The design of the fish tank through the fish hole design flow rate is 0.7m/s ~ 1.2m/s while the total length of the fishway is 850m (Maopiling) and 775m (Hushanzui), slope degree of 1/60, fishway width of 3m, fishbowl pool length of 3.6m, design depth of 2m. Rest lounges are set at the corners, the elevation of fish entrance is 11.8m and exit elevation is 16.0m. Fishroad entrance and exit are equipped with inspection gates and barrier gates are located in the earth dam.

2) Construction of artificial fish proliferation station. To establish a fish breeding and releasing station within the Hexin island hub between the Dongdahe River and Xidahe River of Xijiang River. It has initially determined that the number of annual flow-releasing seedlings will be 3 million. In the recent period, the proportion of releasing is controlled as silver beast 30%, bighead carp 30%, grass carp 20% and herring 10 %,and other economic fish (such as red eye trout, bream, carp, crucian carp, etc.) 10%. The release specifications and proportions of long-term release targets need to be assessed on the basis of monitoring and investigation on the change of habitat conditions, fish resources and so on.

3) Habitat rehabilitation

In the reservoir area and Zhuqiao River and Baita River as alternate river reachs, artificial fish nests are set in the reservoir area to sow seeds of aquatic plants such as bitter grass, algae in shallow water areas of less than 2m in depth to accelerate the recovery of plants. In addition, you can sow some other seedlings of emergent plants, such as: cattail, catfish white, silvergrass and so on. Dissemination area is 15 acres.

4) Prevention and protection measures. To strengthen publicity and develop ecological environment protection manuals, set warning signs for aquatic organisms, strengthen the management of construction workers and prohibit any fishing activities in the construction area; establish a timely rescue mechanism for fish, holding or release in time; reasonable storage under the gate to avoid the main breeding season for fish as far as possible; during initial storage, the dam downstream the river will reduce, it should be taken to increase discharge water in early period to extend the initial storage time. And other measures to reduce the impact of initial storage of fish; to strengthen fishery management and environmental management department should actively assist the local fishery management departments to do well fish protection and publicity work in the reservoir area and downstream of the dam, to increase law enforcement and intensify efforts to patrol and inspect patrols, and prohibit illegal fishing activities such as exploding, electricity and poisonous fish.

11.7 Ambient Air and Acoustic Environment Impact Assessment

11.7.1 Environmental Status and Environmental Protection Goals

(1) There are 10 ambient air and acoustic environment protection targets in the junction project area, including Waixiongcun and Bucun. And there are 22 ambient air and acoustic environmental protection targets mainly distributed in the assessment area of the reservoir protection project.

(2) According to the survey results from the two ambient air monitoring points, the ambient air quality in the area where the project is located meets the Grade II standard of Ambient Air Quality Standard (GB3095-2012), and the ambient air quality in the area is good.

(3) According to the survey results from the five acoustic environment monitoring points, the daytime and night equivalent sound levels at four monitoring points (Waixiongcun, Zhoufanshang, Sanbeishanlujia and Loubucun) meet the Grade I standard of ambient sound levels. the daytime and night equivalent sound levels on the Grade II highway S208 meets the 4a Standard of Sound Environmental Quality Standards (GB3096-2008). The quality of the acoustic environment in the assessment area is good.

11.7.2 Environmental Impacts and Environmental Protection Measures to be Adopted

(1) Environmental Impacts

The main sources of air pollution in the construction area of the Bazizui navigation and electricity junction project are dust and fugitive dust produced by construction activities such as earthwork excavation and backfilling, sand and gravel processing, concrete mixing, cement and other dust material transporting, as well as the fuel gas emitted by construction machinery and transport vehicles, in which the main pollutants are TSP, PM10, NO2, etc. Among them, dust and fugitive dust are the major air pollution sources in the construction process.

Concrete mixing TSP: The TSP concentration at 160m downwind can meet the daily average of 0.30mg/m3 standard of Ambient Air Quality Standard (GB3095-2012). The main production facilities of this project are arranged on the island in the middle of the river. The boundary of the construction site is 200m from the embankment of Dongdahe River on the right bank and 600m from the embankment of Xidahe River on the left bank. Therefore, the production facilities in the construction site have less impact on the ambient air at the sensitive spots around the junction project.

Transport vehicle TSP: The TSP concentration at 160m downwind can meet the requirement of the monitoring concentration limit (5.0mg/m3) for unorganized emission in the Integrated Emission Standard of Air Pollutants (GB16297-1996). Material transport process will have some impact on the sensitive points around the construction road in the junction area. When the construction is over, the impact will be terminated.

Reservoir protection embankment reinforcement project and material transport will produce different degrees of impact on the residents around the distribution of sensitive points near the embankment and the proposed road. But the impact will be short-lived. When the construction is completed, the pollution will be terminated.

The construction site of Bazizui navigation and electricity junction is chosen in the island in the middle of the river. The boundary of the construction site is more than 200m away from the acoustic environment of the left and right banks. The fixed point sound source during the construction period has less influence on the surrounding environment sensitive points.

Daytime traffic noises in the temporary roads and the existing local roads utilized by the construction have no effect of excessive pollution impact on the outside of 10m on both sides of the road (Class 4a standard). Nighttime traffic noises have no effect of excessive pollution impact on the outside of 15m on both sides of the road. The impact of noise during operation is limited to the boundary of the junction area, and the operation of the power station will not cause any noise pollution. During the operation period, the ship noise basically will not cause noise excessive impact on the residents along the waterway.

11.7 Ambient Air and Acoustic Environment Impact Assessment

11.7.1 Environmental Status and Environmental Protection Goals

(1) There are 10 ambient air and acoustic environment protection targets in the junction project area, including Waixiongcun and Bucun. And there are 22 ambient air and acoustic environmental protection targets mainly distributed in the assessment area of the reservoir protection project.

(2) According to the survey results from the two ambient air monitoring points, the ambient air quality in the area where the project is located meets the Grade II standard of Ambient Air Quality Standard (GB3095-2012), and the ambient air quality in the area is good.

(3) According to the survey results from the five acoustic environment monitoring points, the daytime and night equivalent sound levels at four monitoring points (Waixiongcun,

Zhoufanshang, Sanbeishanlujia and Loubucun) meet the Grade I standard of ambient sound levels. the daytime and night equivalent sound levels on the Grade II highway S208 meets the 4a Standard of Sound Environmental Quality Standards (GB3096-2008). The quality of the acoustic environment in the assessment area is good.

11.7.2 Environmental Impacts and Environmental Protection Measures to be Adopted

(1) Environmental Impacts

The main sources of air pollution in the construction area of the Bazizui navigation and electricity junction project are dust and fugitive dust produced by construction activities such as earthwork excavation and backfilling, sand and gravel processing, concrete mixing, cement and other dust material transporting, as well as the fuel gas emitted by construction machinery and transport vehicles, in which the main pollutants are TSP, PM10, NO2, etc. Among them, dust and fugitive dust are the major air pollution sources in the construction process.

Concrete mixing TSP: The TSP concentration at 160m downwind can meet the daily average of 0.30mg/m3 standard of Ambient Air Quality Standard (GB3095-2012). The main production facilities of this project are arranged on the island in the middle of the river. The boundary of the construction site is 200m from the embankment of Dongdahe River on the right bank and 600m from the embankment of Xidahe River on the left bank. Therefore, the production facilities in the construction site have less impact on the ambient air at the sensitive spots around the junction project.

Transport vehicle TSP: The TSP concentration at 160m downwind can meet the requirement of the monitoring concentration limit (5.0mg/m3) for unorganized emission in the Integrated Emission Standard of Air Pollutants (GB16297-1996). Material transport process will have some impact on the sensitive points around the construction road in the junction area. When the construction is over, the impact will be terminated.

Reservoir protection embankment reinforcement project and material transport will produce different degrees of impact on the residents around the distribution of sensitive points near the embankment and the proposed road. But the impact will be short-lived. When the construction is completed, the pollution will be terminated.

The construction site of Bazizui navigation and electricity junction is chosen in the island in the middle of the river. The boundary of the construction site is more than 200m away from the acoustic environment of the left and right banks. The fixed point sound source during the construction period has less influence on the surrounding environment sensitive points.

Daytime traffic noises in the temporary roads and the existing local roads utilized by the construction have no effect of excessive pollution impact on the outside of 10m on both sides of the road (Class 4a standard). Nighttime traffic noises have no effect of excessive pollution impact on the outside of 15m on both sides of the road. The impact of noise during operation is limited to the boundary of the junction area, and the operation of the power station will not cause any noise pollution. During the operation period, the ship noise basically will not cause noise excessive impact on the residents along the waterway.

(2) Environmental Protection Measures

Ambient air: A) In the construction area, a sprinkler will be equipped, and sprinkler dust suppression operations will be carried out in the absence of rain. Sprinkler roads are mainly the access roads with heave traffic flow and close to the centralized residential area. Sprinkler frequency and water consumption will be determined according to the weather conditions and road dust situations, no less than 3 times in a non-rainy day in the important highways. B) Reasonable arrangements of driving routes for construction vehicles, as far as possible to avoid the residents concentrated area. Set slowdown street signs in the concentrated residential area. Set temporary sound insulation barriers in the vicinity of the dam site construction roads near residential areas such as Waixiongcun, Bucun, Songfang, Liujialu, and protection sections near the residents, and increase sprinkler frequency to reduce the impact of construction on its ambient air. C) When the concrete batching and mixing plant is in operation, the dust emission concentration should be controlled within the standard according to Integrated Emission Standard of Air Pollutants (GB16297-1996). Dust collector should be equipped for the concrete mixing plant and should be operated at the same time as mixing plant in operation. Strengthen the maintenance of the dust collector, so that it is always in good working condition.

Acoustic environment：A) Before construction, management measures of construction noise should be listed in the design content of construction organization, and the project period should be managed scientifically, when bidding for a project. Before the project starts, it is necessary to apply to the local EPA (Environmental Protection Agency) for noise declaration and registration of construction sites. B) During the construction, the construction site environmental protection signs should be hung at conspicuous places on the construction site, and the environmental protection responsible person at the construction site and on-site telephone number should be marked for public supervision. During the construction process, the construction noise emitted to the surroundings should meet the emission standards stipulated by the state. C) Where construction around the noise sensitive areas, such as residential areas, medical areas, research and cultural and educational areas, it is necessary to strictly control the operation time and prohibit strong noise operation at night (from 22:00 to 6:00 in the next morning). Operations that must be continuous at night due to the construction process requirements or special needs should be applied in advance. It can only be implemented after the approval of the local EPA. D) Strictly control of man-made noise: To minimize noise nuisance, personnel entering the construction site shall not shout loudly, beat the template with no reason, or whistle, and the use of tweeters is limited. E) Try to use low-noise construction machinery or construction machinery equipped with noise reduction equipment. At the construction site, strong noise construction machinery (such as: mixing machine, chainsaw, grinder, etc.) should be set up in a closed construction plant to prevent the spread of noise. F) In order to reduce the noise produced by the processing of the construction site, products, semi-finished products, production operations Involved to produce strong noise (such as prefabricated components, doors and windows, etc.) should be finished placed in the factory or workshop. G) In the process of construction noise management, we should adhere to the principle of combining control with prevention, strengthen the education of construction units on relevant environmental protection policies and regulations, and enhance the environmental awareness of construction enterprises so as to take all possible measures to reduce noise, to consciously carry out noise control, to lower the construction noise pollution to a minimum level. H) Strengthen the environmental noise monitoring during the construction period. In particular, the sensitive points around the construction roads 1 # and 3 # in the junction area should be monitored three times a year in the construction period. Once the noise is found excessive, deal with it immediately. I) On the ship lock dam, two no-horn signboards shall be set for each channel under the dam, a total of 4 signs, to limit the sudden high-noise.

11.8 Resettlement

This project imposes a total of 1136.82 acres of cultivated land, of which 1084.71 acres is state-owned cultivated land and 52.11 acres is cultivated land owned by the Zhuqiaocun Village in the Huangjinpu town. The project does not involve the relocation of population, does not set the resettlement area, the planned annual production and resettlement population is 86 persons. Reconstruction of engineering projects include: waterways, terminals, power facilities, communications facilities, hydrological observation stations, culverts and other reconstruction. For the main project, the formulation of professional project reconstruction plan: all the affected public facilities will be restored according to the principle of the original scale and the original standard. These measures can ensure the effective restoration of public facilities in the region.

Production resettlement should follow the principle of land acquisition after resettlement to avoid any impact on agricultural production. Reconstruction of professional project planning should follow the principle of construction after the demolition to avoid the impact on local communications, electricity, water intake, drainage, and irrigation.

11.9 Solid Waste

Solid waste during the construction of this project is mainly construction waste, building materials waste, domestic waste generated by construction workers, etc. The solid waste in operation period of this project is mainly the hazardous wastes such as management household garbage, ship's life rubbish and waste oil residue.

Construction wastes and building materials wastes shall be discarded in the junction waste yard. Trash bins shall be set up in all construction and living quarters and main office areas. Garbage should be regularly transported to the disposal site for landfill disposal. During the operation period, garbage bins are installed in the junction area to collect the household garbage of management persons, and garbage is specially collected by Environmental Health Center of Yugan county. The domestic garbage on the ships in the waterway of the reservoir area should be collected by the garbage collection device provided by the ship, and be handed to the environmental protection boat or the ship should stop the dock for garbage disposal. Do not dump garbage arbitrarily in the reservoir area. Waste oil residue, oil-containing rags and oil-containing waste are hazardous wastes, and shall be disposed in time after being collected by the units that are qualified for hazardous waste disposal. Hazardous waste shall not be discharged arbitrarily.

11.10 Groundwater Environmental Impact Assessment

There are no conservation sites of groundwater in centralized drinking water sources within the assessment area.

According to the survey results of the five groundwater monitoring stations, all the monitoring factors meet the Grade III standard of Groundwater Quality Standard (GB / T14848-93), and the overall quality of groundwater in the area is good.

The environmental impact on groundwater is mainly the submergence influence in the reservoir area. According to the prediction, 11 low-lying areas in the reservoir area may be impacted by the submergence, with the total submerged area of 26,395.1 acres.

A) In order to reduce the impact of seepage and immersion in the reservoir area of the dam, it is planted and designed for embankment seepage prevention treatments for the 11 potential submerged areas (including Daxiwei, Duanjiahuwei, Jinbuwei, Zhoujianongwei, Shawowei, Zijiawei, Hegangwei, Shixiangwei, Zhuqiaowei, Tuanhu Farm, etc.) in the construction license. Water-jet concrete walls are designed to prevent vertical leakage of dam foundation, and relief wells and cut-off ditches are set behind the dike. The field-lift protection measures are taken in four slightly low-lying areas (Yangbuwei, Hebu, Pingshangwei and Zhuqiaowei). Electricity pumping station drainage scheme is adopted for 9 drainage areas that could not be treated by local field-lift in the reservoir area. In order to reduce the impact of waterlogging in the reservoir area, new sluices are constructed and the culverts that do not meet the drainage design requirements in the reservoir area are reviewed and designed again.

B) For the possible destruction (bank collapse, or landslide) of the bank, protection measures, such as the slope protection, unloading, remediation, alteration and the necessary plant, are taken in the construction design.

C) In order to better protect groundwater resources and minimize the damage to groundwater quality caused by sudden accidents, emergency plans for groundwater risk accidents should be formulated. To prevent the pollution from sewage entering the reservoir and dispersing in groundwater, it is needed to take measures such as river closure to collect sewage and carry out centralized treatment at the sewage leakage points upstream of the reservoir.

D) During the reservoir operation period, the groundwater level around the reservoir will be perennial observed, and water quality monitoring will be perennial conducted. Once any problem is found, take measures immediately.

E) A detailed immersion impact investigation and study should conducted for the protection zones in the next stage of the design process. According to the investigation and study, the detailed engineering design of phases, including optimizing the layout of engineering measures such as the electric drainage station, sluice and so on, reasonably determining the scope of the field-lift and the height of the field-lift, to minimize the impact of the project on immersion.

11.11 Environment risk evaluation

Environmental risk mainly includes the risk of oil spill (liquid) in operation period, the risk of oil leakage in power plant, the risk of dam break and bank collapse. When the above risks happen, some adverse effects on the surrounding environment will be caused. Corresponding risk prevention measures and risk contingency plans should be taken.

11.12 Public participation

Based on the Special Report on Public Participation in the Project of Jiangxi Xinjiang Bazizui Navigation-Power Junction, the project has carried out public participation investigation by means of information publicity, questionnaire survey and posting notice. The survey results show that the project has received the attention and support from the majority of the public within the scope of the project and people concerned about the construction of the project. During the two network information publicity period, 98.8% of the 162 respondents expressed support or conditional support for the project, 1.2% does not matter, no objection to the construction of the project; 14 of the 100% surveyed groups support the construction of the project, no objection.

11.13 Environment protection investment

The total investment of the project is 39.99 billion RMB. The total investment of project environmental protection and soil and water conservation is 88,666,900 RMB. Among them, the environmental protection project investment is 39,809,800 RMB. Investment in soil and water conservation is 48,857,100RMB. Environmental protection investment accounts for 2.22% of the total investment of the project.

11.14 Comprehensive evaluation conclusion

The project is the second level of “Jiebei-Bazizui-Shuanggang”-Xinjiang National High-grade Channel Construction. The project construction conforms to the "Jiangxi province inland river shipping development plan", "Xinjiang Construction of high-grade channel development plan(2011-2015)", and "Jiangxi’s 13th Five-Year comprehensive transportation system development planning", in accordance with the requirements of national industrial policy.

After the completion of Bazizui Navigation-Power Junction, 37km will be canalized, and Supplemented by corresponding waterway regulation works. The navigation conditions of the section of 49Km from Jiepai to Bazizui can be improved, and the section also can be upgraded to the third level, which will further promote the implementation of the third level planning goal from Guixi Estuary to Chu River Estuary.

Project construction does not involve the environmental sensitive areas such as nature reserves. There is no major environmental sensitive problem restricting the construction of the project. Some adverse effects may be caused by the construction and operation of the project:

Reservoir inundation and land occupation result in partial land resources and surface vegetation loss; Influence of dam barrier on aquatic ecosystem of Xinjiang; An adverse impact may be caused on the local water quality, the air quality and acoustic environment of the construction area environment during the construction period. According to the comprehensive evaluation, these adverse effects can be prevented and alleviated after taking the ecological restoration and environmental protection measures proposed by the report. It is feasible to construct the air navigation power junction project in terms of environment.